



OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
FOR NUCLEAR, CHEMICAL, AND BIOLOGICAL DEFENSE PROGRAMS/
NUCLEAR MATTERS

DoD 3150.08-M
Nuclear Weapon Accident Response Procedures
(NARP)

INTERNET SUPPLEMENT





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FUNCTIONAL AREAS



ADMINISTRATION AND LOGISTICS

1. ADMINISTRATION

a. **Incident Action Plan.** The success of the accident management operation depends upon sound planning on the tactical, strategic, and operational levels. The Incident Action Plan (IAP) is an oral or written plan containing general objectives reflecting the overall strategy for managing an accident. Development of the IAP is the responsibility of the Planning Section Chief; the plan's execution is overseen by the Operations Section Chief. It may include the identification of operational resources and assignments. It may also include attachments that provide direction and important information for management of the accident during one or more operational periods. Planning considerations for developing the IAP can be found in reference (d). See Table 2 of the ICS Functional page for a sample IAP.

b. **Forms.** Given the diversity of the agencies responding to a nuclear weapon accident, commonality is important to ensure that all have a consistent understanding of the accident. Reference (d), Tab 9, gives a listing of the most common types of forms used within the NIMS construct. Additionally, these forms are available electronically at http://www.fs.fed.us/fire/planning/nist/ics_forms.htm. All elements of the nuclear weapon accident response will use these forms to communicate both within the IRF/RTF structure and for up-channeling information to regional and national coordination centers.

c. **Financial Management.** The Military Service or Defense Agency aiding or responding to a nuclear weapon accident shall fund any costs initially incurred from its own existing funds. The Military Service or Defense Agency having possession of the nuclear weapon or nuclear weapon components during the accident or incident is responsible for reimbursing, on request, the assisting or responding Federal coordinating agencies. These reimbursable costs are above and beyond the responder's normal operating costs and must be directly related to, or caused by, operations in response to the accident or incident. DoD 4000.25-1-M (reference (aw)) should be used and, as possible, supplemented by local service contracts. Because timely financial support of response activities is crucial to achieving the operational objectives of saving lives and protecting property, expeditious means should be employed to facilitate proper financing of operations. Federal agencies must use management controls, policies, and procedures to reasonably ensure that programs achieve their intended results; resources are used consistently with agency missions; programs and resources are protected from waste, fraud, and mismanagement; laws and regulations are followed; and reliable and timely information is obtained, maintained, reported, and used for decision making.

(1) To assist in meeting these financial goals, the Coordinating Agency should immediately request the tracking of accident management operations costs through the establishment and use of a Joint Chiefs of Staff project code. The RTF logistics staff officer should request assignment of a Joint Chiefs of Staff project code from the Joint Materiel Priorities and Allocations Board, an Agency of the Joint Chiefs of Staff, through the RTF-IC, the Joint Staff, the Military Service HQ, or the Unified Command HQ, as appropriate. Once approved, all response-related requisitions should contain the Joint Chiefs of Staff project code. For processing purposes, requisitions with a Joint Chiefs of Staff project code shall be ranked above all other

requisitions with the same priority designator. When a Joint Chiefs of Staff project code is assigned, the Defense Logistics Agency shall issue implementing instructions to all concerned.

(2) Project Code Requests. The Joint Chiefs of Staff project code request includes the following information:

- (a) The type of project code required (always 9 Alpha Alpha).
- (b) Project name.
- (c) Service monitor or coordinator.
- (d) Proposed effective date.
- (e) Proposed termination.
- (f) Force and/or activity designator.
- (g) Brief narrative background on the nature of the requirement.
- (h) Where available, units and forces using the project code.

(3) More specific guidance is available in DoDI 7000.14, Department of Defense Financial Management Policy and Procedures (reference (ax)) and the Financial Management Support Annex of reference (c).

(4) A Federal On-Scene Coordinator may need to be appointed to determine the financial liability and appropriate billing of response costs by non-DoD agencies. This individual should be placed in the finance section of the Incident Command.

2. LOGISTICS. The amount of logistics support depends on the location of the accident or incident and the extent of contamination, if any. Similarly, the location and severity of the accident or incident will determine the necessity for the presence of many of the teams listed in succeeding paragraphs of this chapter. Only the IRF, RTF, EOD, DOE/NNSA RAP teams, and DHS special teams (FIRST and ERT-A, see Enclosure 2, section 2.f.(3)(b) of DoD 3150.08-M) will deploy automatically. Other teams will deploy only after a determination is made by the JNAIRT (prior to the Combatant Command assuming operational control of the accident response operation) or upon request by the IRF or RTF commander. In essence, the deployment of assets to the accident or incident scene will be a “pull” (requested) operation as opposed to a “push” (automatically deployed) operation. The Logistics Section is responsible for ensuring nuclear weapon accident or incident response operations are supportable. If an accident or incident results in extensive contamination, all phases of the accident management operation may involve up to 2,500 people and take six months or longer to complete. Specific accident or incident needs may increase or decrease the following requirements. At a minimum, billeting, messing, and sanitation services shall be provided. Logistics management during nuclear weapon accident or incident response operations is conducted primarily within the Logistics Sections of the various NIMS-based organizational elements. The logistics management function is an element of ESF#7 – Logistics Management and Resource Support. This ESF provides the staff for the

Logistics Section Chief for managing the control and accountability of Federal supplies and equipment; resource ordering; delivery of equipment, supplies, and services; resource tracking; facility location and operations; transportation coordination; and information technology systems services and other administrative services.

a. Materiel Management. Logistics personnel find appropriate, time-sensitive, and cost-effective ways to fill the materiel requirements developed by operations personnel. Equipment and supplies are provided from current Federal stocks, or, if necessary, from commercial sources. These materiel requirements include, but are not limited to: sufficient water, potable and non-potable, to support response force personnel; heavy equipment; petroleum, oil, and lubricants (POL); packaging and shipping materials for weapons, components, and contaminated waste and other radioactive materials; electrical power; personal protective and other specialized clothing (climate dependent); and logistical support unique to the JIC.

b. Personal Property Management. All Federal departments and agencies acting within the scope of the Stafford Disaster Relief and Emergency Assistance Act (reference (s)) must account for personal property in accordance with the Federal Management Regulations (reference (ay)) and existing agency property management policies.

c. Facility Management. Facility requirements include: messing and billeting facilities for response force personnel; equipment and personnel decontamination stations; working space or shelters for responders working in forward operations areas; sanitation facilities for response force personnel and news media; and laundry facilities for contaminated and uncontaminated clothing. All facilities and related support necessary for operations are sourced through the following ESFs when they are activated and requested to do so:

(1) ESF#2. Communications support emergency telecommunications and information technology services for Federal, State, local, and tribal accident or incident managers.

(2) ESF#3. Public Works and Engineering provides operational support for mobilization centers, staging areas, and distribution sites for all infrastructure and engineering service commodities required to support assigned Federal and direct-support missions.

(3) ESF#7. Logistics Management and Resource Support includes the requirements for obtaining facilities, facility setup, space management, building services, and general facility operations.

(4) ESF#8. Public Health and Medical Services support public health and medical services for Federal, State, local, and tribal accident or incident managers.

d. Transportation Management. Transportation requirements for a nuclear weapon accident or incident response operation include medical evacuation of acute casualties, rapid transport (air and ground) from the airhead or nearest military installation, air or ground delivery of supplies to remote sites, and response force personnel transportation between staging areas and the accident or incident site. Transportation of DoD forces will be in accordance with the respective Combatant Command's guidance. DoD forces will utilize the mode of transportation that meets mission requirements (commercial, military air, or organic moves) when responding to a nuclear weapon accident or incident. Primary/Emergency Nuclear Airlift Force (P/ENAF) missions will be required for return of damaged weapons and components from OCONUS and may be

determined to be the most risk adverse method for required movements within CONUS. The respective Combatant Command will validate movements within their AOR and coordinate lift requirements with USTRANSCOM when necessary. For all other agencies, ESF#1—Transportation serves as the point of contact for requesting transportation assistance in support of agencies responding to a nuclear weapon accident or incident. This ESF determines the mode and carrier for all transportation requests.

(1) Vehicular Support. A wide variety of vehicles, both in tonnage and purpose, are required to support response operations. If operations continue more than 30 days, equipment maintenance may become a major consideration. To keep the number of maintenance personnel on-site to a minimum, frequent rotation of vehicles with the providing organization is recommended. As an alternative, consideration may be given to replacing unit vehicles with rented or leased vans with six- to nine-passenger or cargo-carrying capacity when an off-road capability or vehicle-mounted radio is not a specific requirement. A sufficient supply of GSA, Defense Energy Support Code, or DOE/NNSA personnel who have Government Purchase Cards should be available for refueling vehicles used in areas where government fueling facilities may not be available. Vehicles in contaminated areas should not be removed for maintenance or returned to the owning organization until they have been decontaminated. Minor on-site maintenance of contaminated vehicles may, therefore, be necessary. Base camp construction and SR may also require heavy equipment. If resources are obtained through a contract, and work will be done in the contaminated area, decontamination criteria and hazardous working conditions will be addressed in the contract.

e. Resources. Response to a nuclear weapon accident or incident is a high priority operation, and thus, all required resources from the Department of Defense, DOE/NNSA, and other Federal agencies with a radiological or emergency response capability are usually available to the accident or incident response forces. Use of local facilities and equipment near the accident or incident scene, such as National Guard armories and vehicles, gymnasiums, and hotels, may be a workable solution to some of the logistic problems. Military installations near the accident or incident site may also provide a supply point, messing, and billeting for response force personnel.

(1) Base Camp Support. If the accident or incident location dictates establishing a base camp for response personnel, consider the proximity of the accident site to the nearest military installation, availability of local civilian facilities, available power, and water supply and sanitation facilities. For remote base camps, Basic Expeditionary Airfield Resources (BEAR), a mobile messing and billeting package maintained by the USAF, may be necessary.

(a) BEAR kits are air-transportable operations support sets for units that operate in remote locations where pre-positioning is not politically or economically practical. The kits include tents, field kitchens, cots, and similar housekeeping items. Additional equipment includes generators, TF-1 light carts, shower and laundry facilities, water storage bladders, and water purification equipment. The kits do not include vehicles, personal equipment items (such as parkas, bedding, or sleeping bags), or expendables (such as food, fuel, or medical supplies). BEAR kits are designated war reserve materials and maintained in a ready-to-deploy status in the CONUS by the 49th Material Maintenance Group, Holloman AFB, NM. These kits are under the operational control of HQ ACC/Logistics Plans. For OCONUS operations, HQ USAF and HQ PACAF also maintains BEAR kits.

(b) BEAR kits are divided into two separate packages – B-550i (initial housekeeping) and B-550f (follow-on housekeeping). Each package supports 550 personnel. They are typically deployed in pairs to support up to 1100 personnel. Both kits may be transported together on 12 C-17 aircraft. If BEAR kits are required at an accident or incident scene, the on-scene staff must make arrangements for personnel to unpack and assemble the equipment, to manage billeting space, and to operate the field kitchens. Special teams, such as USAF Prime Base Engineer Emergency Forces (BEEF) and Readiness In Base units may be requested to provide additional support.

(2) Personal Protective Equipment (PPE). Either reusable or disposable personal protective clothing that can be used for nuclear accident response should be procured for all response forces. Sources for disposable personal protective equipment are:

- (a) DA Services, Inc., Defense Apparel
247 Addison Road
Windsor, CT 06095
Phone: (800) 243-3847
Fax: (860) 688-5787

- (b) Lancs Industries, Inc.
12704 NE 124th Street #36
Kirkland, WA 98034
Phone: (425) 823-6634
Fax: (425) 820-6784
www.lancsindustries.com

- (c) Norvell Protective Clothing
115 Edgewood Street
Alexandria, TN 37012
Phone: (615) 529-2855
Fax: (615) 529-4197

- (d) RSO, Inc.
P.O. Box 1450
Laurel, MD 20725-1450
Phone: (888) RAD-LINE
Fax: (301) 498-3017
www.rsoinc.com

- (e) Vallen Safety Supplies
3300 W. Montague Ave
Suite 400B
Charleston, SC 29418
Phone: (800) 4-VALLEN
Fax: (610) 485-6214
www.vallen.com

(f) FRHAM Safety Products, Inc.
171 Grayson Rd
Rock Hill, SC 29732
Phone: (803) 366-5131
Fax: (803) 366-2005
www.frhamsafety.com

AND

318 Hill Ave
Nashville, TN 37210
Phone: (615) 254-0841
Fax: (615) 726-2514

(g) Kimberly-Clark Corporation
Building 100/1
1400 Holcomb Bridge Rd.
Roswell, GA 30076
Phone: (800) 255-6401
Fax: (800) 579-3555
www.kcprofessional.com/us/

(3) Contaminated Clothing Laundering Facilities. Commercial contaminated clothing laundry facilities may be used at various locations throughout the United States. If a commercial laundry facility cannot be located, contaminated clothing will be treated as hazardous waste and disposed of appropriately.

f. Local Service Contracts. Use of local service contracts to ease logistical support is recommended whenever possible and financially beneficial to the government. The following services should be considered for local service contracts: POL, water, sanitation, maintenance, laundry of non-contaminated clothes, and radiological waste disposal.

g. Dissemination of Procedures. Provisions should be made to ensure that all personnel or units responding to the accident or incident are provided written information describing procedures to follow in requesting logistical or administrative support. This information should indicate clearly to whom requests should be submitted, as well as the approval authority. The status of all requests should be monitored and any problems encountered should be reported to the requesting person or organization.

h. News Media and JIC/CIB. Advance planning should take into account the possible billeting, messing, and transportation support for news media, as authorized by the Department of Defense and Service directives. The number of media personnel might vary from a small number to hundreds, depending on the severity of the accident or incident. Close coordination is required with the Public Information Officer (PIO) to determine specific requirements. The JIC should be provided full logistical support including transportation, expendable and non-expendable equipment, and supplies (see section 6 of the Public Affairs page for JIC/CIB equipment requirements). Specific requirements shall be decided by the PIO. More information on JIC operations and PIO responsibilities can be found in the Public Affairs page.

COMMUNICATIONS

1. GENERAL

a. Fast, reliable, and accurate communications are essential for nuclear weapon accident or incident response operations. Moreover, securing adequate internal communications to support activities at the accident scene is a time sensitive operation. Equally critical to effective C2 is the timely establishment of external communications to higher levels, particularly in the Washington, D.C. area. The communications officers of the DoD IC must act immediately to ensure that appropriate communications equipment is identified and requested early in response operations. Information must be accessible. In general, the value of information increases with the number of users.

b. Effective response to a nuclear weapon accident or incident relies heavily on a communications officer's knowledge of secure and non-secure tactical, strategic, and commercial communications systems. He or she must be able to apply conventional and imaginative methods and ensure that required communications are available. He or she should be equally adept at establishing communications support in remote locations or in areas near existing communications systems.

c. The DoD, DOE/NNSA, FEMA, State, and/or civilian officials shall all establish their own internal communications systems at the accident or incident site and shall ensure that these systems are interoperable with those of sister agencies.

2. SPECIFIC REQUIREMENTS

The DoD IC requires internal communications with the operations center and forces in the field to control and keep abreast of response activities. External communications with higher levels of command are necessary to keep key personnel informed. Many initial communications requirements may be met by unsecured voice communications; however, both secure voice and record communications are required early in the response period. Communication requirements:

a. Establish the following communications capabilities internal to the accident site:

(1) Telephone communications between fixed site locations, for example, the operations center and the JIC/CIB.

(2) Field communications for EOD operations. Secure communications are always necessary.

(3) Wireless Communications. Provide secure wireless nets such as UHF/VHF nets for command, weapons recovery operations, radiological operations, security, and public affairs.

(4) Establish and assign radio call signs.

(5) Establish a local computer network or access to a local computer network. If possible, establish virtual C2 requiring password access. The computer network should be

protected by an appropriate firewall and be able to access the Internet, accommodate e-mail, and ease document processing storage and recovery. Additionally, computer assets must be robust enough to securely maintain the potentially large amount of records which will be generated during all phases of the response operation.

b. Establish the following external communications to higher HQ:

(1) The Department of Defense will establish telephone communications with the Combatant Command's Operations Center, the Joint Field Office (if activated), the Service Operations Center, the NMCC/JNAIRT, and the Office of the ASD(PA). DOE/NNSA actions will include establishing telephone communications with the appropriate Site Offices and the DOE. Conferencing may suffice early in the response.

(2) Multiple secure and non-secure telephone lines to support response force elements. The telephone network should be sized to ensure an adequate ability to handle the expected volume of traffic. The communications officer should consider programming the serving telephone switch or switches to increase the likelihood of call completion. Hunt groups should be considered and features, such as call roll over and voice mail, enabled where appropriate. DSN access must be considered.

(3) Secure voice through satellite, telephone, or high frequency (HF). Often using Secure Telephone Unit (STU) IIIs and Secure Terminal Equipment (STEs) shall be the most practical and immediate method of establishing secure voice.

(4) Access is required to the Defense Information System Network for record communications from remote locations.

(5) Internet access. The requirement to send and receive large data size documents and images between command authorities is probable. Therefore, Internet access should be as robust as practical. The communications officer should strive to provide bandwidth at 128Kbps or higher. SECRET Internet Protocol Router Network (SIPRNET) access is always desirable. If SIPRNET is available, the DOD IC and staff should consider the regular use of the SIPRNET chat room feature for keeping all concerned parties updated on the nuclear weapon accident response operation.

c. Coordinate frequency usage with all response organizations and with the NCS/ESF#2 representative to prevent interference and to ensure electromagnetic emissions will not create explosive hazards or affect electronic and field laboratory instruments. Get frequency clearances, as necessary.

d. Prepare the Incident Communications Plan and Signal Operating Instruction (SOI) for use by all response organizations.

e. If required, request the Chairman of the Joint Chiefs of Staff's deployable communications assets.

f. If required, get leased commercial communications.

g. If present, coordinate all communications activities and planning with the Federal Emergency Communications Coordinator (FECC), who is the lead person on ESF#2. The FECC is the single Federal point of contact in the accident or incident area to coordinate the Federal telecommunications requirements and industry's response. The FECC coordinates with the State telecommunications officer to ensure Federal communications requirements do not conflict with State needs. The FECC prioritizes conflicting requests and recommends solutions to the JFO Coordination Group.

3. RESOURCES

Communications capabilities and resources for nuclear weapon accident or incident recovery operations vary widely. Resources are as familiar as the telephone or as sophisticated as satellite capable secure voice radio. Communications assets must be able to deploy and operate in remote locations. This section briefly describes a variety of communication resources for response organizations. Because the same equipment supports many contingencies, only those assets required for a specific nuclear weapon accident or incident response effort should be requested. Resources are available from the Department of Defense, other Federal agencies, and commercial sources.

a. Service Assets. The Military Services maintain communications assets organic to combat support units and for contingency assets. Information about specific assets, as well as procedures for requesting and tasking Service assets, may be obtained from the respective Service operations centers or operational commanders. Service assets may be obtained by contacting the individual Service Operations Center.

(1) U.S. Army. U.S. Army Signal organizations are designed to support deployed forces from the theater Army level down to the smallest unit. Major communications support includes C2, communications, and automation systems. Essential elements of these areas include long haul transmission systems Super High Frequency (SHF) and Ultra High Frequency (UHF) satellite terminals, voice (Mobile Subscriber Equipment and Tri-Service Tactical [TRI-TAC] Voice Switches), record communications traffic (e.g., TRI-TAC Message Switches), Frequency Modulation (FM) and HF radio systems (e.g., SINCGARS), and data communications networks.

(2) U.S. Air Force. Tactical communications assets are available from both the Combat Communication Groups and HAMMER ACE. HAMMER ACE is a rapidly deployable team with military and commercial off-the-shelf technology communications equipment. The mission of HAMMER ACE is to provide initial secure C2 communications.

(3) U.S. Navy. The Joint Maritime Operations Command Center, Mobile Integrated Command Facility, and the Mobile Ashore Support Terminal comprise the U.S. Navy's Joint Maritime Command Information System, i.e., the U.S. Navy's tactical ashore communications capability. These systems were fielded to replace the Ashore Mobile Contingency Communication System. Although these capabilities primarily support the naval component commander of a Combatant Command or Joint Task Force, their modular organization makes these systems ideally suited for use with liaison teams or in support of contingency requirements.

(4) U.S. Marine Corps. Present Marine Corps C2, communications, computers, and intelligence systems mix some analog transmission equipment with digital transmission and

switching equipment that is compatible with TRI-TAC. During contingency operations, and if approved by the supported Combatant Commander, the Marine Air Ground Task Force HQ may extend Defense Information Infrastructure (DII) common users services (Internet Protocol Router, DSN, Secure Voice Systems, Defense Messaging System/Automatic Digital Network) through a DII entry point by way of a Ground Mobile Force satellite link.

b. Joint Chiefs of Staff Controlled Assets. Joint Chiefs of Staff contingency support communications resources are requested according to procedures in the Chairman of the Joint Chiefs of Staff Instruction 6110.01A (reference (bb)). Additional information on these assets may be obtained from the Joint Staff Contingency Support Division.

c. DOE/NNSA Assets. The DOE/NNSA maintains emergency response, air transportable communications services, and hardware. Systems include a multi-point telephone switch, fax, HF/VHF radio networks (with pagers), video teleconferencing, and terrestrial microwave system. A multi-channel satellite system is available to provide long-haul transmission capability. Single-channel International Marine Satellite (INMARSAT) terminals with data interface are included for advance party use and emergency backup. Secure communications include voice, fax, still and full motion video, and data. Field communications are linked into the DOE/NNSA ECN through satellite. DOE/NNSA assets may be obtained through the DOE HQ/EOC.

d. DHS Assets. DHS provides communications support in two primary ways – FEMA deployable assets and activation of Emergency Support Function #2.

(1) FEMA Assets. Telecommunications can be provided for one or multiple locations within a disaster location. This support is provided by Mobile Emergency Response Support (MERS) and Mobile Air Transportable Telecommunications System (MATTS) telecommunications assets which are based at five locations designed to support the ten FEMA regions (see Table 1.); further, Table 2. lists other communications assets which can be deployed by FEMA. Both MERS and MATTS can establish or reestablish communications connectivity with the public telecommunications system or Government telecommunications networks. They can interconnect facilities within the disaster region. MERS and MATTS can wire austere facilities and install computer, telephone, and video networks. Both systems have these telecommunications transmission capabilities:

(a) Satellite. Ku-band satellite for quick connectivity that provides up to 48 lines for either telephones or data. INMARSAT and American Mobile Satellite Corporation (AMSC) satellite terminals provide immediate, single-voice channel capabilities.

(b) Line of Sight Microwave. Microwave transmission to connect to the public network, provide connection to other facilities, or extend communications.

(c) High Frequency (HF) to communicate with Federal, State, and local emergency centers via the FEMA National Radio Network and FEMA Regional Radio Network.

(d) Very High Frequency (VHF) and Ultra High Frequency (UHF) for local radio communications.

Table 1. MERS and MATTS Regional Responsibilities

MERS or MATTS	Area of Responsibility
Maynard, MA MERS Detachment	FEMA Regions I and II
Thomasville, GA MERS Detachment	FEMA Regions III and IV
Denton, TX MERS Detachment	FEMA Regions VI and VII
Bothell, WA MERS Detachment	FEMA Regions IX and X
Denver, CO MERS	FEMA Regions V and VIII
Berryville, VA MATTS	As required

Figure 1. FEMA Regions



Table 2. Additional FEMA Assets

Type	Purpose
Fiber optic cable	Inter-site communication distribution
Private Branch Exchanges (MERLIN and G3) and telephones	Telephones and switches capable of supporting 25-300 people
Multiplexers (IDNX and IMUX), D4 channel banks, routers, and file servers	Communications routing and exchange
Personal computers with standard software configured in local and wide area networks	For use by the Federal responders
VHF and UHF radios	For local radio networks. These can be extended with repeaters
Video broadcast	To record and disseminate video information from the disaster location
INMARSAT and AMSC satellite telephones	Provide single channel voice or data

(2) ESF #2 Assets. While a full description of ESF #2 capabilities is available in reference (c), ESF #2 has the capability of providing access, when and where appropriate, to national-level programs such as the Shared Resources (SHARES) High-Frequency Radio Program, Telecommunications Service Priority (TSP) Program, Government Emergency Telecommunications Service (GETS), and Wireless Priority Service (WPS).

e. Commercial Assets. In the CONUS, acquisition of supporting communications systems from commercial carriers (for example, American Telephone and Telegraph) is possible. Commercial carriers may provide communications to a remote area by transportable microwave, carrier systems, or cable. Leased services, including telephone, data Teletypewriter Exchange, Telephone Exchange, and Wide Area Telephone Service (WATS), are available in most locations.

4. CONCEPT OF OPERATIONS. Nuclear weapon accidents and incidents present a variety of technical, logistical, and operational communications problems. Several factors, including the location of the accident, the response force involved, and the C2 arrangements of those forces, contribute to the complexity of the problems. This concept of operations focuses on the actions of the military response force(s) communications officer(s) and the DOE/NNSA communications personnel. The approach is to present items of concern sequentially, regardless whether the IRF, RTF, or DOE/NNSA communications officer takes the action. The RTF communications officer shall find out what has been accomplished before arrival and carry on from that juncture.

a. Initial Actions. The initial task of the response force communications officer is to determine the communications assets at, or close to, the accident or incident site. The local telephone company, State and/or local officials, or civilian authorities may provide information on the communication infrastructure near the accident or incident scene and the capabilities for

long haul and local communications; this information is particularly important if the accident or incident damaged or destroyed portions of the communication infrastructure. Additionally, cell phone capabilities may be severely limited in a large scale accident due to over usage. Once existing capabilities are determined, the communications officer should use these resources with deployed assets to establish an effective communications network.

(1) In remote or sparsely populated areas, the initial communication capability may consist of only hand-held, short-range VHF/FM radios, portable HF radios, cellular telephones, or wire (field phones). Conversely, if an accident or incident occurs close to a populated area, a coin-operated telephone, cellular telephones, or even a business or private telephone may be available immediately for emergency use. In either case, additional leased communications, such as Wide Area Telephone Service (WATS), may be obtained to supplement available communications. Because more time is required to provide leased assets to remote areas, the requirements must be identified and requested at the earliest possible time. Follow-on deployment of mobile communications provides the response force with additional local telephone and radio, as well as long haul secure voice and record capabilities.

(2) Another method of communications for external (long haul) communications, particularly if assets are limited, is the telephone conferencing capability of the Service Operations Centers, the NMCC, and the DOE/NNSA HQ/EOC. Further, if communication may be established from the site to the DTRA Operations Center and the DOE/NNSA Service Center, the DTRA Operations Center or the DOE/NNSA Service Center will assist by relaying information or coordinating with other forces and/or Agencies.

(3) The DoD IC may spend considerable time away from the Command Post. The response force communications officer must, therefore, plan communication methods to support the mobility of the DoD IC. Radio nets provided for DoD IC communications should have sufficient range and be capable of frequent use. If possible, the net should be secure and have a radio and/or wire integration capability into the local switchboard and long haul voice circuits. The staff directors for operations, planning, and logistics, as well as the special staff advisors, should be included in this net.

(4) The communications officer must take prompt action to get frequency clearances. Radio frequencies are managed at the national level by the Military Communications-Electronics Board (Joint Frequency Management Office). Each Service has membership on the board. Moreover, each Military Department has a frequency management office, but in most cases these offices have delegated the authority to assign frequencies to area coordinators. Additional details may be obtained from USA FM 24-2 or AFI 33-118 (references (bc) and (bd)). DOE/NNSA and FEMA communications personnel should coordinate frequency requirements through their own channels and keep the military communications officer advised. Failure to get valid frequency authorizations might result in interference with other critical communications.

(5) One of the more complex problems facing the response force communications officer is preparing an Incident Communications Plan (ICP) using the ICS205 form (see Figure 2.), as well as a Signal Operating Instruction (see Figure 3. for an SOI outline). The ICP should be designed to make the most efficient use of the communications equipment and facilities assigned to the accident or incident response operation. The SOI should be an easy-to-use instruction containing the capabilities and limitations of equipment and detailed "how-to-use" procedures for all available systems. The SOI should be unclassified, if possible, and widely distributed. It

should at least include system descriptions (charts and diagrams are helpful), an on-site telephone directory, dialing and telephone routing instructions, message addresses, message handling instructions and routing indicators, radio procedures and call signs, secure voice procedures, and Communications Security (COMSEC) operations security procedures, including Essential Elements of Friendly Information (EEFIs).

(6) Although COMSEC instructions are a part of the SOI, COMSEC deserves additional emphasis. Enemy or dissident elements may be able to intercept and exploit C2 communications systems and traffic used for response to nuclear weapon accidents or incidents. Compilations of individually unclassified items concerning weapons communicated during recovery procedures may well be classified, and unfriendly elements may be able to compile these items; therefore, the communications officer in conjunction with the Operations and Plans Sections, must plan to defeat this threat by determining the EEFI for the operation, and then acting to prevent interception or exploitation of this information. COMSEC actions to prevent exploitation of EEFIs may include using secure transmission facilities, communications discipline, codes and authenticators, and changing call signs.

Figure 2. Incident Communications Plan

INCIDENT COMMUNICATIONS PLAN				1. Incident Name	2. Date/Time Prepared	3. Operational Period Date/Time
Telephone						
4. Communications Plan Concept of Operation						
5. Contact List						
Section & Position	S T A T E	F E M A	O F A	Name	Phone Number	Cell Phone Number
Incident Facilities						
Command Staff						
General Staff						
Other FCO/SCO Staff						
ICS 205-A FEMA	6. Prepared by Date/Time				7. Reviewed by Date/Time	

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b. Follow-On Actions. As additional response forces deploy to the accident or incident scene and a support base camp is established, additional communication resources shall be

deployed or acquired concurrent with the buildup. As this buildup occurs, the response force communications officer should establish and maintain a list of communications assets and capabilities on-scene. The list should include assets and frequencies belonging to non-DoD or DOE/NNSA agencies, identifying potential mutual interference, and should ensure that all possible assets are considered when meeting overall communication requirements. Coordination should be made with the appropriate representative from Federal and civilian authorities and/or officials having on-scene communication systems.

(1) As stressed throughout this chapter, increasing the quantity of communications assets and routing those assets into the appropriate users' hands is very important as the response organization grows. Additional communication assets, primarily in the form of telephones and VHF/FM radios, are needed for effective operation of the JIC/CIB and to support radiological monitoring and SR operations.

(2) As the response operations peak, so shall the communications support required. As the response transitions into SR, the primary communications should be routine situation reports, Military Standard Requisitioning and Issue Procedures messages, and other administrative messages. After the weapon(s) and weapon components are removed from the site, little or no need shall exist to communicate by secure voice; however, a record of communications support provided on-site during the early response and weapon recovery should continue through SR. This record should be submitted to the Documentation Unit of the Planning Section at the termination of the operation.

LEGAL

1. GENERAL. A nuclear weapon accident or incident presents complex legal problems for the DoD IC. Legal issues range from questions on jurisdiction and authority to exclude the general public from specific areas, to paying simple personal property claims. The response force organization should include a legal element to advise and assist the DoD IC in resolving these issues. During a DoD-led response, the senior military member of the legal element responding with the staff of the DoD IC is the DoD PLA. During a DOE/NNSA-led response, the PLA is the Legal Advisor from the DOE/NNSA Service Center that deploys with the SEO.

2. SPECIFIC REQUIREMENTS. The PLA shall:

a. Advise the DoD IC and functional staff elements on any legal matters related to the accident or incident. Advise the DoD IC on authority for establishing jurisdiction and authority for establishing an NDA in accordance with DoD Directive 5210.63 (reference (be)) and section 797 of Security Regulations and Orders, Penalty for Violation (reference (bf)).

b. Organize and supervise the legal functional element at the accident or incident site, including facilitating a claims processing facility.

c. Ensure that the claims processing facility is accessible to the public and mutually agreeable to local officials. As soon as the claims processing facility is established, the JIC will be provided information on the location for inclusion in a news release.

d. Coordinate technical legal matters with a higher authority, when required.

e. Coordinate legal issues with the PLAs of other participating departments or agencies, the Combatant Commanders, and DoD General Counsel as required.

f. Provide legal advice and assistance to other Federal officials, on request.

g. Review operational plans to identify potential legal problems and ensure that they are legally sufficient, with emphasis on security, radiological safety, environmental law, and the preservation and/or documentation of evidence for use in any resulting criminal prosecutions, resolving claims or other litigation.

h. Ensure that all legal personnel work closely with the PIO to ensure no hidden legal implication will impact response efforts. Additionally, all press releases and media guidance should be reviewed for accuracy and legal sufficiency. Finally, the PLA and his staff should work with the PIO to prepare the DoD IC and his staff for press conferences.

i. Coordinate on the RUF and the Rules of Engagement, as necessary, outside the territory of the United States before finalization.

j. Ensure compliance with and adherence to HIPAA, CERCLA, and Freedom of Information Act (FOIA).

3. RESOURCES

a. Providing timely and sound legal advice and assistance depends on adequate personnel and communication among functional elements. The designated legal element of the DoD IC's staff should include at least two attorneys and one legal clerk available for 24-hour operations in support of the ICP. Depending on the nature of, and circumstances surrounding an accident or incident, additional personnel may be required. Pre-designated response forces should ensure that the assigned legal element is aware and capable of addressing the complex and politically sensitive national defense issues that evolve from a nuclear weapon accident or incident, as well as managing and administering a claims processing facility.

b. Other Interagencies may include a legal advisor as an element of their response force. To assure consistency, all legal advice and assistance should be coordinated jointly with these other legal advisors.

c. The General Council, DTRA, is a member of the CMAT and will deploy to the accident or incident site to advise and assist the PLA.

4. CONCEPT OF OPERATIONS

This concept of operations establishes guidelines for the operation of the PLA and his or her staff. Circumstances surrounding an accident or incident are the driving force of the sequential order.

a. Planning. The PLA must be knowledgeable about the authority and responsibility of the Department of Defense and DOE/NNSA, as well as that of the various other Federal departments and agencies in a nuclear weapon accident or incident. Inherent in this event are the relationships between international, Federal, State, and local authorities, as well as jurisdictional principles, security requirements, environmental requirements, and claims administration. Since requests for legal advice require immediate response, and adequate research facilities are unlikely to be available on-site, designated legal elements should prepare a handbook of references, including those listed in the reference page. These references provide the authority and some background for subject areas, such as establishing the NDA, law enforcement, use of force, evacuation of civilians, and damage to public or private property. The handbook should be tailored to the respective Service or agency.

b. Initial Actions.

(1) The DoD IC and staff must have immediate access to the PLA; accordingly, the legal element should be located in or near the ICP.

(2) Providing timely and legally sound advice and assistance is mostly based on communication; therefore, liaison must be established with all the major functional elements of the DoD IC's staff to make all elements aware of the need for coordination of planned actions.

(3) Maintain a prioritized list of planned actions and events and a record of completed actions. A copy of this record will be provided to the Documentation Unit of the Planning Section.

(4) The claims processing facility should be established at a location easily accessible to the public and mutually agreeable to local officials. Depending on circumstances, more than one claims facility may be required. The claims processing facility should be collocated with the civil emergency relief and assistance office, when possible. As soon as the claims processing facility is established, the JIC will be provided information on the location for inclusion in a news release.

(5) Claims processing personnel will be aware of the sensitive nature surrounding the accident or incident. The PLA ensures that any information provided to claimants is according to established policies, and that query for any information other than claims procedures are referred to the PIO.

(6) Response efforts may necessarily result in the disturbance and/or destruction of physical evidence that may later prove to be significant in resolving claims, criminal prosecution, or other litigation. Accordingly, the PLA should take immediate action to ensure factual and evidentiary information is preserved for both safety and/or criminal investigations, as well as claims resolution. This includes photographs and/or videos, interviews with witnesses, documentation of radiological hazards and safety procedures, identification of responding forces and civilians at or near the accident or incident scene, and appropriate recording and receipting of property.

(7) The PLA must identify and establish liaison immediately with local law enforcement officials, legal authorities, and State and local emergency response organizations.

(8) To ensure that legal advice is timely, responsive, and consistent, the PLA should establish liaison with legal advisors representing other Federal Agencies at the accident or incident site.

c. Follow-On Actions. The PLA, or a representative, stays at the scene until the response operation is complete. The PLA advises the DoD IC until the claims processing facility stops operations.

d. Public Affairs. Adverse publicity is inherent to a nuclear weapon accident or incident simply by its occurrence. Mishandling of public affairs may impact claims and litigation, result in a loss of confidence by the public in the actions of the USG in the cleanup process, or have long-term political and financial implications that might undermine support for the nation's nuclear deterrent capability. It is therefore essential that:

(1) Legal personnel work closely with the PIO to ensure that no hidden legal implications impact response efforts.

(2) All personnel involved in the response effort must refer all media and public queries for information to the PIO.

(3) Legal personnel coordinate with the PIO to review proposed public statements and media guidance for legal sufficiency and implications.

(4) Legal personnel should work with the PIO to prepare the DoD IC and his staff for press conferences.

MEDICAL

1. GENERAL. This page provides guidance on the medical requirements resulting from a nuclear weapon accident or incident. Recommended procedures and available resources, their location, and how to get them are also discussed.

a. Radioactive and other types of contamination may result from a nuclear weapon accident or incident. The accident or incident itself (traffic accident, aircraft accident, storage facility fire, terrorist attack, etc.) may generate a large number of casualties that may be compounded by the detonation of the weapon's high explosives and the presence of noxious fumes. These casualties may have a variety of injuries ranging from inhalation of hazardous materials to severe trauma from the accident or incident. Specifically, emergency life-saving procedures in any major disaster are applicable to a nuclear weapon accident or incident. These procedures should not be delayed because of the presence of radioactive materials. Other weapon-specific non-radioactive hazards (fire, presence of explosives, etc.) should be considered before emergency care is rendered. In instances when radioactive contamination is not dispersed (for example, the September 1980 TITAN II explosion at Damascus, AR), the medical requirements, while greatly simplified, may still be significant.

b. If radioactive contaminants are dispersed, medical personnel must treat people who may be contaminated externally or internally. Treatment of contaminated patients requires special handling similar to universal precautions commonly used by medical care providers. For externally deposited radioactive material, decontamination involves removal and proper storage of clothing, as well as a standard washing procedure using mild soap and lukewarm water. Significant decontamination (greater than 90 percent) may be achieved by removing contaminated clothing. Contaminated wounds are surveyed and lavaged or debrided based on standard wound care management techniques, as well as the amount of radiological contamination. On other occasions, sophisticated treatment available only at special medical facilities may be required. If an explosion occurred, the potential exists that patients may have embedded fragments that may or may not be radioactive. Standard fragment removal procedures should be used initially. Once the nature of the fragment is determined, the need to remove the fragment should be reassessed by a competent medical authority. If embedded fragments are removed, they should be forwarded to the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) for evaluation. As with any response function, training must be conducted before an accident or incident.

c. For a more detailed discussion of specific radiological and non-radiological hazards which may be encountered during nuclear weapon accident or incident response, see section 6. of the Health and Safety page.

2. SPECIFIC REQUIREMENTS. Medical personnel will assist in accident- or accident-related emergency medical treatment. Rescue will be accomplished by trained fire and hazard materials responders. In general, medical personnel will work with personnel from Emergency Support Function #8 (if present) to assess the public health and medical needs (to include behavioral health), conduct surveillance of public health, provide medical care personnel, and provide medical equipment and supplies. Specifically, medical personnel are required to:

- a. Promptly treat accident casualties, injuries, or illnesses.
- b. Assess and report the magnitude of the accident or incident. This report will include as much specific medical and personal identification information that can be obtained, such as the names and Social Security Account Numbers of the fatalities, identifying information and the categories of injuries, suspected contamination, and priority for transport to a medical facility for each patient, including ambulatory, from the accident. Normal patient-regulating procedures and accident or incident site to medical treatment facility communications will be established to ensure appropriate patient transport and treatment.
- c. Advise medical facilities receiving casualties, in coordination with radiological personnel, of the possibility of internal and external contamination and measures that may be taken to prevent its spread as well as to treat the patient. Medical personnel should ascertain whether the treatment facility has the ability to administer standard drugs that are used to facilitate excretion of radioactive materials and treat the chemical toxicity that may occur. Medical personnel should also provide advice and assistance on the bioassay procedures that may be required to ascertain the level of radioactive and non-radioactive materials that may have been internalized by the patient that are specific to nuclear weapons.
- d. Establish health and safety programs to support response operations over an extended period of time.
- e. Implement the collection of bioassay samples from personnel who were in the area and response personnel and ensure that bioassay and external exposure data become part of the health records. Bioassays are procedures that estimate the amount of radioactive material deposited in the body, either by direct measurement, using sensitive X-ray detectors placed over the chest (lung counting) and/or other organs, or by detecting radioactivity in excreta (feces and urine). Bioassays should not be performed until the individual has been decontaminated due to the possibility of cross contamination. Also, skin contamination might cause instruments to indicate a potentially large intake of radioactive materials when none may be present. See section 4.e. for a discussion of collection procedures for bioassay samples. In addition, actions should be taken to identify any retained embedded fragments to determine if they are radioactive or unusually hazardous if allowed to remain embedded.
- f. Establish a heat- and/or cold-exposure prevention program and other environmental prevention measure programs.
- g. Assist in casualty decontamination.
- h. Manage remediation of internal contamination.
- i. Help obtain and maintain radiation health history of all personnel involved in accident or incident response, including civilians in the surrounding community exposed to radiation or contamination because of the accident or incident.
- j. Record and track all information germane to personnel, evacuees, and casualties for hand-off to the Radiological Advisory Medical Team (RAMT) or the Medical Radiobiological Advisory Team (MRAT) for follow-up. RAMT policies and procedures are outlined in AR 40-13 (reference (bg)). MRAT policies and procedures are outlined in AFRRI Instruction 5100.52.

- k. Update the IC periodically on the extent and condition of casualties.

3. RESOURCES

Medical support assistance, specializing in radiological health matters, is available from the Department of Defense and DOE/NNSA. Although many resources are available, all may not be required for response to a given accident or incident. When an accident or incident occurs, assets should be requested when needed.

- a. The DoD IC may elect to have a medical advisor on his special staff. The medical advisor's role is to provide advice and recommendations to the DoD IC in the context of a nuclear weapon accident involving medical and mental health services to those personnel working at the accident or incident site. The medical advisor will work closely with the Safety Officer.

- b. IRF. The IRF will have a medical element. If possible, the medical element will include a medical officer trained in radiological health matters, preferably by completion of the Medical Effects of Ionizing Radiation (MEIR) course.

- c. RTF. The RTF medical officer will assess the medical requirements and ensure that adequate medical resources are available. The RTF medical officer will be proficient in radiological health matters, preferably by completion of the Medical Effects of Ionizing Radiation (MEIR) course.

4. CONCEPT OF OPERATIONS. The medical response to a nuclear weapon accident or incident involves the emergency treatment of casualties, liaising with civil medical authorities, processing fatalities, establishing a medical clearing facility, collecting bioassay samples, and providing base camp medical support.

- a. Emergency Treatment. Treating casualties is a high priority at any accident or incident. The likelihood of response force involvement in the initial rescue and treatment procedures depends on response time. The longer it takes to get to the accident or incident, the greater the likelihood that casualties will have been treated and removed by civilian authorities. If possible, EOD personnel and/or radiation monitors should mark a clear path, or accompany fire/rescue personnel into the accident or incident site to help avoid radioactive, explosive, and toxic hazards. However, weapon render safe operations may prevent EOD personnel from accompanying fire/rescue personnel into the accident or incident site. Fire/Rescue personnel will wear protective clothing, appropriate for the medical risk to the patient and the radiological risk to the provider. Respiratory protective devices will be worn based on the non-radiological hazards (smoke or fumes) when entering the accident or incident area. Respiratory protection will not be required when treating patients outside the contaminated area, but patients' clothing should be removed and handled carefully. Suggested casualty handling procedures for emergency response to a nuclear weapon accident or incident include:

- (1) Assess and assure an open airway, breathing, and circulation of the victims. Administer cardiopulmonary resuscitation, if necessary, using a bag-mask, positive pressure ventilator, or mouth-to-mouth resuscitation.

(2) Move victims, if possible, away from the contaminated area. Take routine precautions. Do not delay customary life-saving procedures (drugs, Military Anti-Shock trousers, etc.) because of radiological contamination.

(3) Administer intravenous (IV) fluids, as necessary. Prophylactic IVs are not recommended.

(4) Control hemorrhaging and stabilize fractures.

(5) If a victim is unconscious, consider medical or toxic causes. While supra-lethal doses of radiation exposure can cause rapid unconsciousness, this is not possible without at least a partial nuclear yield.

(6) When required, patients should be triaged using standard triage procedures that divide patients into the categories of immediate, delayed, expectant, and minimal.

(7) After the immediate medical needs are met, coordinate with appropriate radiological response personnel to monitor the victims for possible contamination before transporting to the hospital. Note and record the location and extent (in counts per minute (cpm)) of the contamination, and the instrument used, on a field medical card, then place this card in a plastic bag and attach to the patient's protective mask or in another fashion that prevents loss. Also, ensure that open wounds are covered with a field dressing to keep out contamination if the wound is uncontaminated or to contain the contamination if the wound is contaminated. Removal of contaminated clothing is advisable if the medical authority decides that its removal is not contra-indicated. Clothing should carefully be cut, not torn, and rolled to keep the outside of clothing away from the skin. Finally, wrap the patient in a clean sheet to contain any loose contamination during evacuation. Casualty decontamination, particularly wound decontamination, of seriously injured patients is best performed in a medical treatment facility.

(8) Determine if corrosive materials were present at the accident scene, since these materials may cause chemical burns. Take all possible precautions to prevent introduction of contaminated materials into the mouth.

(9) No medical personnel or equipment should leave the contaminated area without monitoring for contamination; however, transporting seriously injured victims should not be delayed for monitoring or decontamination. It is important that medical personnel positively identify each patient before transport and permanently attached personal identification to each patient. This is especially important if the patient is unconscious and the clothing has been removed. For conscious patients, it is still important to positively establish identity prior to transport or during the transport process.

(10) Attendant medical personnel shall then process the patients through the Contamination Control Line. As long as the patient stays wrapped in the sheet, he or she does not pose a threat of spreading contamination and compromising the CCL. Hence, these patients should be evacuated without decontamination. The patient shall then be transferred to the "clean" side of the hot line and placed in the charge of "clean" medical personnel residing on the uncontaminated side of the CCL. The patient may then be loaded into the ambulance or evacuation vehicle and be transported to the receiving medical facility. The procedures listed in subparagraphs 4.a.(11)(c). through 4.a.(11)(e) below may be determined en route to the medical

facility if radiation detection instruments are available, but not at the expense of medical care. Consider using a single medical facility for contaminated casualties if a facility has sufficient capacity.

(11) To ensure that the receiving facility is prepared for the arrival of the victims, notify the facility of the following:

- (a) Number of victims.
- (b) Types or nature of injuries, vital signs, and triage category.
- (c) Extent of contamination, if known.
- (d) Areas of highest contamination.
- (e) Any suspicion of internal contamination.
- (f) The radionuclide and the chemical form, if known, and by what instrument it was measured.
- (g) Any exposure to non-radiological toxic materials.

(12) On arrival at the hospital, take patients immediately to the area designated for receiving contaminated patients. If no such area exists, then take the patients to the emergency room. Under no circumstances should life- or limb-saving treatment be delayed because of concerns for the spread of contamination in the hospital. En-route to the hospital, attendant medical personnel should advise the hospital to institute contamination control precautions to the greatest extent possible. These precautions include, but are not limited to:

- (a) Covering the area with butcher paper, non-slip plastic sheeting, or absorbent-lined plastic diapers to contain loose contamination. Tape seams to prevent trip hazards.
- (b) Ensuring that personnel have the appropriate radiation detection instrumentation, i.e., alpha scintillation detectors or GM counters with pancake probes, and that they are versed in the use of this equipment.
- (c) Ensuring personnel are wearing proper protective clothing. For this type of accident, surgical gowns, gloves, shoe covers, and masks should be appropriate protection against contamination.

(13) The decontamination of the patients may then begin. An autopsy table is a very suitable decontamination platform. These measures include:

- (a) Carefully opening the sheet or blanket wrapped around the patient to avoid spreading any contamination.
- (b) Removing clothing by cutting away the sleeves and trouser legs and folding the contamination in on itself. This method parallels the standard methods of removing patient clothing in a NBC environment. These articles of clothing shall then be bagged to contain the

contamination. Removing contaminated clothing may remove up to 90 percent of the contamination.

(c) Remaining contamination may be located with the use of monitoring equipment and then removed by washing with mild soap and warm water. Several washings may be required, but do not expect decontamination to be 100-percent effective. Suspect areas include the hair, face, neck and hands, as well as other exposed areas of the body due to injuries or torn clothing. Hair is extremely difficult to decontaminate because of its oil content. If shampoo or lemon juice are not effective in decontaminating hair, then clipping the hair and collecting it in marked zip-locked bags for analysis is an appropriate alternative.

(d) Except in life-saving emergencies, the ambulance or evacuation vehicle shall not be returned to normal service until it is monitored and decontaminated and such efforts have been confirmed by attending radiological monitors.

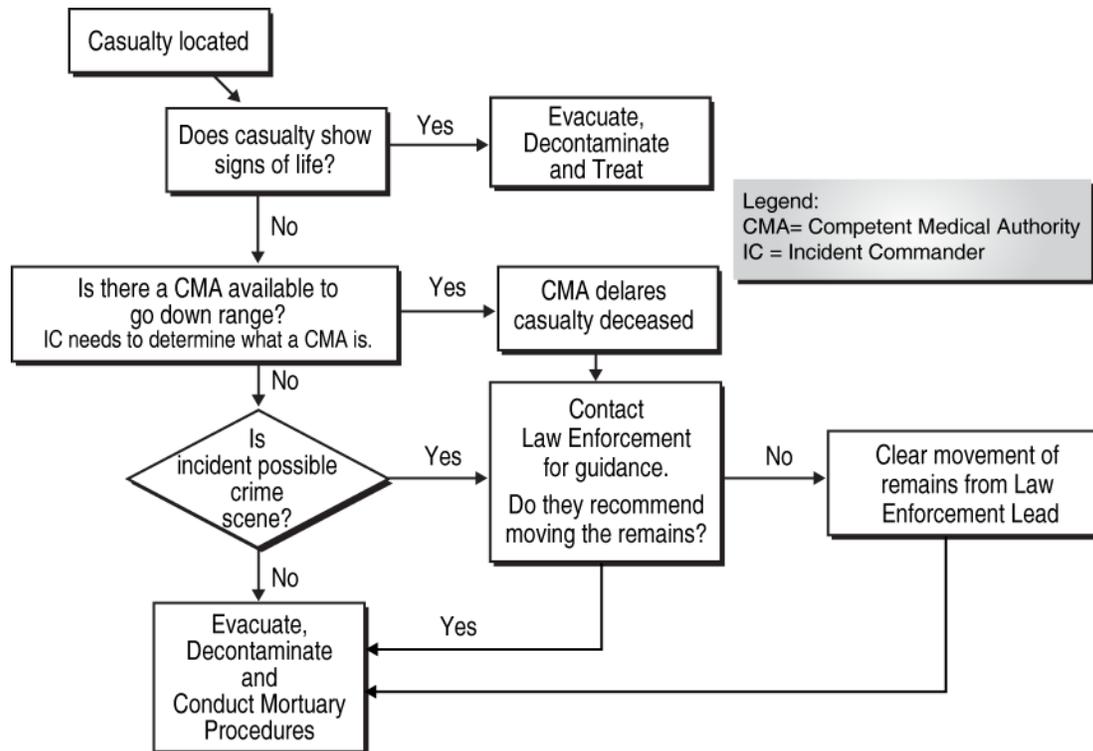
b. Liaison with Civil Authorities. Emergency evacuation of contaminated casualties may have occurred before response force personnel arrived at an off-base accident or incident. Additionally, some response force personnel may have returned from the contaminated area before appropriate controls were implemented; if so, follow-on responders must liaise with area medical facilities to ensure that proper procedures are taken to prevent the spread of contamination. It must be determined if local medical facilities are able to monitor and decontaminate their facilities or if assistance is required. The following procedures may be used by medical facilities not prepared for radiological emergencies to reduce the spread of contamination:

- (1) Use rooms with an isolated air supply, if possible.
- (2) Use scrub clothes, shoe covers, and rubber gloves, and bag them and any other clothing, sheets, or materials that may have come in contact with the patient when leaving the room.
- (3) Get radiation monitoring assistance for detecting alpha emitters.
- (4) Use non-slip plastic sheeting, butcher paper, or absorbent pads on floors to ease decontamination and cleanup.
- (5) Use isolation-control procedures.

c. Processing of Fatalities. The remains of deceased accident or incident victims will be treated with the same respect and procedures used in any accident; however, all fatalities must be monitored for contamination, and decontaminated if necessary, before release for burial. The determination of whether decontamination is to be done before an autopsy will be made by the examining authorities. Any radiological support for autopsies will be arranged on a case-by-case basis. Service procedures for handling casualties are in AR 600-8-1; Air Force Instruction (AFI) 36-3002; and Naval Military Personnel Manual, Article 1770-010 (references (bh) through (bj)). Civil authorities must be notified of any civilian casualties as quickly as possible, and if required, help identify the deceased before decontamination. Additional technical guidance on handling radioactively contaminated fatalities may be found in the National Council on Radiation Protection and Measurements Report, Number 65; Joint Pub 4-06; and U.S. DHS, "Working

Group on Radiological Dispersal Device (RDD) Preparedness, Medical Preparedness and Response Sub-Group” (references (bj) through (bm)).

Figure 1. Contaminated Casualty Flowchart



d. Medical Clearing Facility. A medical clearing facility will be established near the Contamination Control Station (CCS) with supplies for medical treatment of response force injuries and to assist in decontamination. Minimum response force medical staffing after the initial emergency response should include a medic with a physician and health physicist, on call. If an injury occurs within the contaminated area or exclusion zone, and if injuries allow, the injured person should be brought to the CCS and clearing facility by personnel and vehicles already in the area. A separate first aid station may be needed to support the base camp.

e. Collection of Bioassay Samples. Medical personnel usually collect required bioassay samples from response force personnel. Procedures for collecting and marking samples will be coordinated with the ASHG. The ASHG will also guide where samples should be sent for analysis. Depending on Service procedures, urine and fecal samples may be required of all personnel who enter the exclusion zone or of those suspected to have internalized radioactive material.

(1) Bioassays are procedures that estimate the amount of radioactive material deposited in the body, either by direct measurement, using sensitive X-ray detectors placed over the chest (lung counting) and/or other organs, or by detecting radioactivity in excreta (feces and urine). Therefore, many factors must be known in addition to the quantity and isotopic distribution of the material to accurately estimate the dose. These factors include chemical form, route of intake, elapsed time from intake, organ(s) containing the material, distribution pattern, organ(s) mass(es),

biological half-life, particle size of the original material, and decay scheme of the radioisotope. Complex mathematical models have been developed that take each of these factors into account.

(2) Three methods are used to determine the amount of material present in the body. Each method has specific advantages and disadvantages and the specific methods used in any given situation shall be determined by the health physicists.

(a) Fecal Sampling. Fecal sampling may be an effective means of detecting inhaled insoluble material that has been transported from the lungs to the gastrointestinal (GI) tract and excreted. Fecal samples may be quickly screened using low-energy gamma detectors such as the FIDLER to estimate the plutonium or americium content. For more definitive results, chemical separation and low-level counting techniques (which may take days or weeks) must be used. Fecal samples should not be collected until at least 48 hours after exposure to allow the contamination to pass through the GI tract. (Samples collected sooner than this may not be representative and may, in fact, give a false sense of security.) The optimal time for sampling is between two and three days after the inhalation; however, samples collected weeks or months after an intake may still be useful, depending on the size of the intake. Samples should be collected in well-sealed bags. Local medical supply houses or medical facilities should have collection kits (which fit onto a standard toilet seat) which may make sample collection easier. Figure 1. below may be used to roughly estimate the committed effective dose equivalent (CEDE) from inhaling weapons-grade plutonium based on contamination detected in a single fecal sample.

(b) Urine Sampling. Urine sampling is a less sensitive indicator of plutonium exposure; only a tiny fraction of the amount inhaled is excreted through urine. This fraction also depends on the solubility of the plutonium in the original aerosol. Samples taken during the first five days after the exposure may not reflect the quantity of plutonium inhaled due to the time required for movement through the body. Large-volume samples collected for 24 hours are preferred. Urine samples must be processed in a chemistry laboratory before quantification is possible, but screening for very high levels (by gamma-scanning for Am-241) may sometimes be done in the field. Samples should be submitted in plastic or glass bottles with well-sealed tops. Figure 1. below may be used to roughly estimate the CEDE from inhaling weapons-grade plutonium based on contamination detected in a single urine sample. Samples taken for several years after exposure may be used, since plutonium is insoluble in the lung. Material is usually released from the lung into the bloodstream over a very long period of time. Some material may be so insoluble that it may not even show up in the urine for several years.

1. Single-voiding urine samples should be collected from all personnel suspected of being exposed (through inhalation) to significant quantities of uranium. The optimal time for such samples is from 24 to 48 hours after exposure, although samples collected for days or weeks after an intake may be useful depending on the size of the intake. Such samples must be processed by a radiochemical laboratory. These analyses typically take several days to several weeks. Since uranium from normal environmental sources is always present in the urine, care must be taken to determine whether the level of uranium detected is significantly greater than this "background" level.

2. Single-voiding urine samples should be collected from all personnel suspected of being exposed to significant quantities of tritium. Exposed workers should void their bladders immediately after exposure to avoid collection of a non-representative sample. Subsequent voids

are collected for analysis. The optimal time for such samples is from four to eight hours after exposure, although samples collected for days or weeks after exposure may still be useful. Samples collected sooner than 90 minutes after exposure may not be representative. Usually such samples must be processed in a radiochemistry laboratory (using liquid scintillation counters) but portable liquid scintillation counters are available in some emergency response organizations. Urine sampling is the main way of determining tritium uptake.

(c) Lung Counting. Lung counting is the direct measurement of emitted X rays and gamma radiation (typically Am-241 in a weapons accident) from the body with a sensitive low-energy photon detector. Lung counters are used at DOE/NNSA national laboratories, commercially, and at some hospitals and universities. Most lung counters are immobile systems using large shielded rooms (special trailer-mounted systems may be obtained through the DOE/NNSA in a few days), and the patient must be sent to the facility. Inhaled plutonium stays in the lungs for extended periods of time. Portable FIDLER (or similar) detectors may be used for rough screening measurements but have poor sensitivity. However, such measurements may be easily distorted by small amounts of surface contamination, and should only be performed by experienced and qualified personnel. Figure 2. may be used to roughly estimate the CEDE from inhaling weapons-grade plutonium based on the results of a lung scan for Am-241. Note that a negative lung count measurement obtained with a FIDLER or other portable instrument does not rule out a significant intake of transuranics.

(3) Interpretation of Single Bioassay Results: Weapons-Grade Plutonium. Figure 2. may be used to make a rough initial estimate of the dose significance of a single bioassay measurement (Am-241 gamma scan) obtained after acute inhalation of weapons grade plutonium. The curves represent the 50-year CEDE implied by a 24-hour urine or fecal sample result of 1 microcurie of Am-241, or a lung count of 1 microcurie of Am-241, on a given day after inhalation. Note that these curves are using the Am-241 result from a gamma count as a "marker" for the entire mix of plutonium and americium found in weapons-grade plutonium. Accordingly, these curves may not be used directly for plutonium results; they must be used with Am-241 results. Note also that Figure 2. may not be used to interpret uranium or tritium bioassay results.

(a) The following steps are used:

1. Move right along the horizontal (X) axis to the number of days between inhalation and sample collection.
2. Move up to the curve of interest (urine sample, fecal sample, or lung count).
3. Move left to read the dose-per-microcurie on the vertical (Y) axis.
4. Multiply this dose-per-microcurie by the actual sample or measurement result.

(b) Example of use.

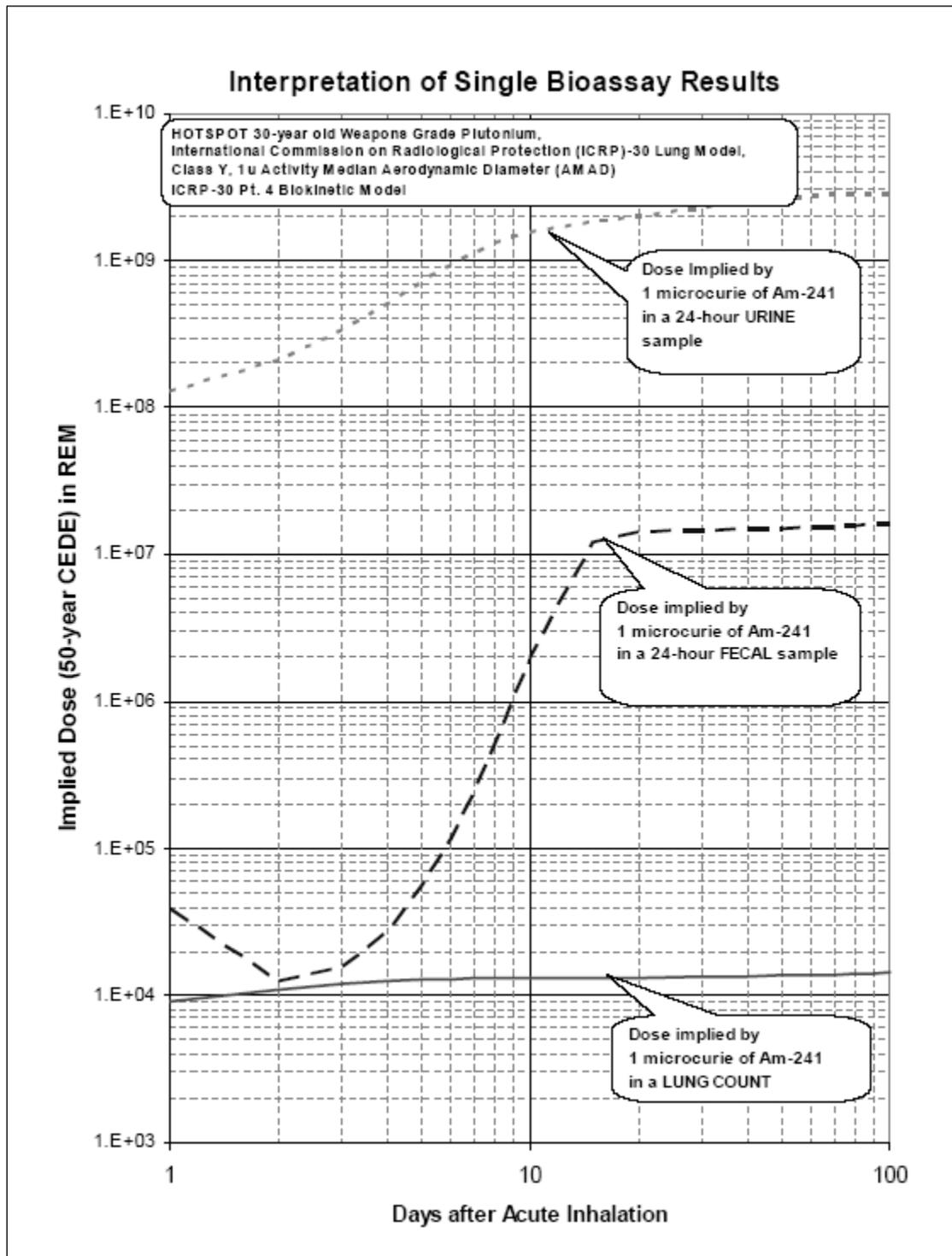
1. A fecal sample was collected about a week after a person was exposed to a fire involving weapons-grade plutonium. The plutonium involved in the fire is known to be about 30 years old. A "screening" gamma scan was performed on this sample, giving a result of 5.0 x

10^{-5} μCi (about 110 dpm) of Am-241. What is the approximate dose implied by this single result?

2. The fecal sample dose curve is represented by the heavy dashed line. At 7 days after inhalation, the dose-per-microcurie value is about 2×10^5 rem. Multiplying this value by the actual fecal sample result of 5.0×10^{-5} μCi gives an implied 50-year CEDE of about 10 rem.

(c) Cautions about Use. This information is intended for use by individuals with expertise in internal radiation dosimetry. There are many potential sources of uncertainty and error in using a single bioassay measurement to estimate dose. Different exposure or intake scenarios, individual biological differences, and sample collection and analysis uncertainties all contribute to this overall uncertainty. Accordingly, such "single-point" dose estimates should be viewed as rough indicators at best.

Figure 2. Estimated 50-Year Committed Effective Dose Equivalent



(d) Technical Notes for Figure 2.

1. These curves are generated by estimating the fraction of an inhaled intake that would be excreted through the urine or feces, or kept in the lungs, on any particular day after intake. Dividing the actual bioassay result by these “intake excretion fractions” or “intake retention fractions” gives an estimate of the initial intake. Multiplying this estimated intake value by a “dose conversion factor” (DCF) (dose per unit intake) gives an estimate of the dose.

2. The material inhaled is assumed to be a 30-year-old mixture of “weapons grade” plutonium, as characterized by the LLNL “Hotspot” Health Physics Codes (The Am-241 concentration is about 4,300 parts per million). The material is assumed to have “Class Y” (very insoluble) lung solubility characteristics and to have a particle size distribution of 1 micrometer Activity Median Aerodynamic Diameter (AMAD). Since the Am-241 is assumed to have “grown-in” to the plutonium matrix, the Am-241 is assumed to have the same lung solubility characteristics as the plutonium. It is also assumed that this Am-241 has the same systemic retention and excretion characteristics as the “parent” plutonium. These assumptions are somewhat simplistic but are likely to provide a conservative estimate of dose.

3. For consistency with current guidelines and regulations, the following models were used to generate the intake excretion and retention fractions used in Figure 1.:

a. ICRP-30 Respiratory Tract Model.

b. ICRP-30 GI Tract Model.

c. “Jones” Plutonium Excretion Model.

4. The intake, excretion, and retention fractions were computed, but are essentially the same as those published in NUREG/CR-4884 [http://www.nrc.gov/reading-rm/doc-collections/reg-guides/occupational-health/active/8-09/ - book8#book8](http://www.nrc.gov/reading-rm/doc-collections/reg-guides/occupational-health/active/8-09/-book8#book8) (reference (bn)).

5. DCFs were taken directly from Federal Guidance Report 11 (reference (bx)). This report uses the ICRP-30 Respiratory Tract and GI Tract Models, the ICRP-48 Systemic Model for Plutonium and Americium, and the tissue weighting factors of ICRP-26.

6. Newer Biokinetic Models. The ICRP has recently introduced a new Respiratory Tract Model (ICRP-66) and new biokinetic models for plutonium and americium (ICRP-67.) Use of those models, coupled with corresponding DCFs (ICRP-71) produces dose estimates that are usually from two to five times lower than those of Figure 2. Thus, the curves of Figure 2. probably provide a conservative estimate of doses from such an intake.

(4) Bioassay Procedures. The Federal agency, State agency, or affected country may administrate a bioassay program for affected civilians. The guidelines in table 1. below are provided to assist the response force or civilian authorities conducting initial screening in advising contaminated individuals when requested to provide urine or fecal samples for analysis. Advisors explain that sample analysis determines if the individual received a detectable radiation dose when contaminated. The bioassay procedures used shall be established by health physicists responding to the accident. If possible, all follow-up bioassay monitoring or sampling protocols

should be established by a health physicist who has specific experience and expertise in the internal dosimetry of plutonium, uranium, and/or tritium. The DOE ARG usually has such dosimetry assets available. When bioassay samples are collected, try to keep samples and their containers free of contamination from the environment, clothing, or skin. Since tritium contamination may not be detected by CCS monitoring, anyone suspected of having been exposed to tritium should follow the guidelines in table 1. A bioassay program is recommended for all individuals without respiratory protection who are found to be contaminated. This program shall determine if any dose was received, and assure those who did not receive a dose that their health was not affected. To provide similar assurance to all people in the contaminated area, bioassays may be appropriate even for people who were not found to be contaminated; moreover, some people never in contaminated areas may request tests to ensure they were not affected by the accident or incident.

Table 1. Guidelines for Bioassay Sampling

Suspected Radioactive Material	Feces Optimum Sampling Time After Exposure	Urine Optimum Sampling Time After Exposure	Sample Quantity
Plutonium	2 to 3 days	2 to 3 weeks	24 hours total
Uranium	2 to 3 days	24-48 hours	24 hours total
Tritium	N/A	4 to 8 hours	1 voiding

(5) Bioassay Priorities. If a nuclear weapon accident or incident occurs near a populated area, getting bioassay samples from large numbers of people may be necessary. Accurate identification of all bioassay samples (full name, ID and/or Social Security Account Number, age, gender, address, phone number, and date and time of collection) is imperative. The specific reason for sampling (e.g., “facial contamination: 50,000 CPM alpha using X instrument” or “1 mile downwind during initial plume passage”) should also be included to aid in later prioritization of processing. Considering the potential for public concern for their possible exposures, it may probably be better to err on the side of collecting too many samples, rather than too few samples. Note that samples may be collected from large numbers of people during the optimal collection time period and then stored for later analysis on a prioritized basis. Fecal samples should be frozen, and urine samples should be refrigerated (not frozen).

(a) Since it is very difficult for a significant amount of plutonium to be incorporated into the body without gross contamination of skin or clothing also occurring, initial alpha monitoring that identifies contaminated personnel may also provide a method for assuring that those with the greatest possibility of radiation exposures (that may affect their health) are given priority treatment.

(b) Table 2., applicable only to people not wearing respiratory protection, provides recommended guidelines for assigning priorities for bioassay analysis. Response force personnel shall usually be equipped with protective clothing and respirators, when required. Bioassays for response force personnel shall be performed in accordance with Service regulations and as directed by the IC.

Table 2. Guidelines for Assigning Priorities for Collecting and Processing Bioassays

Priority	Alpha Contamination Level on Clothing or Skin			
	60 cm ² (45% eff)	17 cm ²	100 cm ² (50% eff)	100 cm ² (20% eff)
HIGH	> 300,000 cpm	> 85,000 cpm	> 550,000 cpm	> 222,000 cpm
MEDIUM	30,000-300,000 cpm	8,500-85,000 cpm	55,000-550,000 cpm	22,200-222,000 cpm
LOW	< 30,000 cpm	< 8,500 cpm	< 55,000 cpm	< 22,200 cpm

Table 3. Sample Instrument Readings to Determine Bioassay Priority in Table 2.

Instrument	Probe (area in square cm)	Activity (microCurie/100 square cm)	Instrument indication
AN-PDR-56	*DT224B (17)	0.5	~85,000 cpm
ADM-300	#ASP 100 (100)	0.5	~222,000 cpm
E-600	‡SHP 380 (100)	0.5	~550,000 cpm
AN-PDR-56	*DT224B (17)	0.05	~8,500 cpm
ADM-300	#ASP 100 (100)	0.05	~22,200 cpm
E-600	‡SHP 380 (100)	0.05	~55,000 cpm

“High” contamination should be defined as “at or above 0.5 uCi/100 cm²” (or similar)

“Medium” contamination should be defined as “between 0.05 and 0.5 uCi/100 cm²” (or similar)

“Low” contamination should be defined as “below 0.05 uCi/100 cm²” (or similar)

*assumed α efficiency (4π) for DT224B is 45%

#assumed α efficiency (4π) for ASP 100 is 20%

‡assumed α efficiency (4π) for SHP380 is 50%

If α efficiencies are different from those assumed above, instrument indications must be re-calculated. Additionally, the use of activity, instead of instrument-specific count rates, will eliminate problems associated with inconsistencies in instrument calibration from facility to facility or from service to service (Air Force, Navy, National Lab, etc.).

(c) Personnel falling in the HIGH priority category in table 2. may have had a substantial plutonium intake. Conversely, exposure to airborne contamination that produces a surface contamination level in the LOW category would be less likely to result in a significant deposition in the lungs. To ensure alpha meter readings provide a valid guide for assigning priorities, individuals should be asked, during screening, if they have bathed or changed clothes since the time of possible contamination. The results of both alpha meter screening and bioassays for all personnel screened must be recorded and kept for future reference. Use of the Radiation Health History and Bioassay Screening Forms should be considered.

(6) Nasal Smears. Contamination on a wipe (e.g., a cotton swab) from inside the nasal passage is a possible indicator of plutonium inhalation. If initial alpha meter screening indicates probable plutonium or uranium inhalation, a nasal smear shall be collected for analysis by medical personnel trained in nasal swab bioassay procedures. However, due to the biological half-life of nasal mucus, a nasal smear is a reliable indicator only if collected during the first hour after the exposure. Accordingly, prompt nasal samples may be collected by any personnel, as long as they are taken carefully and labeled appropriately. Great care must be taken to avoid cross-contamination from the face, hands, or other sources while collecting nasal smear samples.

Ideally, separate swabs should be taken from each nostril. Each of these should be bagged separately, then placed in another bag labeled with name, ID number (as applicable), and collection date and time. After collection, the swabs must not be placed into any gels or liquids since this would inhibit alpha particle counting. A negative nasal smear does not rule out an intake of radioactive material. Nasal smears are only one tool of many used to determine whether an intake has occurred.

(7) Personnel Exposure and Bioassay Records. Documentation should be maintained on all personnel who enter the exclusion zone, or who may have been contaminated before an exclusion zone was established. Examples of forms used for recording data on personnel working in the exclusion zone, or who may have been exposed to contamination downwind from the accident, are in the Radiological Monitoring, Measurement, and Control Forms page. To ensure appropriate follow-up actions are completed on all exposed or potentially exposed people, a copy of all CCS logs, other processing station records, bioassay data, and other documentation identifying people who were or were not contaminated should be provided to the ASHG for consolidation into a single data file. This data file is subject to Privacy Act Regulations (section 552a of reference (bo)), and must be kept as part of the permanent accident records; therefore, procedures for handling data obtained on non-DoD personnel should be coordinated with the IC's legal officer. Data obtained on DoD personnel will need to satisfy Service-specific requirements in AR 11-9, BUMED P-5055, and AFI 48-125 (references (bp) through (br)). These records shall be kept and become part of the individual's permanent medical record.

f. Base Camp Medical Support. Base camp support requirements include treating on-the-job injuries and illness, inspecting field billeting and messing facilities, evaluating the adequacy of restroom facilities and sewage disposal, and supplying water. Personnel suffering cuts or open sores should be prohibited from entering the contaminated area until the wound is properly protected to exclude possible contamination. Their supervisors should be notified of the restriction.

5. PUBLIC AFFAIRS CONSIDERATIONS. All medical staff personnel should be aware of the sensitive nature of issues surrounding a nuclear weapon accident or incident. All public release of information should be approved by the IC and coordinated with the JIC/CIB. Medical personnel should ensure that public affairs personnel are informed of medical information provided to medical facilities receiving potentially contaminated patients. Hospitals shall provide medical information to the public and the news media in accordance with their policies. USG military and civilian responders should refer media and public queries for information to PA personnel. Additionally, medical personnel should make themselves available for participation in any news conferences held by the DoD IC.

HEALTH AND SAFETY

1. **GENERAL.** A nuclear weapon accident or incident is different from other accidents due to the possibility of radioactive contamination at the immediate accident site and extending beyond the accident vicinity. The complexities of a nuclear weapon accident or incident are compounded further by general lack of public understanding of radiological hazards. The IC must quickly establish a vigorous and comprehensive health physics and industrial hygiene/safety program to manage the health and safety aspects of a nuclear weapons accident. A good health and safety program provides for civil official involvement in the cooperative development of response efforts and a site remediation plan. The Safety Officer is the DoD IC's focal point for ensuring health and safety of the overall recovery operation. The ASHG is a valuable resource to the Safety Officer for addressing health and safety for the on-site weapon recovery operations portion of the response .

a. The Safety Officer monitors accident or incident operations and advises the DoD IC on all matters relating to operational safety, including the health and safety of emergency responder personnel. The ultimate responsibility for the safe conduct of accident management operations rests with the DoD IC or UC and supervisors at all levels of accident management. The Safety Officer is, in turn, responsible to the DoD IC or UC for the set of systems and procedures necessary to ensure ongoing assessment of hazardous environments, coordination of multiagency safety efforts, and implementation of measures to promote emergency responder safety, as well as the general safety of accident operations. The Safety Officer has emergency authority to stop and/or prevent unsafe acts during accident or incident operations. In a UC structure, a single Safety Officer should be designated, in spite of the fact that multiple jurisdictions and/or functional agencies may be involved. Assistants may be required and may be assigned from other agencies or departments constituting the UC. The Safety Officer, Operations Section Chief, and Planning Section Chief must coordinate closely regarding operational safety and emergency responder health and safety issues. The Safety Officer must also ensure the coordination of safety management functions and issues across jurisdictions, across functional agencies, and with private-sector and nongovernmental organizations. Agencies, organizations, or jurisdictions that contribute to joint safety management efforts do not lose their individual identities or responsibility for their own programs, policies, and personnel. Rather, each entity contributes to the overall effort to protect all responder personnel involved in accident or incident management operations.

2. **PURPOSE AND SCOPE.** This chapter provides information on health physics and industrial hygiene/safety and guidance on the radiological and other hazards associated with a nuclear weapon accident or incident. Also included is information on the resources available, the hazards and characteristics of radioactive and other hazardous materials potentially present, and suggested methods for detecting these hazards and protecting personnel from them. This information assists the IC in the operations under his or her control. The ASHG provides both direct health and safety support to weapon recovery operations and serves as the IC's organizational means to task on-site hazard and radiological data collection and analyze data collected for the most accurate and complete hazard and/or radiological assessment in support of the response effort. This chapter provides recommendations, advice, and assistance to civil authorities with jurisdiction over areas affected by the accident for both radiological and non-radiological hazards of a nuclear weapon accident. The ASHG is the on-site equivalent of the Federal Radiological Monitoring

and Assessment Center (FRMAC), and the two organizations coordinate closely if both are present. The FRMAC supports the IC with coordinated off-site monitoring and assessment. In accordance with reference (ad), the FRMAC may also be activated under a direct request from SLT governments and other Federal agencies. When activated, plume modeling conducted by the FRMAC will be used by DoD.

3. **SPECIFIC REQUIREMENTS.** DoD and DOE/NNSA response activities include protecting response force personnel and the public from on-site hazards associated with a nuclear weapon accident and to lessen potential health and safety problems. To accomplish this, DoD and the DOE/NNSA establish an ASHG to:

a. Initiate and manage on-site hazard and radiation health assessments, support weapon recovery operations, and provide on-site safety and environmental monitoring capabilities.

b. Obtain initial hazard plots (HPAC and/or ARAC) for an assessment of potential contamination and potential public dose; make the plot available to the IC; correlate the plot with survey results for confirmation and/or validity; and rerun the model(s), as needed, to update the projections. Once the FRMAC or IMAAC is on scene and operational, HPAC or ARAC plots will no longer be used.

c. Determine if radioactive contamination has been released.

d. Determine the presence of non-radiological hazards associated with the accident.

e. Advise the IC of precautionary measures for on-site personnel (residents, impacted individuals, security personnel, responders and others) in potentially contaminated areas. Convey risk assessment information.

f. Coordinate and integrate the capabilities of specialized teams working on-site.

g. Implement applicable health and safety standards and monitor the safety procedures of all personnel taking part in weapon recovery operations.

h. Monitor the tempo of the response effort and, if required, recommend a safety stand-down period to prevent undue physical and mental fatigue.

i. Manage and advise for actual and potential medical casualties in coordination with the medical response element and in accordance with guidelines in the AFRRRI's "Medical Management of Radiological Casualties" (reference (bs)); Army FM 4-02.283, Navy NTRP 4-02.21, Air Force Manual (AFMAN) 44-161(I), Marine Corps MCRP 4-11.1B "Treatment of Nuclear and Radiological Casualties" (reference (bt)); and other accepted medical practice. See the Medical page for specific discussion of the medical aspects of nuclear weapon accident or incident response activities.

j. Brief and train people not previously designated as radiation workers who are called upon to work in the contaminated area on the subjects of PPE, hazards, and safety measures before they enter potentially contaminated areas.

- k. Establish dosimetry and documentation procedures as early as Phase II, and especially during personnel decontamination and remediation operations.
- l. Determine levels of contamination present and boundaries of the on-site contaminated areas through ground and air surveys. Establish a CCL that marks the approximate perimeter of the on-site contamination area.
- m. Develop and provide on-site contamination plots to the IC.
- n. Consolidate all radiological and non-radiological assessment information for on-site recovery operations and provide it to the IC.
- o. Analyze and correlate all contamination data collected to identify inconsistencies requiring further investigation.
- p. Establish contamination control procedures and operate a CCS for personnel, equipment, and vehicles. If necessary, additional CCSs may be established.
- q. Establish a bioassay program (in conjunction with the medical response element). Upon arrival, the RAMT will provide advice and oversight for the bioassay program.
- r. Review and correlate records from CCS(s) and other personnel processing points to ensure bioassays or other appropriate follow-up actions are taken.
- s. Recommend methods and procedures to reduce or prevent resuspension and spread of radioactive contamination in case of wind shifts or disturbance by recovery activities.
- t. Refer all unofficial and media requests for information to the JIC/CIB. However, be prepared to present radiological contamination findings and results at press conferences and community forums, as directed. Present data in clear, concise, and non-technical briefings, outlining hazards, precautionary measures, business recovery, and where to get more information and/or assistance.
- u. Liaise with the FRMAC and with SLT authorities on off-site issues and on-site activities with the potential for off-site consequences.
- v. When the NDA, NSA, or Security Area is dissolved, transfer applicable control of ASHG personnel and equipment as requested to support FRMAC and/or SR operations (if on U.S. territory) or to the corresponding host nation authorities off-site.
- w. With the EPA, support the FRMAC in the development and coordination of the SR plan.
- x. Track all medical and radiological casualties in coordination with medical response personnel (see the Medical page).

RESOURCES

a. Response Force Resources. Response forces should have a full complement of operable and calibrated radiological and industrial hygiene/safety monitoring equipment. Sufficient quantities of materials should also be available for replacement or repair of critical or high-failure-rate components such as Mylar® probe faces. For the Department of Defense, replacement plans are necessary as RADIAC equipment available to IRFs may not meet initial operational needs after a large release of contamination. Although IRFs are equipped and trained to conduct radiation surveys for low levels of radioactive contamination, this is difficult to do over rough surfaces like rocks or plants, or over wet surfaces. Specialized DoD and DOE/NNSA teams are better equipped to monitor for low-level contamination, and more detailed monitoring should wait until these specialized teams arrive. The Radiological Monitoring Equipment page has a list of radiological monitoring equipment used by the Services, with a summary of their capabilities and limitations. Additionally, personnel should know the various units in which contamination levels might be measured or reported and the method of converting from one unit to another. A conversion table for various measurements is provided in the Conversion Factors for Weapons Grade Plutonium page.

b. Specialized Teams. Several specialized teams are available within the Department of Defense and the DOE/NNSA with substantial radiological monitoring and hazard assessment capabilities; these teams may also provide field laboratories and analytical facilities. Specialized teams, when integrated into the response, provide adequate technical resources to completely assess the on-site hazards. Additionally, specialized DOE/NNSA teams, which have off-site responsibilities, should be integrated into the response as appropriate. HPAC development support is through the DTRA Operations Center as well as the CMAT, which is an established and trained specialized team of advisors deployed to help the response manage all phases after a nuclear weapon accident. Specialized team operations are best integrated by establishing an ASHG, as discussed in section 3. above. When not required on-site, DoD specialized teams should assist in the off-site radiological response efforts, as requested. The capabilities of the specialized teams are highlighted in the Specialized Radiological Monitoring and Hazard Assessment Capabilities page.

5. CONCEPT OF OPERATIONS

This concept of operations assumes that a nuclear weapon accident or incident has resulted in a release of contamination to areas beyond the immediate vicinity of the accident site. The distinction between on-site and off-site is significant for security and legal purposes; however, for effective collection and meaningful correlation of radiological data, the entire region of contamination must be treated as an entity. Therefore, although the DoD IC is normally responsible only for activities occurring inside the NDA/NSA, the nature of the safety mission and its direct link to operations inside the NDA/NSA necessitate that RTF safety personnel remain under the authority of the DoD IC. The on-site and off-site distinction should be considered only when assigning areas to monitoring teams. Possible response force actions are addressed in this concept of operations. Only limited equipment and expertise may be available to the IRF.

a. IRF or DOE RAP Team Actions. Within the constraints of available resources, the IRF or the DOE RAP team arriving on-scene should determine the absence or presence of any

radiological problem and its nature; recommend reducing possible radiation hazards to the public and response force personnel as appropriate; identify all persons who may have been contaminated; establish traceable records of such personnel for follow-up; begin decontamination actions as resources permit; recommend public confirmation of the accident to the IC and provide appropriate news releases and; notify local officials of potential hazards.

(1) Pre-Deployment Actions.

(a) Before leaving for the accident site, hazard plot delivery should be arranged to help determine potential areas of contamination to avoid contamination of response teams and equipment. ARAC and HPAC plots can provide theoretical (conservative) estimates of the radiation dose to personnel downwind during the accident and also the expected location and level of maximum contamination deposition on the ground. As more details of the accident become known, specific accident data should be provided to the ARAC facility at DOE's Lawrence Livermore National Laboratory to update and refine these estimates of deposition and dose. These follow-on plumes generated by the IMAAC or FRMAC will be used instead of the preliminary HPAC plots.

(b) If an advance party is deployed, at least one trained person should have radiation detection instruments to determine if alpha-emitting contamination was dispersed and to confirm that no beta and/or gamma hazard exists. The sooner that confirmation of released contamination is established, the easier it is to develop a plan of action and communicate with involved civil authorities.

(2) Initial Actions.

(a) If the IC, or an advance party, deploys by helicopter to the accident site, an overflight of the accident or incident scene and the downwind area may provide a rapid assessment of streets or roads in the area and the types and uses of potentially affected property. During helicopter operations, flights should stay above or clear of any smoke and at a sufficient altitude to prevent resuspension from the downdraft when flying over potentially contaminated areas. The landing zone should be upwind, or crosswind, from the accident or incident site.

(b) After arrival at the site, a reconnaissance team consisting of an EOD element and/or other specialties should enter the accident site to inspect the area for hazards, determine the type(s) of contamination present, measure levels of contamination and initiate air sampling, mark a clear path, mark hazards, perform initial site stabilization and emergency procedures, and assess weapon status. The approach to the scene should be from upwind, if at all possible. The accident situation indicates whether the initial entry teams requires PPE or respiratory protection. PPE and respiratory protection should always be donned before entering a suspect area. Every consideration should be given to both protecting the initial entry team and preventing undue public alarm. Until the hazards are identified, only essential personnel should enter the possible contamination or fragmentation area of the specific weapon(s). The generally accepted explosive safety distance for nuclear weapons is 770 m (2,500 feet); however, contamination may extend beyond this distance. Specific fragmentation safety distances may be found in classified EOD publications. At this point, a temporary CCL should be considered. Later, when the boundary of the contaminated area is defined and explosive hazards are known, the control line may be moved for better access to the area. Contamination, or the lack thereof, should be reported immediately to the IC.

(c) If radiation detection instruments are not yet on-scene, observations from firefighters and witnesses and the condition of the wreckage or debris may indicate the possibility of contamination. Questions that may be asked to evaluate the potential for release of contamination are:

1. Was there an explosive detonation?
2. Has a weapon undergone sustained burning?
3. How many intact weapons or containers have been observed?
4. Do broken or damaged weapons or containers appear to have been involved in an explosion or fire?

(d) If no contamination was released by the accident or incident, the remaining radiological actions become preparation for response in the event of a release during weapon recovery operations and support of non-destructive evaluation operations (i.e., radiography). Ruling out the release of contamination shall be confirmed by a Specialized Team (i.e., AFRAT, RAMT, DOE-RAP, DOE-ARG).

(3) If contamination is detected, authorities should be notified and the assistance of specialized radiological teams and the DOE/NNSA AMS requested. The highest priority should be action to initiate general public hazard abatement. Do not delay or omit any life-saving measures because of radioactive contamination. If precautionary measures have not been implemented to reduce the hazard to the public, civil officials should be advised of the situation and consider possible actions. Actions that should be initiated include:

(a) Deploy monitoring teams, with radios if possible, to conduct an initial survey of the security area after EOD personnel have found the area free of hazards or have identified and marked hazards. Before EOD inspection of the area, all downrange personnel must be accompanied by EOD personnel.

(b) Recommend public confirmation of the accident to the IC. Prepare appropriate news releases (see examples on the Public Affairs page).

(c) Determine if medical treatment facilities receiving casualties have a suitable radiation monitoring capability. If not, deploy a monitor to determine if the casualties, and subsequently the surrounding area, were contaminated. Initiate notification of monitoring teams available in the private sector. Also help ensure that contamination has not spread in the facility. Procedures that a medical treatment facility may use to reduce the spread of contamination are described at sections 4.a.(12)(a) – 4.a.(12)(c) of the Medical page.

(d) Identify any witnesses, bystanders, or others present at the accident, in coordination with civil officials.

(e) Establish a CCS and a personnel monitoring program. If available, civil authorities and/or officials should have monitoring assistance provided at established personnel processing points.

(f) Arrange to have a fixative applied as soon as possible to reduce resuspension and the associated inhalation hazard (consistent with any weapon recovery operations).

(g) Implement procedures to protect response personnel. Protective coveralls (personal protective clothing), hoods, gloves, and boots are necessary to protect response personnel from contamination and to prevent its spread to uncontaminated areas. Respiratory protection is required if airborne contamination is detected above certain levels (see paragraph 6.c). Using Service-approved protective masks may provide respiratory protection in most instances. If extremely high contamination levels of tritium are suspected in a confined area, firefighting and other special actions require a positive pressure Self-Contained Breathing Apparatus (SCBA). Unless an accident is contained within an enclosed space, such as a magazine, only those personnel working directly with the weapon need take precautions against tritium.

(h) Develop and implement plans for controlling the spread of contamination. Administrative controls must stop contamination from being spread by personnel or equipment and protect response force personnel and the general public. This control is usually established by determining a contamination control area and limiting access and exit through a CCS. The perimeter of the CCA shall be near the line defined by the perimeter survey; however, early in the response before a full perimeter survey is completed, a buffer zone may be considered. If the contamination control area extends beyond the NDA or NSA, civil authorities and/or officials shall help to establish and maintain the control area perimeter. Personnel and equipment should not leave the control area until monitored and decontaminated. Injured personnel should be monitored and decontaminated to the extent their condition allows. A case-by-case exception to this policy is necessary in life-threatening situations, in which case emergency medical treatment takes precedence over contamination control (see section 4.a. of the Medical page).

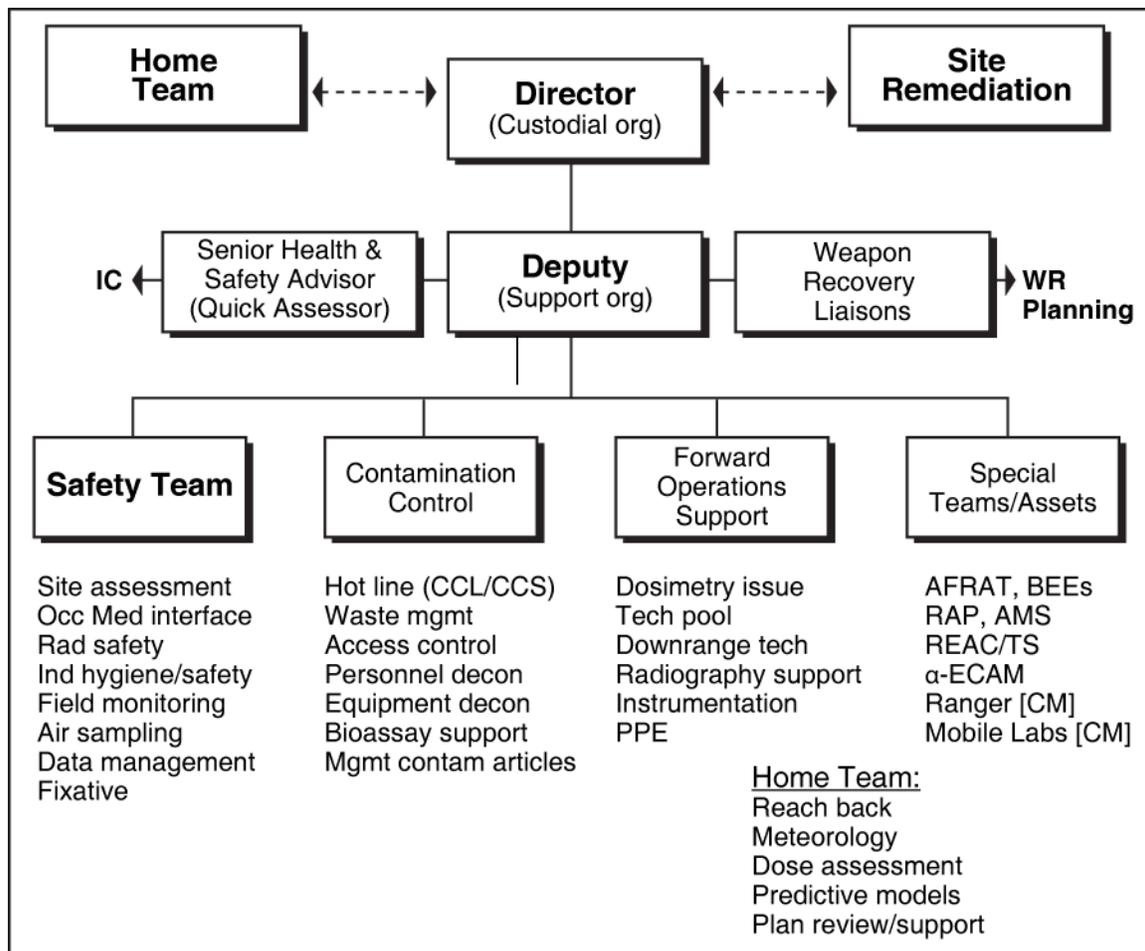
(i) Establish the location and initial operation of the Command Post, Operations Area, ASHG, and Base Camp. This is discussed in Enclosure 2, section 2. of DoD 3150.08-M.

b. RTF Actions. RTF personnel shall review IRF or DOE RAP team actions once they arrive on-scene. Actions include determining the status of the following: identification and care of potentially contaminated people, casualties, and fatalities; the results of radiation surveys and air sampling or an ARAC- and/or HPAC-computed assessment if the survey is not completed; radiological response assets on-scene or expected; logs and records; and the location for the ASHG. Representatives from the DOE/NNSA, the FEMA, the EPA, and SLT governments come together to serve as the primary off-site health and safety interface with the public. However, the Department of Defense should continue to provide assistance and radiation monitoring support, as necessary. During those periods early in the response when EOD operations limit access to the accident site, radiological survey teams should only support the weapon recovery efforts. Off-site radiological surveys require coordination with civil authorities. This arrangement may be understood by explaining the role of the ASHG and the FRMAC and by inviting civil government-approved radiological response organizations to participate in FRMAC operation. DoD specialized teams and the DOE/NNSA ARG are integral parts of the response. The IC should integrate DOE/NNSA ARG radiological assets into the ASHG organization.

(1) Accident Site Health Group ASHG. The ASHG provides health and safety support to and oversight of on-site recovery operations—weapon recovery activities, protection of

responders, and characterization and assessment of radiological and non-radiological hazards. The ASHG Director is a senior DoD health physicist if the Department of Defense is the custodial organization of the item(s) involved in the accident or incident with the DOE/NNSA providing the Deputy Director. If the DOE/NNSA is the custodial organization, it provides the Director and the Department of Defense provides the Deputy. These personnel should be knowledgeable about data on-site and how to best use the technical resources available. The recommended functional diagram is shown in Figure 1.

Figure 1. ASHG Functional Diagram



(a) Technical notes on Figure 1.

1. This figure is intended as a functional diagram and not as an organizational chart. Not all of the functions may need to be done in response to a particular accident. Some of the functions may take a number of personnel to do. Others may be combined under a single person. All are scenario dependent.

2. The ASGH Director is provided by the organization in custody of the item(s) which caused the problem (the DoD or DOE/NNSA). The ASHG Deputy Director comes from the other (supporting) organization.

3. DOE/NNSA will coordinate the functional areas on this diagram, whether or not it is the custodial organization, with inputs from and supported by DoD responders as needed. Joint operations are expected in most functional areas.

4. As the Safety Officer will be a member of the DoD IC's staff, the Safety Officer will be collocated with the DoD IC at the ICP. As the ASHG is a robust organization with considerable expertise in field health and safety, the Safety Officer should maintain close communication with the ASHG in order to keep the IC apprised of health and safety issues in the on-site (weapon recovery) area and to ensure appropriate support to ASHG operations. While safety is everyone's responsibility, the variety of safety professionals participating in the response efforts in various venues should position themselves or allocate their time and priorities such that they can best ensure health and safety oversight of all accident site operations.

(b) On-site monitoring data are processed through and further distributed by the ASHG to the FRMAC. (Exercise appropriate communications security (COMSEC) in the exchange of on-site data and/or information because of the potential for classification issues).

(c) The ASHG is the single control point for all on-site hazard and/or radiological data, and they shall provide the most rapid information available to both military and civil users. After the initial response, the ASHG establishes the worker health and safety program, to include radiation protection, industrial hygiene/safety, and a dosimetry program that meets the needs and requirements for personnel working in or entering the on-site CCA. The responsibilities of the ASHG are detailed in section 3.

(2) Hazard Assessment and Control. The primary radiological hazard associated with a nuclear weapon accident is from fissile material, particularly alpha emitters. Quantities of beta and/or gamma emitters sufficient to pose a significant health problem are not usually present at a nuclear weapon accident. Other, non-radiological, hazards may be present as well, either from weapons components or from other objects involved in the accident (e.g., aircraft, vehicles). Some of the recovery operations may themselves introduce hazards (e.g., radiography, heavy equipment, heat or cold stress). Assessing such hazards and taking measures to control or mitigate them, both for the responder and for the potentially impacted members of the public, are key priorities.

(a) Radiological Surveys. Radiological surveys and other radiological data are required by the IC and civil authorities and/or officials to identify actions to reduce hazards to the response force and the public. Site characterization and decontamination and remediation planning will also need this information. Radiological survey results will be shared with the FRMAC to present a consistent picture of accident site contamination. During the emergency phase of the response, the emphasis of radiation surveys is on worker and public protection. Before beginning an extensive survey, select appropriate detection equipment, calibrate instruments, and determine the background readings. Early survey priorities may include establishing the edges of the contaminated area, surveying the NDA perimeter, assessing contamination levels in recovery operations areas, and resource and/or facility surveys. Ultimately, more detailed surveys will need to be conducted to support SR planning and operations, which may require days to weeks to complete. Survey procedures are in the Area and Resource Surveys page.

1. Radiological Hazard Assessment. From the outset, concern exists about the potential health hazard to the general public, particularly to those persons residing near the accident site. Considering possible radiation exposures is the primary method of estimating the potential health hazard. If no beta and/or gamma radiation is present, the primary risk is inhalation of alpha emitters that may cause a long-term increase in the likelihood of radiation-related diseases. Initial hazard assessments shall, of necessity, be based on limited information, assumptions, and worst-case projections of possible radiation doses received. The ARAC and the HPAC provide theoretical projections of the maximum internal radiation dose people may have received if outdoors without respiratory protection from the time of release to the effective time of the predictive plot. Exposure to resuspended contaminants usually results in doses that are a small fraction of the dose that could be received from exposure to the initial release for the same time period. Contamination released by the accident should not usually affect the safety of public water systems with adequate water treatment capability.

2. Reduction of Public Exposure. A hazard assessment must be followed promptly by recommended precautionary and safety measures to protect the public from any avoidable exposure. To control and reduce exposure, radioactive contaminants must be prevented from entering the body and confined to specific geographic areas so that the contamination may be removed systematically. Methods for reducing the exposure to the public should be implemented by, or through, civil authorities and/or officials. Although political and possibly international issues may be involved, the ultimate decisions on measures to be taken should be based on health and safety considerations.

3. The first Federal officials to arrive at the accident or incident scene (typically the IRF or DOE RAP team) may need to advise civil authorities and/or officials of recommended actions and provide technical assistance until appropriate civilian assets arrive. When contamination has been released, or when probable cause exists to believe that contamination was released, implementing precautionary measures to reduce exposure to radiation or contamination is appropriate, even though the RTF personnel may not arrive for some time.

4. Protective measures include:

a. Establishing a CCA. This operation requires identifying people in the area during the accident and/or restricting access to the area. Any vehicles or people exiting the area should be identified and directed to go to a monitoring point immediately (see section 5.a.(3)(h) above).

b. Sheltering. Sheltering is used to reduce exposure to the initial release of contamination as it moves downwind and to reduce exposure to resuspended contamination before an evacuation. Officials advising people to seek shelter and providing the procedures to follow constitutes sheltering. The effectiveness of sheltering depends on the timeliness of the recommendations and on following the procedures provided. Pets should also be gathered and sheltered to prevent spread of contamination. Livestock may continue to range free since they have little intimate contact with the general public.

c. Evacuation. Contaminated areas must be defined and civil authorities must develop and implement an evacuation procedure if warranted. Civil authorities are responsible for an evacuation of the public but may require radiological advice and assistance. Immediate evacuation of downwind personnel should be discouraged, since the likelihood of

contaminant inhalation may increase. Explosive or toxic materials may present an immediate hazard to people near the accident site and immediate evacuation should then be required.

d. Fixing Areas of High Contamination. Areas of high contamination must be controlled to prevent spread by resuspension, water runoff, or personnel movement. Although fixing of contamination is part of the SR process, some fixing procedures may be necessary long before SR plans are implemented (see section 5.b.(6) above).

(b) Materials Sampling.

1. Environmental Sampling. Radiological survey data should be used to the greatest extent possible to determine areas and objects that must be sampled and for screening samples after collection. The use of radiological survey data is necessary to reduce personnel radiation exposure.

a. Air sampling is conducted to determine if airborne contamination is present. It serves as the basis for protection decisions for response workers and also provides a basis for estimating the radiation dose and/or exposure that people without respiratory protection may have received since the air sampling instruments were emplaced.

b. Soil, water, vegetation, and swipe sampling of hard surfaces will be required. Initial sampling is for the purpose of worker and public protection during weapon recovery operations. Samples must also be taken at locations remote from the contaminated area to verify background readings. After this, samples are required periodically during the recovery process to determine radioactive material migration and dispersion and to substantiate decontamination and/or recovery completion. The ASHG, in cooperation with the FRMAC, will determine on-site sampling boundaries, such as sample location(s), method, frequency, volume of sample, and size.

2. Bioassay Program.

a. Bioassay methods estimate the amount of radioactive material deposited in the body. The methods use either direct measurement, e.g., sensitive X-ray detectors placed over the chest (lung counting) and/or other organs, or detection of radioactivity in the excreta (nasal mucous, feces, or urine).

b. A bioassay program for potentially affected individuals is recommended to determine if an internal uptake occurred. Implementation of a bioassay program and the documented results will be important in the fair settlement of any legal action that may occur in the years after a nuclear weapon accident or incident. Personnel monitoring and bioassay programs are conducted by the ASHG in conjunction with medical personnel and are discussed at section 4.e of the Medical page.

(c) Work Force Protection. Standard radiation accident and incident response procedures guide personnel protection during the first few days. Protecting the general public, response force members, and workers in the accident or incident area from exposure through inhalation is extremely important. As conditions stabilize, regulations governing work in radiation areas should be implemented. Participating organizations' or Services' methods and previous doses, and whether their procedures jeopardize health and safety or unduly impair

operations, must be considered. The ASHG implements the IC's health and safety standards and closely monitors the safety procedures of all participating organizations. Personnel entering the contaminated areas, if not trained to work in a contamination environment, should be given specific guidance.

(d) Radiological Advisory to the JIC/CIB. All public release of information shall be processed in accordance with reference (bu) and made through the JIC/CIB. Public interest in the actual or perceived radiological hazard from a nuclear weapon accident or incident is expected to produce intense public concern and media scrutiny of response operations. The JIC/CIB requires assistance from the ASHG and the FRMAC in preparing press releases to reduce and allay these concerns. Any part of the public that may have been advised to take precautionary measures will seek clear, understandable explanations of methods to protect their health and property. The public must be informed through the JIC/CIB and a public outreach program explaining the potential hazards, in terms that recognize the populace's knowledge level and understanding of radiation and its effects. Selected ASHG personnel (usually the Senior Health & Safety Advisor or designee) should be made available to support development and delivery of publicly released hazard information.

(e) Protective Action Recommendations (PARs) and Re-entry Recommendations (RERs). Provide appropriate protective action and RERs to the public. PARs are usually provided to the State through the Coordinating Agency. The State then has the final determination in what PARs are issued and/or enacted. The PARs and RERs shall have been coordinated and/or reviewed by the cognizant Federal authority (the DoD or the DOE/NNSA) and responsible civilian authorities and/or officials. Additionally, the ASHG and FRMAC will consult with the EPA Advisory Team on determining appropriate PAGs/PARs. If possible, all Federally developed PAGs/PARs should be consistent with any PAGs/PARs issued by SLT authorities. In an accident, PARs for initial notification or evacuation are likely not to have been prepared formally. The notification in the accident area should occur through visual means or word of mouth. Evacuation of about a 600m disaster cordon might occur automatically or at the direction of civilian law enforcement personnel. A PAR for a controlled evacuation might be formalized in anticipation of a later release of HAZMAT or radioactive contamination. The PAR/RER format may at least include problem, discussion, action, coordination, and approval sections (the format should be site and situation specific). A sample PAR for controlled evacuation is shown in Figure 6. below.

(f) Fixing of Contaminants. Fixatives should be used to reduce resuspension and the spread of contamination. If water is readily available, a water fog may be used as a temporary fixative to reduce resuspension, consistent with weapon recovery operations. Other more permanent fixatives may be used to reduce the spread of contamination by resuspension and runoff from highly contaminated areas. The use of fixatives in areas of low-level contamination is usually inappropriate. Fixatives may enhance or hinder subsequent decontamination and SR operations and affect radiation survey procedures and, in fact, may generate mixed waste or conflict with EPA regulations. The DOE/NNSA ARG may provide information on the advantages and disadvantages of different types of fixatives and methods of application. They should be consulted before applying any fixatives.

(g) Site Remediation (SR). Procedures and/or methods to return the accident scene to a technically achievable and financially and politically acceptable condition begin early in the response effort. SR becomes a major issue after classified information, weapons, weapon debris,

and other hazards are removed. Several factors have significant influence on SR decisions and procedures, such as size of the contaminated area and topographical, geological, hydrological, meteorological, and demographic information. Other important aspects are use of the area and civil authorities' and/or officials' prerogatives for the area. Remediation shall include those measures to remove or neutralize the contamination. Removal and/or decontamination may be time-consuming and require an extensive workload to implement. Monitoring is required during the decontamination process to document clean-up progress. Follow-on resampling, remonitoring, and/or resurveying will also be required to verify that cleanup levels have been achieved. See Enclosure 2, section 3.e.(3) of DoD 3150.08-M for additional information.

(h) Disposal of Contaminated Waste. CCS operations and ASHG field laboratory operations can create significant quantities of contaminated waste. Provisions are required to store this waste temporarily in the contaminated area until it may be moved to a disposal site. Procedures for disposing of contaminated waste are addressed as part of SR. The SRWG shall develop a plan to dispose of contaminated waste as part of SR.

(i) Logistics Support for Radiological Operations. Radiological response assets arrive with sufficient supplies to last a few days. High-use items that soon require resupply include potentially large quantities of personal protective clothing, 2-inch masking or duct tape, varied sizes of polyethylene bags, marking tape for contaminated materials, and respirator filters. Personal protective clothing may be laundered in special laundry facilities and reused. The turnaround time, when established, determines the approximate amount of anti-contamination clothing required. Close liaison is required between the ASHG and the IC's logistics section. Disposable personal protective clothing may prove more logistically practical in some circumstances.

6. SAFETY AND HEALTH HAZARDS INFORMATION. Hazards resulting from a nuclear weapon accident or incident vary in complexity depending primarily on the presence or absence of radioactive contamination. Regardless of the presence of contamination, several other weapon-specific substances may be present that are toxic hazards to personnel. Of primary non-radiological concern are: beryllium, lithium, lead, and smoke or fumes from various plastics. In addition, there may be hazards associated with non-weapon materials involved in the accident (such as aircraft or vehicles). There can also be serious workplace hazards such as heat and cold stress and industrial safety concerns.

a. Radiological Hazards.

(1) Plutonium and Americium. Plutonium is a heavy metal with a shiny appearance similar to that of stainless steel when freshly machined. After short exposure to the atmosphere, it oxidizes to a dark brown or black color. Americium is a progeny product of plutonium decay and is always a constituent of weapons-grade plutonium.

(a) Radiological Characteristics. With the exception of Pu-241, the plutonium isotopes in weapons-grade plutonium are alpha emitters. Pu-241 is primarily a beta emitter. Americium-241 is an alpha emitter that also emits detectable X-rays as part of its decay process.

Table 1. Radiological Characteristics of Plutonium and Americium

Isotope	Primary Particle Emitted	Half-Life* in Years
Pu-239	alpha	24,100
Pu-240	alpha	6570
Pu-241	beta	14.4
Pu-242	alpha	376,000
Am-241	alpha	432

*See Definition List

(b) The americium-241 in weapons-grade plutonium emits two detectable photons: a 17-keV X ray and a 60-keV gamma ray. The 17-keV X ray is difficult to detect because it is easily shielded. The 60-keV gamma ray is usually detectable.

(c) A critical mass may be obtained from several hundred grams or more of plutonium, depending on the geometry of the container and the material surrounding or near the mass. Recovery personnel should consult EOD technical publications and the DOE/NNSA ARG to ensure that the possibility of aggregating a critical mass of recovered material is considered and avoided.

(d) When dispersed in an accident, plutonium is considered the most significant radiological hazard. The primary hazard results from inhalation and later deposition in the lungs. From the lung, plutonium enters the bloodstream and is deposited in the bone and liver. Bone deposition may lead to bone diseases many years later. Due to its extremely long physical and biological half-lives, plutonium is held within the body for a lifetime. The hazards from americium are comparable to those of plutonium.

(e) Plutonium is eliminated from the body extremely slowly. If a person contaminated internally is given prompt medical treatment with a chelating agent, plutonium retention may be significantly reduced.

(f) A properly fitted respirator and standard personal protective clothing may provide adequate protection from plutonium contamination expected at an accident site.

(g) Smoke from a fire or explosion involving plutonium may carry fine particles of plutonium into the air, causing an inhalation hazard.

(2) Uranium. Uranium is a heavy metal that occurs in nature in significant quantities. When newly machined, it has the appearance of stainless steel. After short exposure to the atmosphere, it oxidizes to a golden-yellow color and from that to black. The natural uranium isotopes are primarily alpha emitters; however, the progeny of uranium-238 and uranium-235 decay are short-half-lived beta emitters that can be readily detected using appropriate instrumentation. It should also be noted that most U.S. uranium contains trace amounts of uranium-236. Uranium-236 is an alpha emitter with a half-life of 23,420,000 years that is introduced during the U.S. manufacturing process.

Table 2. Radiological Characteristics of Uranium

Isotope	Primary Particle Emitted	Half-Life in Years
U-238	alpha	4,500,000,000
U-235	alpha	710,000,000
U-234	alpha	2,150,000

(a) Types of Uranium. Three forms of uranium have been used in nuclear weapons: natural uranium, depleted uranium (DU), and enriched uranium.

1. Natural Uranium. Natural uranium has 0.006% U-234, 0.72% U-235 with the remainder (99.28%) U-238. When uranium is separated from its ore, the isotopic ratio is maintained but trace amounts of U-236 are added as a result of the manufacturing process. Natural or depleted uranium in metal form is sometimes referred to as tuballoy.

2. Depleted Uranium (DU). DU is defined as uranium with less than 0.7% by weight U-235. U.S. DU has approximately 0.2% by weight U-235.

3. Enriched Uranium (also referred to as “oralloy”). Enriched uranium contains more than the naturally occurring weight percentage of U-235. It is enriched through chemical and metallurgical processes. When uranium has been highly enriched, it can be used in a nuclear explosive device

(b) A critical mass may be obtained from several hundred grams or more of enriched uranium, depending on the isotopic mix and geometry or enrichment level, the geometry of the container, and the material surrounding or near the mass. Recovery personnel should consult with EOD technical publications and with the DOE/NNSA ARG to ensure that the possibility of aggregating a critical mass of recovered material is considered and avoided.

(c) Radiological hazards associated with any uranium isotope are usually less severe than those of plutonium. If uranium is taken internally, a type of heavy metal poisoning may occur. Lung contamination due to inhalation may cause a long-term hazard.

(d) When involved in an extremely hot fire, uranium melts and forms a slag, with only a part of it oxidizing; however, the possibility of hazardous airborne contamination exists, and protective measures must be taken to prevent inhalation or ingestion. A protective mask and standard personal protective clothing will protect personnel against levels of uranium contamination expected at an accident site.

(3). Tritium. Tritium is a radioactive isotope of hydrogen and diffuses very rapidly in the air. The diffusion rate is measurable even through very dense materials such as steel. Tritium combines chemically with several elements. This chemical reaction produces heat. Tritium when in the water vapor form is a health hazard when personnel are engaged in specific weapon RSPs, when responding to an accident that occurred in an enclosed space, and during accidents that occurred in rain, snow, or a body of water. Tritium reservoirs can also present a high-pressure hazard.

(a) Radiological Characteristics. Tritium emits a weak beta particle and decays into stable helium-3.

Table 3. Radiological Characteristics of Tritium

Isotope	Primary Particle Emitted	Half-Life in Years
H-3	beta	12.26

(b) Like stable hydrogen, tritium may combine in a combustive reaction with air, forming tritiated water and releasing large amounts of heat. In a fire, tritium combines spontaneously with oxygen in the air and also replaces ordinary hydrogen in water or other hydrogenous material (grease or oil), causing these materials to become radioactive.

(c) In its gaseous state, tritium (like stable hydrogen gas) is not absorbed by the skin to any significant degree. The hazardous nature of tritium is due to its ability to combine with other materials. Tritiated water (HTO) is readily absorbed by the body by inhalation and absorption through the skin. The radioactive water entering the body is chemically identical to ordinary water and is distributed throughout the body tissues. The body usually eliminates and renews 50 percent of its water in about 8 to 12 days. This biological half-life varies with fluid intake. Since HTO is water, its time in the body may be significantly reduced by increasing the fluid intake. Under medical supervision, the biological half-life may be reduced to 3 days. Without medical supervision, a recommended procedure is to have the patient drink 1 quart of water within 1-half-hour of exposure. Thereafter, maintain the body's water content by drinking the same amount as excreted until medical assistance is obtained.

(d) Metals react with tritium in two ways: plating, the deposition of a thin film of tritium on the surface of the metal; or hydriding, the chemical combination with the metal. In either case, the surface of the metal becomes contaminated. Tritium that has plated on a surface or combined chemically with a material is a contact hazard. Metal tritides, when aerosolized as the result of an explosion or fire, or when ingested/inhaled as a result of the contact hazard, deposit in the lung. The tritium involved is bound with the metal. Only after an extended period of time is the tritium available for absorption and elimination through the urine. The low-energy betas continue to deposit energy in lung tissue until the material is removed from the lung.

(e) A SCBA and protective clothing will protect personnel against tritium for a short time. An air-purifying respirator (APR) with a combination filter (*i.e.*, HEPA plus activated charcoal) provides only limited protection.

(4) Thorium. Thorium is a naturally-occurring, heavy, dense radioactive gray metal that is about three times as abundant as uranium. Th-232 is the naturally occurring radioactive isotope of thorium. There are 28 artificially produced isotopes of thorium with a wide range of radiological characteristics.

(a) Radiological Characteristics. Th-232 is the principal isotope. It decays by a series of alpha emissions to radium-225. Th-232 is not fissionable but is used in reactors to produce fissionable U-233 by neutron bombardment. A non-nuclear property of thorium is that, when heated in air, it glows with a dazzling white light.

Table 4. Radiological Characteristics of Thorium

Isotope	Primary Particle Emitted	Half-Life in Years
Th-223	alpha	14,100,000,000

(b) Thorium presents both a toxic and radiological hazard. Toxicologically, thorium causes heavy metal poisoning similar to lead or uranium isotopes. Thorium accumulates in the skeletal system where it has a biological half-life of 200 years.

(c) A properly fitted respirator and standard personal protective clothing will protect personnel against levels of thorium contamination expected at an accident or incident site.

(5) Fission Products. The materials considered so far are used in weapons construction in pure forms and in combinations with other elements. Due to weapon design, the likelihood of a nuclear detonation because of an accident is extremely low. However, in the unlikely event that some fission occurs as a result of the accident, the products of the reaction may pose a severe hazard. In general, fission products are beta and gamma emitters and are hazardous, even when external to the body. It is difficult to predict and estimate the quantity of fission products since the amount of fission is unknown and, to further complicate the situation, the relative isotopic abundances change with time as the shorter-lived radioisotopes decay. The hazard may be estimated by gamma and beta monitoring.

(a) Gamma Monitoring. When approaching a nuclear weapon involved in an accident, always survey for gamma radiation because some fission products may be present. Ensure maximum permissible exposure limits are observed.

1. Off-scale Gamma Survey. If the gamma survey instrument being used has a meter capable of indicating a maximum of 3 R/hr (or less) and the meter goes off scale, do not enter the area because the actual radiation level is unknown.

2. Saturated Gamma Survey Instrument. Many gamma survey instruments become saturated when placed in a strong field. A saturated instrument may indicate a false low or zero reading. When approaching a radiation field, begin monitoring in a low exposure area and then move toward the higher exposure area. If the meter reading drops using this survey technique when approaching the high exposure area, it is likely that the meter electronic processors are becoming saturated from too much data load (e.g., too much radiation).

3. Inverse Square Law. The radiation intensity emitted from a given point source is inversely related to the square of the distance from that source. If a dose rate, R1, is taken at distance, D1, from the source, a second unknown dose rate, R2, may be computed for a second (different) distance, D2, using the equation shown in Figure 2., below. Rule of thumb: Doubling the distance from a point source will reduce the dose rate to ¼ of the dose rate at the original distance.

Figure 2. Inverse Square Law

$$R_2 = R_1 \times ((D_1/D_2) \text{ squared})$$

R1 = Dose rate at distance D1 from a point source of gamma.
 R2 = Unknown dose rate at distance D2 from a point source of gamma.
 D1 = Known distance from point source of gamma where R1 was measured.
 D2 = Known distance from point source of gamma for which R2 shall be computed.

4. Stay Time. No individual less than 18 years of age or women known to be pregnant shall be occupationally exposed to radiation in excess of that allowed to any individual in the general population. The MPE for an individual in a given radiation field before reaching a predetermined maximum cumulative dose is computed as follows in Figure 3. Use the highest maximum reading to determine stay time:

Figure 3. Stay Time

$$T = D/R$$

T = Time of exposure to ionizing radiation expressed in hours or decimal fractions thereof.
 R = Dose rate expressed in R/hr or mR/hr, as determined from the beta/gamma instrument.
 D = The predetermined maximum yearly cumulative dose:
 0.5 rem
 100 mrem: non-occupational (general public)
 5 rem: occupational dose limit
 25 rem: to save valuable property
 100 rem: to save lives
 Other: as decided by the IC consistent with operational considerations.

Note: Working in an area with airborne radioactive materials at a concentration of one DAC, without respiratory protection, results in a Committed Effective Dose Equivalent (CEDE) rate of 2.5 mrem per hour of exposure (which would equate to reaching the 5 rem occupational exposure limit in a 2,000-hour working year).

5. Cumulative Dose. The dose an individual receives over a specific period of time in a given radiation field is computed as follows in Figure 4.:

Figure 4. Cumulative Dose

$$D = R(T)$$

D = Cumulative dose received expressed in R or mR.
 R = Dose rate expressed in R/hr or mR/hr, as determined from the beta and/or gamma instrument.
 T = Time of exposure to ionizing radiation expressed in hours or decimal fractions thereof.

b. Non-radiological Hazards. Several weapon-specific non-radiological hazards may be present because of a nuclear weapon accident or incident. The DOT's Emergency Response Guidebook (reference (bv)) is a source document for hazardous response, evacuation, hazard

descriptions, and protective actions for non-radiological HAZMATs. Reference (bv) was developed jointly by the U.S. DOT, Transport Canada, and the Secretariat of Communications and Transportation of Mexico for use by firefighters, police, and other emergency services personnel who may be the first to arrive at the scene of a transportation accident involving a HAZMAT. It is mainly a guide to aid first responders in quickly identifying the specific or generic classification of the material(s) involved in the event, and protecting themselves and the general public during this initial response phase of the accident or incident.

(1) Beryllium. Beryllium is a light, gray-white nonradioactive metal that is hard and brittle and resembles magnesium. In its solid state (normal state), beryllium is not a personnel hazard. However, in powder, oxide, or gaseous form, it is highly toxic. Inhalation is the most significant means of entry into the body. Because it oxidizes easily, any fire or explosion involving beryllium liberates toxic fumes and smoke. When beryllium enters the body through cuts, scratches, or abrasions on the skin, ulceration often occurs. The most common beryllium disease symptoms seen today are associated with chronic beryllium disease – an obstructive lung disease that develops many years following exposure. The symptoms of shortness of breath, chronic cough, cyanosis, loss of weight, and extreme nervousness are characteristic of this disease and *not* seen immediately following exposure. A wound contaminated with traces of beryllium does not heal until the metal is removed. Beryllium or its compounds, when in finely divided form, should never be handled with the bare hands but always with rubber gloves. An M40-series, or equivalent protective mask and/or respirator, and personal protective clothing must be worn in an area known, or suspected, to be contaminated with beryllium dust. An SCBA is necessary when beryllium fumes or smoke are present. Decontamination of personnel or facilities is similar to radiological decontamination. An effective method, when applicable, is vacuum cleaning, using a cleaner with a HEPA filter. Since beryllium is not radioactive, its detection requires chemical analysis in a properly equipped laboratory. Direct detection in the field is impossible.

(2) Lithium. Lithium and its compounds, usually lithium hydride, may be present at a nuclear weapon accident. Due to its highly reactive nature, naturally occurring lithium is always found chemically with other elements. When exposed to water, a violent chemical reaction occurs, producing heat, hydrogen, oxygen, and lithium hydroxide. The heat causes the hydrogen to burn explosively, producing a great deal of damage. Lithium may react directly with the water in the body tissue causing severe chemical burns. Also, lithium hydroxide is a caustic agent that affects the body, especially the eyes, in the same manner as lye (sodium or potassium hydroxide). Respiratory protection and firefighter clothing are required to protect personnel exposed to fires involving lithium or lithium hydrides. An SCBA is necessary if fumes from burning lithium components are present. The eyes and skin must be protected for operations involving these materials.

(3) Lead. Pure lead and most of its compounds are toxic. Lead enters the body through inhalation, ingestion, or skin absorption. Inhaling lead compounds presents a very serious hazard. Skin absorption is usually negligible, since the readily absorbed compounds are seldom encountered in sufficient concentration to cause damage. Once inside the body, lead concentrates in the kidneys and bones. From the bone deposits, lead is slowly liberated into the bloodstream causing anemia and resulting in a chronic toxic condition. Lead poisoning displays several specific characteristics and symptoms. The skin of an exposed individual turns yellowish and dry. Digestion is impaired with severe colicky pains and constipation results. With a high body burden, the exposed individual has a sweet, metallic taste in his mouth and a dark blue coloring of

the gums from a deposition of black lead sulfide. Lead concentrations within the body have been reduced successfully by using chelating agents. An M17 or equivalent protective mask protects personnel against inhalation of lead compounds.

(4) Plastics. When involved in a fire, all plastics present varying degrees of toxic hazards due to the gases, fumes, and/or minute particles produced. The gaseous or particulate products may produce dizziness and prostration initially, mild to severe dermatitis, severe illness, or death if inhaled, ingested, placed in contact with the skin, or absorbed through the skin. Any fire involving plastics that are not known to be harmless should be approached on the assumption that toxic fumes and particles are present. This includes all nuclear weapon fires.

(5) High Explosives (HE). Information on pressed and cast HE and Insensitive High Explosives (IHE) may be extracted from reference (bg), after a DOE/NNSA classification review.

(6) Hydrazine. Hydrazine is used as a missile fuel or as a fuel in some aircraft emergency power units. Hydrazine is a colorless, oily fuming liquid with a slight ammonia odor. It is a powerful explosive that, when heated to decomposition, emits highly toxic nitrogen compounds and may explode by heat or chemical reaction. Self-igniting when absorbed on earth, wood, or cloth, the fuel burns when a spark produces combustion; any contact with an oxidized substance such as rust may also cause combustion. When hydrazine is mixed with equal parts of water, it does not burn; however it is toxic when inhaled, absorbed through the skin, or taken internally. Causing skin sensitization as well as systemic poisoning, hydrazine may damage the liver or destroy red blood cells. The permissible exposure level is 1 part per million, although a lower concentration causes nasal irritation. After exposure to hydrazine vapors or liquids, remove clothing immediately and spray exposed area with water for 15 minutes. An SCBA is required in vapor and/or liquid concentrations.

(7) Red Fuming Nitric Acid. Red nitric acid is an oxidizer for some missile propellant systems. It is a reddish brown, highly toxic corrosive liquid with a sharp, irritating, pungent odor. Dangerous when heated to decomposition, it emits highly toxic fumes of nitrogen oxides and reacts with water or steam to produce heat and toxic corrosive and flammable vapors. The permissible exposure level is two parts per million, although a lower concentration causes nasal irritation and severe irritation to the skin, eyes, and mucous membranes. Immediately after exposure, wash acid from skin with copious amounts of water. An SCBA is required in vapor and/or liquid concentrations.

(8) Solid Fuel Rocket Motors. Rocket motors (composed of dimeryl diisocyanate, cured hydroxyl terminated polybutadine polymer, ammonium perchlorate, and aluminum powder or other cyanate, butadiene, perchlorate, or nitrate-based compounds) present severe explosive hazards if accidentally ignited. If rocket motors ignite or catch fire, evacuate to a safe distance.

(9) Composite Fibers (CFs). CFs are carbon, boron, and graphite fibers that are milled into composite epoxy packages that are integral aircraft structural members. If the epoxy outer layer breaks or catches fire, CF strands may be emitted into the environment and become a respiratory tract, eye, and skin irritation hazard. In the immediate accident area or location where a composite package has broken open, the fibers may cause severe arcing and shorting of electrical equipment. For additional information, refer to Technical Order (TO) 00-105E-9, Aerospace Emergency Rescue and Mishap Response Information (reference (bw)).

(10) JP-10. JP-10 is used as a missile fuel. It is a clear liquid and has a kerosene-like odor. Recommended special firefighting procedures are to use a water spray to cool fire-exposed surfaces and to protect personnel. Wear an SCBA when firefighting in confined spaces. JP-10 is an aspiration hazard. It is slightly toxic by inhalation. Do not allow liquid or mist to enter lungs. Vapor contact causes very little to no eye irritation. High heat, sparks, open flame, or strong oxidizers may ignite JP-10 fuel.

(11) TH Dimer. Similar to JP-10, TH Dimer (RJ-4) is also a missile fuel with the same color and odor characteristics. The hazards and firefighting precautions are also similar. TH Dimer may cause gastrointestinal irritation (vomiting and diarrhea) and nausea. For prolonged and/or repeated skin contact, appropriate impervious clothing is required (gloves, boots, pants, coat, face protection, etc.).

(12) Composite Materials. Composite materials are solids that are composed of two or more substances having different physical characteristics. Such materials might be at the site of a nuclear weapon accident and pose additional health and safety hazards if involved in a fire or explosion. Composite materials are broken down into three categories:

(a) Composite. A physical combination of two or more materials, i.e., fiberglass (glass fiber and epoxy).

(b) Advanced Composite. A material composed of high strength and/or high stiffness fibers (reinforcement) with a resin (matrix). Examples include Graphite/Epoxy, Kevlar®/Epoxy, and Spectra/Cyanate Ester.

(c) Advanced Aerospace Material. A highly specialized material used to fulfill unique aerospace construction, environment, and/or performance requirements. Examples include Beryllium, DU, and Radar Absorbent Materials.

c. Respiratory and Personnel Protection. During a radiological emergency, health officials must act to protect the public and response forces from potential health hazards associated with the emergency. The following paragraphs address respiratory protection to include Protection Factors (PFs), Protective Action Guides (PAGs), Resuspension Factors (RFs) and protective clothing.

(1) Respiratory Protection. Plutonium and uranium particulates are the most serious source of airborne radioactivity at an accident or incident site unless fission has occurred. These particulates may be present in the cloud and smoke from a breached or burning weapon, but settle to the ground shortly thereafter. The radioactive particles may become resuspended in the air by surface winds and by soil-disturbing operations, including vehicular traffic. Resuspension is highly dependent on specific conditions (for example, type and condition of soil or surface, vegetation, moisture present, and time since deposition) and is difficult to measure and predict. Respiratory protection prevents airborne contamination from entering the lungs and is provided by a SCBA or APRs that filter particulates out of the ambient air. Respiratory protection devices adversely affect productivity and effectiveness and their use is not recommended except when airborne contamination is present or expected. In hot climates, respiratory protection devices may result in heat injuries, including death, and a heat injury prevention program, should be implemented when temperatures exceed 70° F.

(2) Protection Factors. The assigned protection factor (APF) is defined as the expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users. The APF for a full-face APR is 50. The APF for a pressure-demand SCBA is no more than 10,000. A full-facepiece SCBA operating in demand mode is assigned an APF of 100. The fit factor (FF) is a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when properly worn. A fit test is conducted on the individual, either qualitatively or quantitatively, to evaluate the fit of a respirator. A fit test chamber/hood, using probed face pieces and a nontoxic particulate, is required for quantitative tests. The fit-test chamber/hood is used to determine the fit-factor for each individual with a particular size and make/model of mask. The fit factor is determined by dividing the Ambient Air Concentration (AAC) of a particulate by the Inhaled Concentration (IC) or amount of particulate that enters the mask. Quantitative fit-factor pass limits are set by the Department of Defense. Units may use an M-41 Protection Assessment Test System or commercial equivalent to verify fit-factors for first responders. A qualitative fit-factor can be determined by conducting a smoke test around the edges of the mask. If the mask passes a qualitative smoke test it is assumed to have a fit factor above the nominal value set by the Department of Defense.

(3) Protective Action Guides (PAG). PAGs are developed to identify protective devices to limit exposure to the lungs from inhaling contaminants to agreed-on limits. The appropriate Derived Air Concentration (DAC), should be that in reference (bx). For plutonium in non-chemically active forms that should be expected after a fire, the DAC is 0.222 Bq/m^3 or 13.32 dpm/m^3 , which corresponds with the lower level in table 5.

(4) The guidelines provided in table 5. are intended for use until health physics personnel at the scene are able to develop situation-specific instructions. In deriving the respiratory protection guidelines, a PF of 50 was assumed for full-face APR. Such computations assume possible exposures to radiation workers of 13.32 dpm/m^3 of Pu-239/40-hour week, averaged over the period of a year (2,000 hours), which would result in 5 rem CEDE. The general public guidelines are 100 mrem/year dose equivalent from normal radiological operations. Early phase PAGs recommend evacuation during an emergency when one additional rem of projected dose could be avoided by evacuation. One rem corresponds to an airborne concentration of approximately 31.67 dpm/m^3 of Pu-239 for one week (168 hours). Radiological dose equivalent is a function of both activity and exposure time, so emergency response personnel may be allowed to enter an area of higher activity without respiratory protection for a short period of time without exceeding regulatory dose equivalent limits (10 rem for protection of property, 25 rem for protection of personnel, and >25 rem for protection of personnel on a voluntary basis by personnel fully briefed on the associated risk of receiving >25 rem). Situation-specific guidelines will be developed by the ASHG for weapon recovery operations.

(5) In many areas, especially during thermal inversions, radon progeny products may be detected in air samples. A background sample of the same length and counted the same time after collection as the on-scene sample allows proper background subtraction; however, typical radon concentrations would completely mask the 13.32 dpm/m^3 plutonium DAC value above. Samples should be recounted at 30-35 minute intervals, the rough half-life of radon progeny products. When, after a 20-minute decay period, the residual sample activity is within 1% of the previous activity, all of the sample activity can then be considered long-lived activity.

(6) The time versus dose approach should be applied in emergencies, as appropriate; that is, if a person suffers heat stroke, the respirator should be removed immediately to meet the urgent medical requirement to cool the person, since the short unprotected exposure during evacuation from the area for treatment limits the amount of contaminant that is inhaled. Table 5. shows respiratory protection guidelines to use when air sampling data provide a basis for assessing airborne contamination levels. Computed activity levels should be corrected for background activity before entering the table.

Table 5. Recommended Respiratory Protection Levels for Emergency Workers as a Function of Airborne Contamination

Airborne Alpha Activity dpm/m³ above background	Respiratory Protection
Below 13.32 dpm/m ³	No respiratory protection needed.
13.32 to 665 dpm/m ³	Full-face respiratory protection required (M-series Protective Mask or National Institute of Occupational Safety and Health/ Mine Safety and Health Administration approved High Efficiency Particulate Air (HEPA) respirator).
Above 665 dpm/m ³	Pressure demand SCBA or limited entry restricted to essential personnel wearing full-face respiratory protection. Source of contamination should be fixed as soon as possible.

(7) Air sampling data are unavailable until some time after response personnel have arrived on-scene. During the initial response, and when working in areas where available air sampling data may not be applicable, the use of table 6. is recommended. Table 6. provides guidelines for protective requirements based on measurements of average surface contamination levels. The recommendations in Table 6. provide guidelines for personal protective measures that may be taken by first responders until the situation may be evaluated by health physics personnel. Using Table 6. is appropriate during the initial approach to the area when using respirators in uncontaminated areas may create undue public alarm. If contamination levels detected during the initial approach show high levels of contamination, people entering the contaminated area should wear respirators until air sampling data are available to assess the actual airborne hazard. Table 6. guidelines should not be used in the downwind area until after the contamination cloud released by the accident or incident has dispersed (several hours after the fire is extinguished or after the explosion).

Table 6. Protective Devices for Emergency Workers as a Function of Surface Contamination

Surface Contamination			Respiratory Protection
Activity $\mu\text{Ci}/\text{m}^2$	dpm per 100 cm^2	cpm (ADM-300)	
< 6	< 133,200	< 20,000	No respiratory protection. If there is detectable contamination, gloves and booties should be worn at a minimum, and coveralls depending on the activity being performed.
6 to < 60	133,200 to 1,332,000	20,000 to 200,000	No respiratory protection for limited entries of up to 4 hours. Full protective clothing.
60 to 300	1,332,000 to 6,660,000	266,400 to 1,332,000	Air-purifying respirator (APR) and full protective clothing.
Above 300	Above 6,660,000	Above 1,332,000	Wear pressure-demand SCBA and full protective clothing. Source of contamination should be fixed as soon as possible.

Note: The above (revised) numbers are based on the corrected DAC of $13.32 \text{ dpm}/\text{m}^3$, the revised APF of 50, and an assumption of a 10^{-6} resuspension factor.

Table 7. Instrument Comparisons for Surface Contamination Levels in Table 6.

Instrument	Probe (area, in cm^2)	Activity ($\mu\text{Ci}/\text{m}^2$)	Instrument indication
AN-PDR-56	*DT224B (17)	6.0	~10,200 cpm
ADM-300	#ASP 100 (100)	6.0	~26,500 cpm
E-600	‡SHP 380 (100)	6.0	~66,500 cpm
AN-PDR-56	*DT224B (17)	60	~100,000 cpm
ADM-300	#ASP 100 (100)	60	~250,000 cpm
E-600	‡SHP 380 (100)	60	~650,000 cpm
AN-PDR-56	*DT224B (17)	300	~500,000 cpm
ADM-300	#ASP (100)	300	~1,300,000 cpm
E-600	‡SHP 380 (100)	600	**Off Scale (>1.0E6 cpm)

**The instruments with 100/square cm scintillation probes are incapable of measuring deposited activities much greater than 60 microcuries/square meter, because the instrument goes off-scale high.

*assumed α efficiency (4π) for DT224B is 45%

#assumed α efficiency (4π) for ASP 100 is 20%

‡assumed α efficiency (4π) for SHP380 is 50%

If α efficiencies are different from those assumed above, instrument indications must be re-calculated.

Additionally, the use of activity, instead of instrument-specific count rates, will eliminate problems associated with inconsistencies in instrument calibration from facility to facility or from service to service (Air Force, Navy, National Lab, etc.).

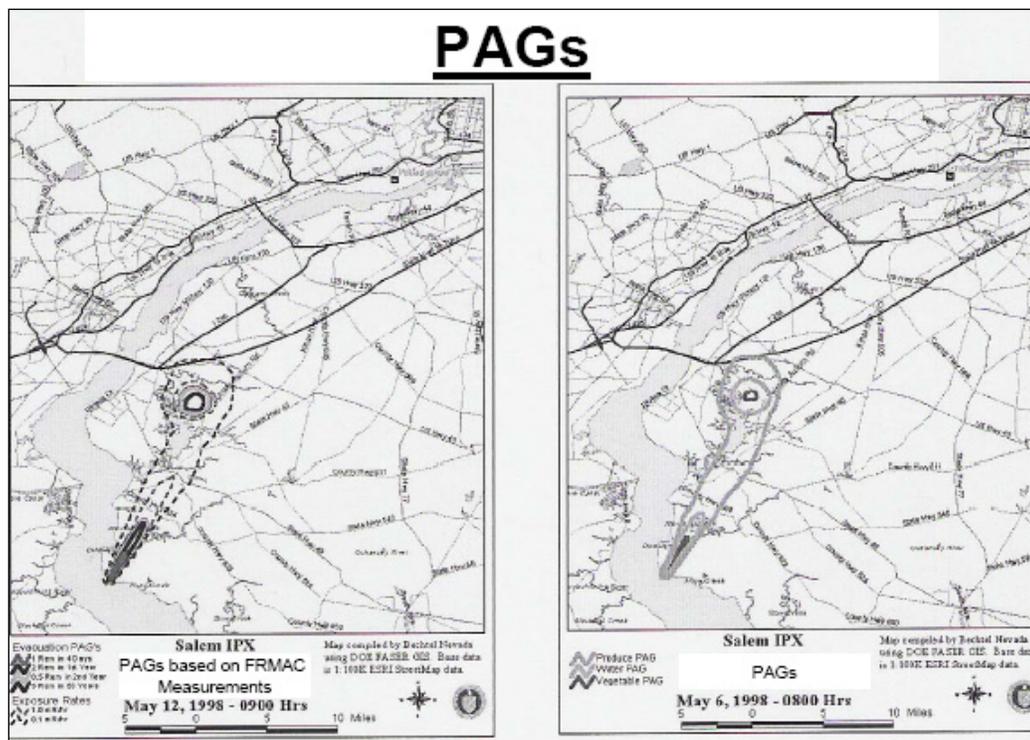
(8) EPA and FDA Protective Action Guides (PAGs). To ease decision making during radiological emergencies, EPA and the FDA have developed PAGs to guide the actions (e.g., sheltering, evacuation, food embargoes, etc.) taken to lessen the health consequences of an accident and/or emergency. These guides allow for various actions to be taken to protect human health, and for State and local officials to develop emergency response plans. A PAG is the

projected dose (to a reference individual) from an unplanned release of radioactive material at which a specific protective action to reduce or avoid that dose is warranted. It is important to note that PAG dose values include only the future dose that may be avoided by taking the specific protective action considered. Example PAGs are shown in Figure 5. Not all PAGs are the same as those in Figure 5.; some may be depicted as charts, graphs, tables, etc.

Table 8. Protective Action Guide Hazard Values

Dose Levels	Recommended Actions
> 25 rem	same as below except voluntary only (NARAC > 25 rem contour)
> 5 rem to 25 rem	Workers performing emergency services for saving lives or protecting large populations. (NARAC > 5 rem contour)
1 – 5 rem	evacuate and/or consider sheltering (NARAC > 1 rem contour)
< 1 rem	consider sheltering

Figure 5. Aerial Survey Results: PAGs, Evacuation PAGs, and Quarantine Areas



(9) Air Sampler Equipment. Commonly referred to as a Staplex®, the TF-1A is capable of sampling air for particles down to 0.01 micron in diameter, depending on the filter paper used. A flow meter is used to determine rate of air flow. Cellulose filters are usually used and kept for laboratory analysis. Field estimates of airborne contamination may be derived from measuring filter contamination with field survey instruments.

(10) Resuspension Factors (RFs). Other than during the initial release of contamination, airborne radioactivity is caused by resuspension. One means of estimating the potential airborne hazard caused by a given level of surface contamination is by using RFs. The RF is defined as the activity in the air (μCi , dpm , etc.) per unit volume (usually m^3) divided by the activity on the ground below expressed in the same activity unit per unit area. The dimension of the RF is then inverse length, usually m^{-1} .

Table 9. Equation for Calculating Resuspension Factors

$$\text{RF} = \frac{\text{airborne activity}}{\text{ground activity}} = \frac{\text{dpm} / \text{m}^3}{\text{dpm} / \text{m}^2} = \text{m}^{-1}$$

(a) In theory, the surface is assumed to have an infinite plane of uniform texture with a uniform level of contamination. In practice, the contaminated area has varied levels of contamination, is finite in size, and may contain a variety of surfaces with different resuspension characteristics. For wind speeds below 20 mph, only those surfaces within about 200m may contribute to the airborne contamination. For wind speeds of more than 30 mph, surfaces as much as 900m away may contribute.

(b) Averaging ground activity levels from these areas may be considered when computing RFs. RFs may provide a method of roughly estimating airborne contamination levels for use with Table 6. in areas where air sampling data are unavailable. When using RFs to estimate airborne contamination levels, the types and levels of contamination on surfaces in the area where the RF was computed and those in the area of interest should be considered. RFs may vary from 10^{-5} to 10^{-7} for plutonium newly deposited on soil and up to 10^{-3} on pavement. RFs are affected by:

(c) Soil Disturbing Operations. Mechanical disturbance, such as vehicular traffic, may increase RFs by as much as 100 times in the vicinity of the disturbance.

(d) Wind. RFs vary proportionally to the cube of the wind speed.

(e) Rain or Moisture. Leaching of plutonium into the soil by rain or sprinkling may reduce RFs by 10 to 100 times or more. Surface and airborne alpha contamination levels may not be measurable with an alpha meter for some time after rain or sprinkling due to the shielding action of the moisture.

d. Protective Clothing. Any close-weave cotton material or disposable suits may protect against contamination. The outfit includes the standard anti-contamination coveralls, boot covers, gloves, mask, and hood. The outfit openings should be taped using masking or other appropriate adhesive tape. The Battle Dress Overgarment or Chemical Protective Overgarment with protective mask, overboots, gloves, and hood also provides protection from contamination. Refer to Service guidelines for use of this equipment. For identification, the person's name and team should be written on tape and placed on his or her back and chest.

e. Personal Safety Precautions.

(1) Do not eat, chew, smoke, or drink in areas where radioactive materials are handled.

(2) Handle radioactive material only when necessary and keep handling time as short as possible. Health hazards are increased by extended exposure. Flaking, scratches, and fractures of radioactive material are sources of contamination. Do not handle radioactive materials with bare hands.

(3) If wounded by a contaminated item or while in a contaminated area, take the following steps (the steps in subparagraphs 6.e.(3)(d) through 6.e.(3)(g) do not apply to tritium exposure or contamination):

(a) Leave the contaminated area.

(b) Remove contaminated clothing or contaminated material at the decontamination line.

(c) Get medical assistance as soon as possible.

(d) Irrigate the wound with copious amounts of water. Do not induce bleeding. Pack the wound with gauze and wrap tightly with a Curlex® or Ace® bandage. Remove the dressing at a medical treatment facility and check the dressing for contamination. To detect the presence of contamination in the wound, you must swab it with a cotton-tipped applicator, dry the applicator, and monitor it in a counting chamber. The liquids present in the wound mask almost all emissions.

(e) Wound debridement should not be attempted outside of a medical treatment facility. The wound should only be irrigated, packed loosely with sterile gauze, and wrapped. Debridement must take place in an emergency room or operating room. An appropriate survey instrument and technician must be available during treatment to confirm the wound has been decontaminated before closure. Wound debridement must not be continued to the point of functional compromise. If contamination is still suspected, again, pack the wound with sterile gauze, wrap, and redress the wound in 24 hours. The wound should not be sutured closed but should be allowed to heal by second intention (tissue granulation).

(f) Do not check the wound for contamination without a cotton-tipped applicator or gauze swab. It must be allowed to dry before being counted.

(g) Any metallic particles must be assumed to be radioactive unless confirmed otherwise. Handling tongs and a lead pig should be standing by during wound debridement to receive a “discrete particle” or metal foreign body.

(4) If any form of internal contamination is suspected, immediately report to a medical authority.

f. Hot and/or Cold Weather Operational Conditions. The reduction in natural cooling of the body caused by wearing full personal protective clothing with hoods and respirators increases the likelihood of heat injuries. Heat injuries (stroke, exhaustion, or cramps) may occur with the

ambient air temperature as low as 70° F when wearing full protective gear. Preventive measures to reduce heat injuries include acclimatization, proper intake of salt and water, avoiding predisposing factors to heat illness, monitoring temperatures, scheduling adequate rest or cooling periods, and educating the work force on heat injury symptoms and remedial actions. Adequate water intake is the single most important factor in avoiding heat injuries. Frequent drinks are more effective than the same quantity of water taken all at once. Table 10. provides information necessary to estimate recommended work-rest cycles and fluid replacement cycles for various environmental conditions (using the Wet Bulb Globe Temperature (WBGT) Index), clothing levels, and work intensities. The work-rest cycles specified in the table are based on keeping the risk of heat casualties below 5 percent. Under some operational conditions, work-rest cycles offer no advantage to continuous work (see No Limit (NL)) entries in table 10. Use the information in table 10. and guidance provided by the medical staff to estimate work-rest cycles and fluid replacement requirements.

Table 10. Work-Rest Cycles and Fluid Replacement Guidelines

Heat Category	WBGT Index °F	Light (Easy) Work		Moderate Work		Hard (Heavy Work)	
		Work/Rest	Water Intake (Quart/hr)	Work/Rest	Water Intake (Quart/hr)	Work/Rest	Water Intake (Quart/hr)
1	78-81.9	NL	1/2	NL	3/4	40/20 min	3/4
2 (Green)	82-84.9	NL	1/2	50/10 min	3/4	30/30 min	1
3 (Yellow)	85-87.9	NL	3/4	40/20 min	3/4	30/30 min	1
4 (Red)	88-89.9	NL	3/4	30/30 min	3/4	20/40 min	1
5 (Black)	>90	50/10 min	1	20/40 min	1	10/50 min	1

1. If wearing Mission Oriented Protective Posture 4, add 10° F to WBGT.
 2. If wearing personal body armor, add 5° F to WBGT in humid climates.
 3. Daily fluid intake should not exceed 12 quarts.
 4. Caution: Hourly fluid intake should not exceed one quart.
 5. Rest means minimal physical activity (sitting or standing), accomplished in shade if possible.
 6. NL = no limit to work time per hour.
 7. These work/rest time and fluid replacement volumes sustain performance and hydration for at least 4 hours of work in the specified work category. Individual water needs may vary $\pm 1/4$ qt/hr.

(1) Specialized personnel cooling equipment (for example, cooling vest) should be used to allow additional stay-time for personnel in extreme heat conditions.

(2) The use of cold-weather gear, personal protective clothing, and respiratory equipment presents severe demands on personnel. Personnel must be monitored closely to prevent frostbite and other cold-weather effects.

Figure 6. Sample PAR Form

(Sample PAR)

Protective Action Recommendation

For

Major Accident _____ at (location _____)

Issued by:

Problem. An accident involving a propane truck and two Safe Secure Trailer (T1 and T2) vehicles carrying _____ (type) nuclear weapons occurred at (time, date, and location). The propane truck sideswiped T1 and collided with T2. A fire erupted causing the propane truck to explode. Shortly afterwards, the weapon in T2 experienced a conventional high explosive detonation, resulting in widespread contamination. The T1 vehicle sustained damage and skidded into a ditch, preventing access through its doors to the stored weapon inside.

Discussion. Actions to gain access into T1 and remove the weapon have been hampered. It is still possible, though highly improbable, that a second explosion might occur during access and removal of the weapon in T1. In the unlikely event of an explosion, debris might be thrown 2,500 feet with additional contamination released. As a result, an evacuation of (outline the specific area) has been ordered by the (civilian authority office).

Action. With the possibility of an explosion during access and removal operations involving the weapon in T1, the following area shall be evacuated. (Indicate the specific area to be vacated and a schedule indicating evacuation start, completion, verification of evacuation, work start, work completion, and return to the area). All personnel are required to sign in at a specific location(s) during evacuation to help local law enforcement and/or response force personnel verify that all personnel are out of the area before access and removal procedures begin. A holding area, for example, a gymnasium or school, may be a temporary area for evacuees. Also, the evacuees might be released for shopping or other activities outside the area. Once access and removal procedures are completed, the civil authorities shall determine when evacuees may return to their houses and/or businesses, if outside the contaminated area.

Release of this "Protective Action Recommendation" may not precede confirmation of the presence of a nuclear weapon by the IC and should be coordinated with local officials and the IC's Public Affairs Officer before release.

PUBLIC AFFAIRS

1. GENERAL

a. A nuclear weapon accident or incident has immediate public impact. The general public knows very little about the potential effects of a nuclear weapon accident. The media has routinely publicized plutonium as the most deadly substance on earth. Therefore, public affairs activities during the initial accident response are perhaps among the most critical aspects of the entire response and remediation process. Within minutes of the accident, news media can be expected at the scene; it is possible and conceivable that witnesses to the accident (if off-installation) may transmit still photos or video images to media organizations via cell phones. Civilian authorities state this phenomenon is occurring with increasing frequency. The news media and local citizens will seek information about how the accident affects them. A proactive, comprehensive public affairs program must be conducted to speed the flow of information to the news media, the public, and internal audiences. Timely, accurate information and frequent updates are essential to keep the public and the news media informed. The fact sheets, checklists, and pre-scripted releases at the end of this chapter should help Public Information Officers fulfill this mission. The chief or lead PIO is referred to as the External Affairs Officer (EAO) and is located at the JFO.

b. During a nuclear weapon accident, Federal, State, local, and tribal authorities share responsibility for communicating information regarding the accident to the public. These actions are a critical component of accident management and must be fully integrated with all other operational actions to ensure dissemination of accident information to the general public and recovery instructions to those directly affected by the accident. Providing information that is timely, accurate, understandable, and in perspective is essential to establishing and maintaining credibility with the public, the news media, and response forces. The success of the response to the accident is only as good as the public's perception of the response.

2. POLICY

a. Under the purview of DHS and outlined in HSPD-5, the National Response Plan Incident Communications Emergency Policy and Procedures (NRF-ICEPP) provides detailed guidance to Federal incident communicators on activities to be initiated in conjunction with potential or actual incidents, regardless of DHS involvement. It establishes mechanisms to prepare and deliver coordinated and sustained messages regarding potential or actual domestic incidents and provides for prompt Federal acknowledgement of an incident and communication of emergency information to the public during incident management operations. It is comprised of two parts: the Public Affairs Support Annex of the NRF and ESF#15 – External Affairs Annex. The NRF-ICEPP is supported by the NRF Incident Communications Emergency Support Supplement (NRF-ICES). The NRF-ICES contains supporting guidance and instructions and is distributed on a limited basis to the core group of Federal departments and agencies. All of these documents, however, have a common theme of instituting an integrated concept, termed “incident communications,” as the approach used to manage communications with the public during incidents. Incident communications incorporates the process of control, coordination, and communications.

(1) Control. Identification of accident communications, coordinating primary and supporting departments and agency roles and authorities for release of information.

(2) Coordination. Specification of interagency coordination and plans, notification, activation, and supporting protocols.

(3) Communications. Development of message content such as accident facts, health risk concerns, pre-incident and post-incident preparedness recommendations, warning issues, accident information, messages, audiences, and strategies for when, where, how, and by whom the messages will be delivered.

b. The Federal Government operates as a team to ensure successful accident communications with the public. From initial notifications to final recovery actions, the Federal team must operate and speak with a unified voice and consistent message that is coordinated not only with the different Federal authorities involved in an accident, but also with the affected State, local, and tribal authorities. The organizational approach for public affairs and accident communications with the public relies on the Core Group of Federal Agencies, the Joint Information Center (JIC), and the DHS ESF #15 External Affairs Officer.

c. The DoD policy for U.S. nuclear weapon accidents, which is described in reference (a), is to provide effective public affairs activities near the scene of a nuclear weapon accident in order to speed the flow of information to the public and the internal audience. Although it is routine DoD policy to neither confirm nor deny the presence or absence of nuclear weapons or nuclear components at any specific location, exceptions exist when a nuclear accident occurs. Joint Pub 3-61 (reference (by)) provides further guidance on DoD support to media in conjunction with military operations.

(1) In the United States, its territories, or its possessions, DoD policy requires the DoD IC to confirm the presence of nuclear weapons or radioactive nuclear components in the interest of public safety or to reduce or prevent widespread public alarm. Public authorities must be notified if the public is, or may be, in danger of radiation exposure or other danger posed by the weapon or its components.

(2) Statements confirming the presence of nuclear weapons should contain information about the possibility of injury from HE weapon components and/or potential radiation exposure. If injury or radiation exposure is unlikely, that should also be stated. The OSD/PA will be notified in advance, or as soon as possible thereafter, if these exceptions are used.

d. The DOE/NNSA's policy is to provide accurate, candid, and timely information, consistent with the requirements of the Freedom of Information Act and the Privacy Act (reference (bu)), to the public during all emergencies, in order to establish facts and avoid speculation. In situations involving classified information, DOE policy is to provide sufficient unclassified information to explain the emergency response and protective actions required for the health and safety of workers and the public, in accordance with DOE Order 151.1A (reference (bz)).

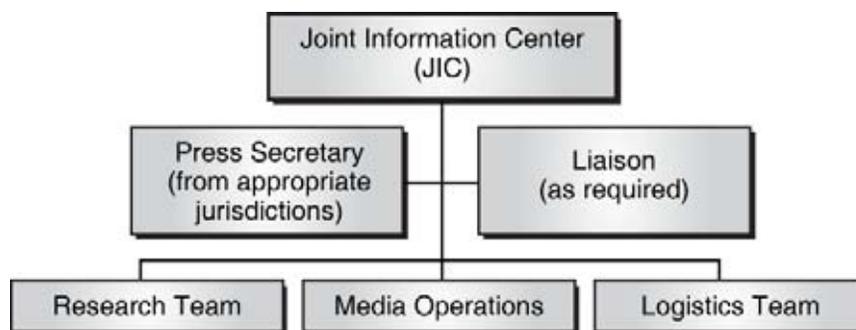
3. RESPONSIBILITIES

The Department of Homeland Security’s Office of Public Affairs (DHS OPA) has primary responsibility for coordinating the Federal incident communications effort for domestic incidents. In general, this office fulfills this responsibility by: identifying the Federal department and agency participants in the core group, arranging conference calls and other activities necessary for coordination, providing a leadership role during domestic incidents when significant interagency coordination is required, and providing coordination with the Homeland Security Council and other entities within the Executive Office of the President on matters related to dissemination of accident-related information to the public. Specifically, DHS OPA relies on the Core Group of Federal Agencies, the JIC, and the DHS ESF #15 External Affairs Officer.

a. Core Group of Federal Agencies. At the Federal level, accident messages are developed, coordinated, and delivered by an interagency core group of the key departments and agencies involved in the accident response. For a domestic nuclear weapon accident, DHS, the Department of Defense, and DOE will most likely be members of this core group. DOS will be a member for foreign accidents.

b. Joint Information Centers (JICs). The Joint Information Center (JIC) structure provides a supporting mechanism to develop, coordinate, and deliver messages. It supports the DoD IC or the unified command and the associated elements of ICS. JICs are established to coordinate Federal, State, local, tribal, and private-sector accident communications with the public. Major announcements, daily briefings, and accident updates from the JIC are coordinated through DHS Public Affairs, the affected Combatant Command Public Affairs office, affected State, local and tribal leadership, and the interagency core group prior to release. This coordination must be closely assessed and agreed upon by all agencies involved in accident communications with the public in the early stages of an accident. A notional JIC organization is provided at Figure 1.

Figure 1. Notional Joint Information Center (JIC) Organization



(1) National JIC. A national JIC may be used when a nuclear weapon incident or accident is expected to be of a long duration (i.e., weeks or months) and when the incident or accident affects a large area(s) of the country. It is established to coordinate information among affected States, as well as Federal departments and agencies.

(2) Accident JIC. The accident JIC is the physical location from which public affairs representatives from organizations involved in the response work together to provide critical emergency information, media response, and public affairs functions. The accident JIC serves as

the focal point for the coordination and dissemination of information to the public and media concerning response, recovery, and mitigation. The JIC may be established at an on-scene location in coordination with State, local, and tribal agencies depending on the requirements of the accident. In most cases, the JIC is established at or is virtually connected to the JFO/RRCC. If necessary, multiple JICs can be established; if so, these JICs should be virtually connected to ensure a unified message and consistent information are delivered to the public. The JIC (or Combined Information Bureau [CIB] in foreign territory) is the single on-scene point of interface between the responding agencies and news media representatives covering the response.

c. When a PFO is appointed and present, the DoD IC's PA responsibilities will be severely limited since PA responsibilities belong to the PFO and his established JIC. However, in the absence of a PFO, the DoD IC's PIO responsibilities are expanded; these responsibilities are shown in paragraphs 3.c.(1) through 3.c.(10). At the JFO, the chief public affairs officer is titled the External Affairs Officer. Additionally, the supported Combatant Commander may impose additional requirements in appropriate Service regulations. The DoD IC's PIO will inform the public and news media through a variety of means.

(1) Protect classified information. Responders must practice "security at the source" to ensure no classified, sensitive, or privacy information is provided to the media or the public. The DoD IC reviews all information about nuclear weapons intended for public release. Most information about the component design and storage of nuclear weapons is classified. However, certain information about nuclear weapon design may be unclassified and appropriate for release to the public. In addition, Unclassified Controlled Nuclear Information (UCNI) must be protected from public release. When the JIC/CIB responsibility is transferred, be careful to ensure nuclear weapons information proposed for public release is reviewed by the appropriate U.S., DoD, and DOE/NNSA offices.

(2) Establish direct communications with the Department-level public affairs office (Office of the ASD(PA) or the DOE/NNSA Office of Public Affairs) and the Combatant Command's public affairs office from the accident scene. The DoD IC should ensure that the EAO at the scene quickly establishes direct communications with the Department-level public affairs office by any means available. The DoD IC must have access to current policy guidance and statements issued at the national level. Direct communications ensure that timely, accurate information may be provided at the accident scene and the national level. The Combatant Command, Military Department, DTRA, and interagency public affairs offices will be kept informed, as appropriate, of news releases and media interest. The U.S. Chief of Mission and the U.S. DOS PAO will be notified and consulted on accidents overseas or on accidents and significant events near a U.S. border.

(3) Establish a JIC in cooperation with State and local authorities in the United States, and establish a CIB with the DOS and host nation authorities outside the United States. The JIC/CIB should be physically collocated or virtually connected with the DoD IC and his or her counterparts. In the United States, the JIC will be composed of one senior, co-equal public affairs representative from the DoD IC, the local authorities, and the State emergency response organization. In foreign territory, the CIB will be composed of the senior U.S. Military and the host nation national and local emergency response authority. The JIC/CIB will plan, manage, and coordinate the on-scene public affairs response. The JIC will coordinate on news press releases before DoD IC final approval. Shortly after the initial release is made, or when appropriate, the DoD IC will assume release authority from the OSD. The JIC/CIB will continue to keep

OSD(PA) and the combatant command public affairs office informed as information is made available.

(4) Identify and establish, in cooperation with State and local authorities, DOS, and host nation authorities, a news media briefing area near the accident scene, but not in a location that interferes with response activities or places the media in danger.

(5) Support news media at the accident scene. The DoD IC may support news media representatives covering a nuclear weapon accident. Support will be the same as that authorized on a military reservation (for example, transportation, logistic, and administrative). Support will depend on the situation and available resources. The media will be briefed on the extent of support available.

(a) Federal, State, and local authorities should jointly establish a media center. Many local authorities already have designated locations. The center should be collocated with the news briefing center, if possible. Initial information provided to the news media will be limited to basic, releasable facts. A news media work area should be established as soon as practical.

(b) Photographers and film crews may arrive on-scene before a cordon is established. The first PIO on-scene will ensure that the initial emergency response force has covered classified or sensitive material. The PIOs should work with police and/or security personnel to identify suitable vantage points for photographers.

(c) Pre-approved handouts, video footage, and photos providing background information should be made available, as appropriate.

(d) The news media may be allowed access to the accident site after the area has been made safe and secure. They should be escorted at all times.

(e) Briefings should be conducted as soon and as often as practical (when there is new information to provide). Subject matter experts (SMEs) should be available for briefings and interviews to include medical experts and representatives from the State and local communities. These subject matter experts should be reminded of what information is releasable and what information is classified. Subject matter expert should avoid speculation when conversing with the media.

(f) The news media should be provided regular photo and film opportunities with specialists and members of the response force, as appropriate.

(g) A news media pool facility may be formed if all the media may not be accommodated near the accident scene. They will decide which organizations will be represented at the facility.

(h) Official photographs or video taken by response force personnel or audiovisual crews may be released to the media through the JIC/CIB after a security review to ensure they do not contain classified information or military controlled technology.

(6) Provide internal information. The DoD IC will ensure that all military and civilian response force personnel are briefed on the public affairs policy when they in-process and ensure that they are informed on the accident response through an internal information program. When news releases and statements are issued to the news media, they should also be issued to the internal audience. They should be coordinated and approved by the JFO Coordination Group or the RRCC before release. Commanders and technical experts may speak to response force and installation audiences in a “town meeting” format if circumstances warrant. Responders should refer the news media to the JIC/CIB. An intranet website should be established, if possible, with a news and information page managed by the JIC/CIB. Logistics information, such as dining hours, should be distributed by the organizations responsible for providing the service. Responders should consider producing a newsletter on response activities and issues for distribution to response personnel.

(7) Work with State and local or U.S. Chief of Mission and/or host nation authorities to identify and respond to public outreach needs. The DoD IC should identify public concerns about the accident and response activities and take appropriate action in cooperation with the SOs, State and local authorities, or the U.S. Chief of Mission and host nation representatives. As soon as public affairs personnel arrive at the accident or incident scene, they will ensure a mechanism is in place to plan a public outreach program and to analyze feedback from the public, the news media, and local authorities to ensure the public affairs program meets the affected public’s needs. Programs should be initiated, modified, or stopped based on data evaluation. An Internet website should be established and regularly updated to provide information on the accident and response efforts. Phone lines will be established with a published number for public inquiries. Public concerns may include:

- (a) Short- and long-term health and safety issues;
- (b) Response and recovery activities and timelines;
- (c) Impact on the economy;
- (d) Impact on the environment;
- (e) Legal claims protocol; and
- (f) Reimbursement for evacuation and/or lost income.

(8) Review and evaluate news media reports about the accident response to ensure accurate information is provided to the public. The DoD IC should ensure that the JIC/CIB monitors media reports to determine if key messages are understood and issued through the media to the public. Misinformation should be corrected immediately. Sample JIC/CIB key messages and non-releasable information examples are listed at the conclusion of this chapter. Media analysis information obtained should be provided to response organizations on-scene, as well as to the higher headquarters. The JIC/CIB should work with the PLA to ensure the legal sufficiency of all press releases and media guidance. Further, the JIC/CIB should work jointly with the PLA to prepare the DoD IC and his staff for any press conferences.

(9) Planning tips the DoD IC may use in a response situation are covered in great detail of the Public Affairs Support Annex of the NRF under the heading “Incident Action Special Considerations” and should be reviewed. Additional planning considerations are:

(a) Confirm a nuclear weapon accident occurred and whether radiation contamination is present, if applicable. Use the guidelines in reference (by).

(b) Communicate with the Office of the ASD(PA) and appropriate local and State public affairs personnel. In foreign territory, ensure communication with the theater PIO; the U.S. Embassy; and, as appropriate, foreign, local, national, and military public affairs personnel.

(c) Ensure a security review is conducted and that all information is coordinated and prioritized before authorizing the release of information about the U.S. nuclear weapon accident response.

(d) Establish a JIC/CIB, a media center, and a briefing area with local authorities, and in foreign territory, with the U.S. Embassy and, as appropriate, with foreign, local, national, and military personnel.

(e) Develop a public affairs plan with key messages.

(f) Monitor news media reports and provide feedback to response organizations and higher headquarters.

(g) Establish an internal information program.

(h) Establish and take part in a public outreach program.

(i) Ensure adequate communications, transportation, logistic, computer and/or information system, and administrative support for public affairs response staff.

(j) Ensure adequate transportation, communications, and logistic support for news media, as appropriate.

4. RESOURCES AND ROLES

All PIOs in the JIC will establish a public affairs information bridge from the JIC to their respective responders and their headquarters. This information bridge will ensure that all agencies involved in the response have information about what is being said or released to the media. The DoD IRF and RTF-ICs will have PIOs from the supporting installation and/or staff as members of the response force. Other public affairs support is available from the organizations listed in paragraphs 4.a. through 4.f., and interagency cooperation is required to ensure timely, accurate, and consistent communication with the news media and the public.

a. The Department of Defense.

(1) The Office of the ASD(PA), as the senior DoD public affairs organization, coordinates with the White House, DOS, DOE/NNSA, DHS, and other appropriate Federal departments and agencies. PIOs from the Combatant Command's component commands may supplement the IC's public affairs staff. A DTRA CMAT PIO is available to provide advice and assistance in the JIC/CIB.

(2) Local media outlets often show a proclivity to "localize" events to make a connection between a national level news story and the local population. For example, a nuclear weapon accident involving a U.S. Navy submarine in Georgia may be localized by the local news media in Wyoming since intercontinental ballistic missiles are deployed throughout the region. This localization can take an inflammatory tone, implying that the mere presence of nuclear weapons can put the local population at risk since the accident has shown that nuclear weapons accidents can occur. For this reason, OASD(PA) will issue an advisory to all DoD installations worldwide announcing the accident and advising installation commanders to expect increased media inquiries. This announcement will reiterate DoD policy found in reference (b).

(3) When an accident occurs, a PIO from the Joint Chiefs of Staff will be included in the JNAIRT. The Joint Chiefs of Staff PIO will help public affairs channels at the accident site and at the departmental level in gathering operational information. Typically, the accident site JIC will be preoccupied with on-scene media and public queries, and the DoD public affairs team will be busy with political, congressional, and agency queries. The JNAIRT, however, is directly connected to operations channels, which places the Joint Chiefs of Staff PIO in a good position to gather, confirm, and share information with other public affairs levels. The Joint Chiefs of Staff PIO is not a release authority on nuclear weapon accidents.

b. Department of Energy. Under DOE policy, a DOE/NNSA PIO will accompany the DOE/NNSA SEO to the accident scene and be present in the JIC/CIB. Other DOE/NNSA public affairs personnel from DOE/NNSA Site Offices, national laboratories, and DOE/NNSA contractors may also be requested to supplement the JIC/CIB operations.

c. Department of State. For accidents occurring on or impacting foreign territory, the U.S. Chief of Mission will be the focal point for diplomatic and political decisions on the U.S. interagency response. A team from the Embassy's Emergency Action Committee, with supplementation as required, will assist the Chief of Mission. The Combatant Command PIOs shall coordinate with the U.S. Embassy in the host nation, as well as the Office of the ASD(PA), to respond to a U.S. nuclear weapon accident in foreign territory. Host nation PIOs should be expected to respond. They may include representatives from the military; national-level health, safety, interior, agricultural, and environmental organizations; and local response organizations. Local fire, police, and emergency management PIOs should be expected on-scene and are likely to arrive at an accident occurring off an installation before U.S. forces. These officials are integral to a successful public affairs operation. In the absence of a bilateral agreement, they should be encouraged to form a combined, coordinated response modeled on the JIC concept. This is normally called the Combined Information Bureau.

d. Department of Homeland Security. If the NRF-ICEPP is implemented, DHS Public Affairs will coordinate all Federal activities related to accident communications with the public; however, the Department of Defense and other departments, agencies, or authorities may retain

primary accident communications responsibility for specific tasks. For example, in a nuclear weapon accident, while DHS may have overall responsibility, the Department of Defense may elect to retain primary accident communications regarding the stabilization of the site and weapons recovery procedures. Similarly, DOE may wish to retain primary accident communications regarding the transporting of the weapon from the accident site to a DOE facility. DHS Public Affairs will manage and coordinate among agencies retaining primary accident communications responsibilities.

e. Other Federal Organizations. PIOs from other Federal agencies involved in the response effort may be present at the scene and will be integrated into the JIC. There may be representatives from agencies such as HHS, EPA, USDA, and DOT. Further, Emergency Support Function #5 (External Affairs Annex) of the NRF provides details on additional support which may be available for the DoD IC. In particular, the Federal Communications Commission's (FCC) Emergency Alert System (EAS) may be particularly useful in rapidly and widely disseminating information regarding the accident to the public.

f. State and Local. PIOs from State and local response organizations, especially fire, police, and emergency management, are key to a successful response. They are likely to arrive at the accident scene before Federal response forces. State and local representatives will be encouraged to become co-equal partners in public affairs operations. Shared Federal, State, and/or local leadership of public affairs operations will ensure a timely, accurate, consistent, and coordinated response. State public affairs on-scene representatives may come from emergency response, agriculture, environmental, health, safety, and transportation agencies. Local public affairs on-scene representatives should be expected from fire, police, and emergency management organizations, as well as utilities.

g. The Internet and the World Wide Web offer an efficient means for response forces to communicate messages and information worldwide. After confirmation of a U.S. nuclear weapon accident, the DoD website, "DefenseLINK" <http://www.defenselink.mil/> should establish a page with information about the accident or link to a DoD-established website. The JIC/CIB should ensure releasable information is forwarded to this site. As soon as practical, the JIC/CIB should determine whether a joint and/or combined response force website is more appropriately handled by a local organization or another organization with links to other sites, as appropriate.

5. PUBLIC AFFAIRS RESPONSE ORGANIZATIONAL CONCEPT

a. JIC. The JIC will contain public affairs decision makers who will develop a public information strategic plan that incorporates key messages and ensures frequent coordination with higher headquarters. The JIC should consist of a senior, co-equal on-scene public information representative from the Coordinating Agency, State emergency response (or foreign national government and/or military), and a local (police and emergency response) public information officer. The JIC should be located with the DoD IC and other senior response leadership. The JIC should:

- (1) Authorize release of information upon approval of the DoD IC.
- (2) Ensure response personnel are prepared for news briefings and interviews.

(3) Ensure adequate staffing, equipping, and support of the JIC/CIB.

b. JIC/CIB. The JIC/CIB is established for news media relations. However, internal information and public outreach programs may be collocated in separate areas of the JIC/CIB, as appropriate. The JIC/CIB should:

(1) Include representatives from all participating organizations that have public affairs personnel. Computer and administrative support is required.

(2) Ensure public affairs personnel are assigned to the accident scene to handle news media at that site and to gather information to provide to the JIC/CIB.

(3) Have personnel research, prepare, and coordinate responses for news media queries; notify news media of briefings; arrange interviews; coordinate photo, film, and video opportunities; and monitor media reports.

(4) Use personnel to set up news briefings, provide recordings and transcripts of briefings and key interviews, arrange and brief news media escorts, and ensure frequent contact with the news media and/or media center.

(5) Implement an internal information program for responders.

(6) Implement a public outreach program and ensure that response force public affairs and other members take part, as appropriate.

(7) The JIC/CIB layout should include:

(a) Private JIC/CIB director work area with telephones for the co-directors.

(b) Media response area with telephones and Internet access.

(c) Multiagency work area with telephones and Internet access.

(d) Administrative support area.

(e) Conference area for JIC/CIB meetings.

(f) Multimedia area to collect, monitor, and review media coverage.

c. Media Center. The media center is the news media work area. This should be collocated with the media briefing area, when possible.

d. Media Briefing Area. The DoD IC's EAO, working with local authorities (police, emergency response, and county), should select a large area with adequate seating, acoustics, power, and lighting for news media briefings. This should be collocated with the media center, when possible.

e. Supporting Systems. The nuclear weapon accident response operation has four supporting systems that are potentially beneficial for the DoD IC command staff and PIOs. The systems are

the virtual JIC, the National Incident Communications Conference Line (NICCL, pronounced “nickel”), the State Incident Communications Coordination Line (SICCL, pronounced “sickle”), the Homeland Security Information Network (HSIN), and Operations Center Support.

(1) Virtual JIC. A virtual JIC links all participants through technological means (secure or non-secure) when geographical restrictions, accident management requirements, and other limitations preclude physical attendance by public affairs leadership at a central location.

(2) NICCL. The NICCL is a standing conference line designated, maintained, and supported by DHS Public Affairs. It is used for transmission and exchange of critical and timely incident information among Federal and affected SLT authorities. If the nature of the accident is of critical importance and urgency DHS Public Affairs will maintain a controller on the line continuously to provide and receive updates from departments and agencies. During sustained incident management activity, the NICCL will be used for daily or other incident communications coordination calls. DHS Public Affairs will maintain a summary of key NICCL communications and interagency coordination actions. These will be maintained and distributed to participants in a timely manner.

(3) SICCL. The SICCL is a similar dedicated Federal-State incident communications conference line. This standing communications resource can facilitate and assure the inclusion, transmission, and exchange of incident management information, evacuee coordination, and messaging relating to all states and territories. Access and use of this line will be managed by DHS Public Affairs. Examples of information could be unclassified public affairs guidance supporting threat information or status changes, pending national decisions, and major incidents where updates are beneficial in support of State-Federal external affairs situational awareness.

(4) EAS. The EAS provides a convenient and reliable means of emergency communications when other national communications resources have been damaged or compromised. Originally designed as a tool the President and others may use to warn the public about emergency situations, it has evolved into a system capable of providing the general public with urgent information over a variety of mediums. The FCC designed the EAS, working in a cooperative arrangement with the broadcast, cable, emergency management, alerting equipment industry, the National Weather Service, and the Federal Emergency Management Administration; EAS uses NOAA Weather Radio digital signaling to broadcast non-weather emergency messages, such as an evacuation order or a radiological emergency. Reference (ca) discusses the type of messages and procedures for using the Emergency Alert System. Additionally, FEMA works with the FCC and SLT authorities to ensure they all have plans for using the EAS.

(5) HSIN. HSIN provides the incident communications team with an encrypted online Web system for record communications, chat room capability, and a real-time capability to post and review documents. The HSIN is also used by the DHS NOC to coordinate homeland security operations with interagency participants. DHS Public Affairs manages access, account support, and administrative issues relating to HSIN for public affairs coordination.

(6) Operations Center Support. In the event that normal communications are lost or degraded, the core group communicates with DHS Public Affairs through respective Federal, State, local, and tribal emergency operations and command centers. The NOC provides support for this task.

f. Other Actions. The “Actions Supporting Incident Communications with the Public” portion of the Public Affairs Support Annex of the NRF lays out specific public affairs action items. This section should be reviewed carefully by DoD ICs and PIOs assigned to the nuclear weapon accident response operation.

6. JIC/CIB EQUIPMENT REQUIREMENTS. Administrative, communications, and logistics support and/or equipment recommended to support an established JIC/CIB should include:

a. Personal computers, for both classified and unclassified computing, to include laptop systems with CD ROM and CD Read/Write capabilities. Ideally, unclassified computers shall provide access to the Internet, a response force intranet, and e-mail. Classified computing capabilities with SECRET Internet Protocol Router Network access and a STU-III/STE phone for secure communications are highly desirable. Appropriate security considerations should be implemented when establishing secure communications both in terms of computing capabilities and secure telephones.

b. Portable television satellite antennas.

c. Printers and ink cartridges.

d. Software and blank discs.

e. Photocopier machine(s) and access to printing.

f. Copy paper.

g. Furniture to support multiple work areas.

h. Visual information, audiovisual, and sound reinforcement equipment.

i. Graphics capability and/or support.

j. Professional quality multi-system still digital and video cameras, video recorders, and playback systems (film, developing equipment, and digital electronic imaging equipment).

k. Overhead projectors and transparencies.

l. Laptop projection capabilities and screen.

m. Appropriate directional and/or information signs.

n. Voice recorders and battery chargers.

o. Commercial Satellite Radios. Consideration should be given to procuring satellite radios due to the remoteness of many locations. Most major carriers offer news and weather channels (to include simulcast of major television networks) which may aid in monitoring media coverage of the accident. Given satellite radio’s large coverage area, satellite radio may be particularly useful where traditional radio and television reception is poor or nonexistent.

- p. Blank audio and videotapes, or blank digital formats.
- q. Office supplies.
- r. Maps.
- s. Briefing aids, including easels, mixers, and microphones.
- t. News sources including televisions and radio receivers (portable, battery operated); wire services; newspapers; magazines; and electronic bulletin boards, news banks, and databases.
- u. Position locators and/or navigational equipment.
- v. Power converters (110 and 220 volt).
- w. Extension cords, plug adapters, and power strips.
- x. Various types of batteries.
- y. Mobile radios.
- z. Cellular phones.
- aa. Answering machines.
- ab. Pagers.
- ac. Facsimile (fax) machines.
- ad. Support vehicles (for public affairs staff and media pools and/or escort).
- ae. Satellite communications.

7. JIC/CIB RECOMMENDED KEY MESSAGES AND NON-RELEASABLE INFORMATION

a. JIC/CIB Recommended Key Messages.

Local emergency response officials are responsible for public safety. DoD IC release of information to those officials must not be confused with release of information to the general public. It is crucial to publicly confirm a nuclear weapon accident and confirm radioactive contamination (if true) as soon as this information is received and confirmed. Delay may lead to public speculation (response forces show up in personal protective suits), panic, and loss of credibility. Delay may also cause members of the public to be unnecessarily exposed to low levels of radiation that may be released during the accident. Paragraphs 7.a.(1) through 7.a.(5), below, list key messages recommended for use during the initial phase.

(1) Safety.

- (a) Public safety is our first priority.
- (b) Trained military and civilian personnel are responding.
- (c) Please stay away from the cordon so that we may work without interference.
- (d) Preventing any further injuries or loss of life is paramount.
- (e) Please continue to listen to local TV and radio and/or refer to response website for further advice.

(2) Sympathy.

- (a) We deeply regret this accident has occurred.
- (b) Our thoughts and condolences go out to families and friends of those involved.

(3) Cooperation.

- (a) We are working closely with all involved military and civilian organizations.
- (b) We are working together as a team.
- (c) Hundreds of trained military and civilian personnel are responding.
- (d) We are bringing our best people and the most advanced equipment to deal with this emergency.

(4) Disclosure.

- (a) We are here to coordinate the initial response.
- (b) We will give you information as soon as it becomes available.
- (c) We want to answer your questions.
- (d) We do not have all the answers.

(5) Compensation.

- (a) There will be an investigation.
- (b) Procedures will be established to handle requests for compensation.

b. JIC/CIB Non-Releasable Information. The JIC/CIB must ensure that the media and public understand early on that there is some information that is not expected to be released by the DoD IC or the JIC/CIB.

(1) Political.

- (a) U.S. and/or host nation diplomatic efforts.
- (b) Foreign relations.
- (c) NATO information.
- (d) Comments about other nations' nuclear weapons.

(2) Policy.

- (a) Future nuclear program and/or posture.
- (b) Deterrence.
- (c) Legality of nuclear weapons and their use.
- (d) Nuclear disarmament.
- (e) U.S. nuclear weapons overseas.
- (f) Accident investigation arrangements.
- (g) Details of government-to-government agreements and/or arrangements.

(3) Operational.

- (a) Nuclear weapon C2 arrangements.
- (b) Location of nuclear weapons (excluding those involved in the accident).
- (c) Transportation of nuclear weapons (frequency of flights and routes).
- (d) Specific weapon design, characteristics, and/or modifications.
- (e) Weapon recovery plans (routes, packaging, and containerization).
- (f) Cost estimates for cleanup and/or remediation.

8. CONTINGENCY RELEASES. Figures 2. through 6. show templates for contingency releases.

Figure 2. Contingency Release Number 1

CONTINGENCY RELEASE NUMBER 1

To the General Public

“When the Public Is Probably in Danger”
(Does confirm)

(Format of sample release to be used when a nuclear accident occurs. Public safety considerations require this announcement because of the likelihood of fire or conventional high-explosive detonation of the weapon. The following statement should be made locally or by appropriate higher authority if no local authority is available.)

An aircraft (other type of transportation) accident occurred (or other circumstances) about (location and time). The accident involved a nuclear weapon that contains conventional explosives and radioactive material. There is no danger of a nuclear detonation, but there is a danger from the conventional explosives that (are burning, may detonate, have detonated). The public is requested to stay out of (indicate the area) (under surveillance by guards) in the interest of safety and to avoid hampering operations at the accident scene. An experienced response team has been ordered to the scene.

(If appropriate, the following WILL be included in the release.) Radioactive material in the form of dust may be scattered because of the accident. The dust poses little risk to health unless taken into the body by breathing or swallowing, although it is unlikely that any person might inhale or swallow an amount that should cause illness. As a precautionary measure, you are asked to stay calm and indoors. Turn off fans, air conditioners, and forced-air heating units that bring in fresh air from the outside. Use them only to re-circulate air already in the building. Eat and drink only canned or packaged foods that have been inside. If you must go outside, cover your nose and mouth and avoid stirring up and breathing any dust. It is important to remember that your movement might cause yourself greater exposure to any radioactive dust, should it be present, and you might possibly spread contamination to others.

(If plutonium is involved) One of the materials involved is plutonium, which is both a toxic and a radiation hazard and a chemical poison if ingested. The radiation given off consists of alpha particles that do not have sufficient energy to penetrate buildings, clothing, or even the outer skin. Therefore, short-term exposure to contamination outside the body poses a negligible health risk. The precautions mentioned earlier should be carefully followed to prevent inhalation or ingestion.

Figure 2. Contingency Release Number 1, continued

(If uranium is involved) One of the materials involved is uranium. Uranium, depending on the type, may be a radiological hazard or a chemical health hazard, similar to lead poisoning. Uranium gives off alpha particles that do not penetrate skin and pose no health risk when outside the body.

The public is asked to stay out of the area (under surveillance or closed off by guards) (and if true) until a monitoring team, now en route to the accident site, may survey the ground and determine the exact area affected by the accident. Any fragments found near the scene may be contaminated and should be left in place. If fragments have been picked up, avoid further handling and notify (authorities) for proper recovery and disposition.

Periodic announcements will be made as more information is known. It is expected that these precautionary actions will be modified as more information becomes available. A U.S. (Military Service) team from (name of installation) is en route to (has arrived at) the accident scene.

We have no details yet on civilian or military casualties (or give number only of civilian and military casualties) or property damage.

The cause of the accident is under investigation. Further details will be provided as they become available.

Figure 3. Contingency Release Number 2

CONTINGENCY RELEASE NUMBER 2

To notify the general public

“No Radiological Danger to the Public”

(Confirms to reduce public alarm)

(Format of sample release to be used initially when no danger to the public from contamination or blast exists, but when confirming the presence or absence of a nuclear weapon or nuclear components significantly prevents or reduces widespread public alarm that may result from unusual activity at the accident and/or incident site.)

A U.S. (type) aircraft (other type of transportation) carrying HAZMAT, classified cargo, or unarmed nuclear weapon(s) crashed (or other circumstances) at about (location and time).

The public is requested to stay out of the area (add, if true: under surveillance by guards) to prevent any remote possibility of hazard from the accident (or conventional HE detonation) and to avoid hampering removal operations. There is no need for evacuation. (There is no danger of nuclear detonation.)

The cause of the accident is under investigation. Further details will be provided as they become available.

Figure 4. Contingency Release Number 3CONTINGENCY RELEASE NUMBER 3

To notify the general public

“When the Public Is Possibly in Danger”

(Confirms possibility of contamination in a nuclear weapon accident)

(Format of sample release to be used when nuclear weapons or nuclear components have been involved in an accident and the possibility exists for contamination due to fire or explosion, and details are unknown. The release to the general public should only be used after the area has been secured. Release may be modified as shown below depending on audience.)

MINIMUM ANNOUNCEMENT

A U.S. (type) aircraft (other type of transportation) carrying unarmed nuclear weapons or nuclear components crashed (or other circumstances) at (location) at about (time).

The public is asked to stay out of the accident area in the interest of safety due to the possibility of hazard from the accident (or conventional HE detonation) and to avoid hampering recovery operations. (There is no danger of nuclear detonation.)

ADD THE FOLLOWING FOR APPROPRIATE OFFICIALS

Fire, rescue, and other emergency services personnel should approach the area with caution from upwind and be equipped with protective clothing and breathing apparatus. Any local official at the scene of the accident or who has left the site who may provide details on the situation should call this number (_____). Current information from the accident scene will help response personnel respond to the accident and provide additional public safety guidance. If contact with the accident scene is established, determine the following: condition of aircraft and/or vehicle (such as burning, evidence of explosion, or extent of damage); condition of accident site (such as fire or blast damage); or evidence of obvious cargo (such as shapes or containers). Avoid handling any debris at the crash site.

If the aircraft is transporting nuclear weapons containing IHE or weapons overpacked with accident-resistant containers, detonation is much less likely, and the fire should be fought as long as there is a reasonable expectation of saving lives or containing the fire. The weapons, or containers, if exposed, should be cooled with water.

Law enforcement officials should prevent unauthorized personnel from entering the site and picking up fragments of the plane (vehicle) or its cargo. If any fragments have already been picked up, avoid further contact or handling. Notify (authorities) for recovery and proper disposition.

A U.S. (Military Department) team from (name of installation) is en route to (has arrived at) the accident scene.

We have no details yet on civilian or military casualties or property damage.

The cause of the accident is under investigation. Further details will be provided as they become available.

Figure 5. Contingency Release Number 4-A

CONTINGENCY RELEASE NUMBER 4-A

“To Notify State and Local Officials
When the Public Is Possibly in Danger”
(Neither confirms nor denies)

(Format of sample release to be used if public safety considerations require notifying State and local officials that hazardous cargo has been involved in an accident, the possibility exists for contamination due to fire or explosion, and details are unknown.)

MINIMUM ANNOUNCEMENT

A U.S. (type) aircraft (other type of transportation) carrying HAZMAT crashed (or other circumstances) about (location) at (time).

Visitors are warned to stay out of the area of the accident in the interest of public safety. Fire, rescue, and other emergency services personnel should approach the area with caution from upwind and be equipped with protective clothing and breathing apparatus. Water should not be directly used on the aircraft unless needed to save property or lives. Any local official at the scene of the accident who may provide details on the situation should make a telephone call to this number (local phone). Current information from the accident scene helps evaluate the accident and provide additional public safety guidance. If contact with the accident scene is established, determine the following: condition of aircraft (burning, evidence of explosion, extent of damage, etc.); condition of accident site (fire, blast, or damage); evidence of obvious cargo (shapes or containers). Determine the need for a public announcement of nuclear weapons involvement based on the responses to the above.

EXPANDED ANNOUNCEMENT

If there is no immediate threat to life, and the fire may not be extinguished immediately (five minutes), the fire should be contained and allowed to burn out. Water as a firefighting agent should be used with caution due to possible adverse reaction with materials involved in the fire.

Law enforcement officials should prevent unauthorized personnel from entering the site and picking up fragments of the plane (vehicle) or its cargo. If any fragments have been picked up already, avoid further contact or handling. Notify (authorities) for recovery and proper disposition.

Military personnel have been deployed (will be deployed) and will arrive (are scheduled to arrive) soon at the site.

Figure 6. Contingency Release Number 4-B

CONTINGENCY RELEASE NUMBER 4-B

To Notify the General Public
“When the Public Is Possibly in Danger”
(Neither confirms nor denies)

(Format of sample release to be used if public safety considerations require making a PUBLIC RELEASE that hazardous cargo was involved in an accident, the possibility exists for contamination due to fire or explosion, and details are unknown.)

A U.S. (type) aircraft (other type of transportation) carrying HAZMAT crashed (or other circumstances) about (location) at (time). The public is warned to stay out of the area (under surveillance by guards) in the interest of safety and to aid operations at the accident scene.

A U.S. (Military Service) team from (name of installation) is en route to (has arrived at) the scene of the accident.

We have no details yet on civilian or military injuries or property damage.

Further announcements will be made as more information is known.

IN RESPONSE TO QUERY ONLY

In response to the question, “Are nuclear weapons stored at (name of facility) or (name of facility)?” The official reply is, “It is DoD policy neither to confirm nor deny the presence of nuclear weapons at any particular location.”

In response to the question, “Are nuclear weapons aboard a specific surface ship, attack submarine, or naval aircraft?” The official reply is, “It is general U.S. policy not to deploy nuclear weapons aboard surface ships, attack submarines, and naval aircraft. However, we do not discuss the presence or absence of nuclear weapons aboard specific ships, submarines, or aircraft.”

9. PUBLIC AFFAIRS RADIATION FACT SHEETS. Figures 7. through 11. show standard public affairs radiation fact sheets.

Figure 7. Fact Sheet 1: Characteristics, Hazards, and Health Considerations of Plutonium

FACT SHEET 1

CHARACTERISTICS, HAZARDS, AND HEALTH CONSIDERATIONS OF PLUTONIUM

(For release to the general public)

The accident at _____ (to be filled in) _____ has resulted in the release of the radioactive substance plutonium. Persons who are downwind from the accident may become exposed to this substance by coming into contact with contamination (radioactive material that has coated or fallen on the surfaces of structures, the ground, or objects) from the mishap. Also, very small amounts of plutonium may have been spread by the winds to adjacent areas. Radiological survey teams are monitoring these suspected areas to determine the presence of plutonium and to measure the levels, if present. No immediate danger exists to anyone, and no medical intervention is necessary; however, some actions may help prevent further contamination or reduce its spread to clean areas.

Plutonium, which is abbreviated Pu, is a heavy metal that has a shiny appearance, similar to stainless steel when freshly machined. After exposure to the atmosphere for any period of time, it oxidizes to a dark brown or black appearance. When released from a weapons accident, plutonium may not be readily seen by the naked eye, but in areas close to the accident, its presence may be assumed in dust and dirt on the ground or on flat surfaces, and from ash resulting from the accident fire.

Plutonium is an alpha radiation emitter; that is, it radiologically decays by emitting an alpha particle, a very heavy radioactive particle. Alpha particles do not substantially penetrate materials. Their range in air is only a few inches at most. This means that alpha radiation is not a hazard to people if it stays external to the body. The epidermis, or outer dead layer of the skin, is sufficient protection for exposure to this isotope from sources external to the body. No external hazard exists to people walking through an area contaminated with plutonium. Alpha radiation may, however, represent an internal radiation hazard when plutonium is taken into the body by inhaling contaminated air, eating contaminated food, or getting contamination into a wound or cut. In actuality, contamination from ingestion is unlikely to be a problem, since plutonium is very poorly absorbed through the intestines. Less than 0.02 percent may be absorbed, or 2 of every 10,000 atoms eaten. Absorption through wounds may introduce small amounts of plutonium into the body. Inhaling plutonium particles is the most likely route of internal exposure.

Inhaled plutonium is kept in the lungs in much the same manner that people in a dust storm inhale dust. This "dust" settles in the lungs. Once in the lungs, a low percentage of plutonium may be translocated by the bloodstream to the liver and the bones. This deposition may be prevented by using "chelation" compounds, such as ethylenediamine tetraacetic acid or diethylenetriamine pentaacetic acid (DTPA), which hasten the excretion of plutonium from the body through the urine. The use of these chelating compounds is not without some medical hazard to the individual, since they are IV-administered, and should be performed by a physician who has been in contact with appropriate agencies to coordinate the use of these drugs.

Figure 7. Fact Sheet 1: Characteristics, Hazards, and Health Considerations of Plutonium,
continued

Plutonium in a weapon has a radiological half-life (the length of time it takes for the plutonium to lose one half of its radioactivity) of more than 24,000 years. This long half-life means that its radioactivity does not decrease substantially by nuclear decay or disintegration. Likewise, eliminating plutonium from the body is also a very slow process. Biological elimination of plutonium may be improved significantly by using the chelating agents mentioned above.

Therefore, until the limits of contamination are determined, the public is advised to follow a few simple guidelines to reduce the spread of contamination, and there will be little, if any, hazard. Stay inside and reduce opening doors and windows. Turn off fans, air-conditioners, and forced air heating units that bring in fresh air from the outside. Use them only to recirculate air already in the building. Children should not play outdoors. Fruits and vegetables grown in the area should not be eaten. Individuals who think they have inhaled some plutonium should not be unduly concerned. The inhalation of plutonium is not an immediate medical emergency. Very sensitive monitoring equipment is being brought into this area to survey the inhabitants of suspected contamination area(s) for inhaled radiation, and once established, this will be made available to those who need it.

Figure 8. Fact Sheet 2: Medical Department Fact Sheet on Plutonium

FACT SHEET 2

MEDICAL DEPARTMENT FACT SHEET ON PLUTONIUM

(For Medical Personnel)

Plutonium is a highly reactive element that may exhibit five oxidation states, from three to seven. The principal routes into the body are through inhalation and contaminated wounds; ingestion and contaminated intact skin are unimportant.

Inhalation is probably the most significant route of contamination in a nuclear weapon accident. Retention in the lungs depends on particle size and the chemical form of plutonium involved. Usually, in a weapons accident, plutonium is in the form of an oxide that has a pulmonary retention half-time of up to 1,000 days.

Absorption through wound contamination results in a translocation of some of the material to the skeleton and liver. The majority remains in the vicinity of the wound and may result in the formation of a fibrous nodule within months to years. The possible development of a sarcoma or carcinoma in such nodules is a matter of concern, although there have been no reports of such in the medical literature.

After entry into the body, some of the plutonium is solubilized by the body fluids, including blood, and is redistributed within the body. Ultimately, it is distributed by the blood to the skeleton (45 percent), liver (45 percent), and the other tissues (10 percent). The retention half-times are estimated to be 200 years (whole body), 100 years (skeleton), and 40 years (liver).

All medical treatment for plutonium contamination or inhalation should be coordinated with the appropriate Service Medical Department or with the REAC/TS because of the hazard of the substances involved. DTPA compounds are defined as investigational drugs that require the advice and concurrence of the REAC/TS before administration. The REAC/TS may be contacted at: (423) 576-3131.

Treatment of plutonium-contaminated wounds should involve copious washing and irrigation to try to dislodge the contamination. If possible, washings should be saved for later counting to determine contamination levels. More extensive treatment by excision requires judgment in assessing the area involved, the difficulty of excision, and the total quantity in the wound. Greater than 4 mCi of Pu embedded in a wound should be considered a candidate for such treatment. It is not expected that the physician will need to make this determination, since a specialized team to perform such monitoring may be made available from the Incident Commander or his or her representative. Immediate chelation therapy with DTPA (consult the REAC/TS for protocol) should be accomplished before surgical excision to prevent possible systemic absorption of plutonium. In burn cases, flushing with sterile saline or water removes a great deal of contamination. The remainder is likely to be removed when the eschar sloughs off.

Figure 8. Fact Sheet 2: Medical Department Fact Sheet on Plutonium, continued

DTPA treatment given immediately after wound or burn treatment has been shown to remove up to 96 percent of the remaining plutonium. In the case of inhaled plutonium, the results have been relatively disappointing, since the oxide forms of plutonium are transferred at a relatively slow rate from the lungs into the systemic circulation. Thus, little systemic burden of plutonium is available for chelation in the early period after exposure and there is never a time when a sizable systemic burden is available in the extracellular spaces for effective chelation.

In spite of this, DTPA should be used as soon as possible after significant inhalation exposures, since the oxides may not be the only compound present. Attempts to stimulate phagocytosis and the mucociliary response, or to use expectorant drugs, have not been successful in animal studies; however, this may not be true in humans.

The only demonstrated useful procedure in enhancing the clearance of insoluble particles, such as plutonium oxides, from the lung is bronchopulmonary lavage. The risk of this procedure versus the risk of future health effects from the estimated lung burden must be very carefully weighed. The use of repeated lavages should remove 25 to 50 percent of the plutonium that should otherwise be kept in the lung. Again, advice should be sought from the Service medical command and the REAC/TS.

Figure 9. Fact Sheet 3: Plutonium Fact Sheet

FACT SHEET 3

PLUTONIUM FACT SHEET

(For Operational Commanders)

As Operational Commander, you will be assaulted by many needs at once in determining the actions to be taken in coping with a nuclear weapon accident. You should have had the opportunity to review the preceding fact sheets for the general public and medical personnel. Several facts are important to keep in mind, as general guidance.

By the time you have arrived at the scene, the weapons have usually suffered low order detonations if they are going to do so. This low order detonation produces a cloud of finely dispersed plutonium that falls out over the area downwind, depending on particle size, wind direction and speed, and amount of explosives in the detonation. A very worst case situation is shown on the ARAC plots that are made available to you. The initial ARAC plots show desposition and dose predictions based on the detonation of all weapons involved, using all the available explosives. Desposition resulting from explosive dispersal is significantly larger than that resulting from a fire. The actual scenario should be less, perhaps 10 to 100 times less, based on the actual survey data from the site. Note that plots are predictive in nature, and must be corroborated by actual field measurements.

Figure 9. Fact Sheet 3: Plutonium Fact Sheet, continued

The cloud deposits its radioactive material over several hours after an explosion or fire, with the largest particles settling out earlier and closer to the accident site and the finest particles being carried further by the wind and taking longer to settle out. In the case of such releases, Protective Action Recommendations to civil authorities for sheltering downwind members of the public in place must be made (and executed) within the several-hour period of plume passage to be effective for reduction of dose from the initial plume. After initial cloud passage, the inhalation of material from the accident is by resuspending the plutonium by operations in the area of cloud passage, such as walking. The DOE may compute a dose equivalent for persons in the area of the initial cloud passage. People exposed in the plume may experience significant intakes of radioactive material through inhalation (with corresponding significant radiation doses). Note that this is only from the cloud passage; doses from resuspension will be significantly less.

The important point is that the ARAC plot usually overestimates the total dispersion of plutonium, and the dose estimate is based only on cloud passage, not later resuspension of the plutonium; therefore, basing your sheltering plans on these numbers may easily result in a significant conservatism.

Sheltering should be recommended for the downwind population, but you must be careful to avoid the impression of extreme hazard from the plutonium. Your sheltering advisory should indicate that there is a contamination hazard and a slight inhalation hazard. Care should be taken not to increase tension over the accident and/or incident. You and your PIO should stress that people should stay indoors as much as possible, keep houses closed to prevent contamination, and follow other ideas, as outlined in the public release.

Usually, the resuspension of plutonium in the original areas of contamination is not significant, except for the area very close to the accident site. To prevent the spread of material in this area, consider spraying with some sort of fixative to prevent resuspension and/or spread of the plutonium. Something as simple as hand sprayers with vegetable oil may be used to bind the plutonium into the soil and/or surface around the site. A secondary advantage is that this method lowers the airborne hazard for the workers inside the control boundaries and may help the eventual cleanup process move faster. It does, however, mask the plutonium from some alpha detection RADIACs, such as the AN/PDR 56, AN/PDR-77, and the ADM-300 with AP-100 alpha detector. Usually, these types of instruments are used only for monitoring people or material leaving the site, not site contamination surveys.

In dealing with a nuclear weapon accident, some of the concepts that are usually used to handle injuries and/or fatalities on board ship do not hold true, or may be counterproductive. Such an example is keeping the population under tight sheltering requirements or restricting traffic from the contamination area downwind. Any recommendation for the civilian populace will be just that, a recommendation. The military has no authority in the contamination areas unless they are military areas, or are within the NDA. Use the local authorities, and have the FEMA representative assist in this function.

Some concept of the exact magnitude of the risk people experience from the accident may be compared with the risks outlined in the Nuclear Regulatory Guide 8.29 (reference (cb)). The Service, DOE, and/or NNSA health physicists should be consulted to give the best approximation of the public risk; this may be compared with the risks reference (cb).

Figure 10. Fact Sheet 4: Characteristics, Hazards, and Health Considerations of Uranium

FACT SHEET 4

CHARACTERISTICS, HAZARDS, AND HEALTH CONSIDERATIONS OF URANIUM

(For Operational Commanders)

Some nuclear weapons may contain uranium. Uranium is a mild to moderately radioactive material that may be hazardous if inhaled in large quantities. In a nuclear weapon accident, the uranium in the warhead of the weapon may get dispersed into the air by fire or explosion of the HE in the weapon. (Keep in mind that this is not a nuclear detonation.) The heat and smoke from the fire or explosion may carry small particles of uranium into the air. As the smoke plume travels downwind, the particles of uranium begin to settle to the ground, leaving a track of contamination on the ground surface and vegetation. Larger particles settle out first, smaller particles may travel much further. The highest levels of uranium contamination will be in the immediate area of the accident. In general, the further away from the accident, the lower the levels of uranium contamination that may be expected.

Uranium is a heavy metal, somewhat like lead. Uranium is a naturally occurring mineral that is mildly radioactive. As found in nature, uranium consists mostly of the isotope U-238, with small quantities of U-235 and extremely small quantities of U-234. This so-called “natural uranium” is only mildly radioactive, emitting alpha and beta radiation and low levels of gamma radiation. The half-life of U-238, the major constituent of natural uranium, is 4.5 billion years. It is likely that uranium released in the circumstances of a weapons accident is in the chemical form of uranium oxide. Natural and depleted uranium are primarily chemical hazards (heavy metal toxins) rather than radiological hazards, even at relatively high exposures. The radiological hazard associated with enriched uranium is higher than for its other forms.

Uranium may be “enriched,” that is, the concentration of U-235 may be increased, by many methods. Commercial nuclear reactors use uranium that has been enriched so that the U-235 makes about 5 percent of the total uranium mass (the rest is U-238). Some nuclear weapons use highly enriched uranium (HEU) in which the U-235 makes up more than 90% of the total mass of uranium, though U-234 comprises almost 97% of the total alpha radiation activity. The uranium left over from the enrichment process is called “depleted” uranium because it has only about one-third as much U-235 as natural uranium. Nuclear weapons may contain several types of uranium, from depleted to highly enriched.

Uranium may be a mild to moderate radiation hazard if it is inhaled. Uranium is not particularly hazardous if it stays outside the body. If uranium is inhaled, the lungs and other organs of the body may receive doses of radiation; however, a person must inhale a very large quantity of uranium to get a significant dose of radiation. Even if the uranium was involved in a fire or explosion, it is unlikely that anyone would get a serious radiation dose from inhalation. It is much more likely that dispersal of uranium should create more of a “nuisance” contamination problem.

Figure 10. Fact Sheet 4: Characteristics, Hazards, and Health Considerations of Uranium,
continued

Compared to plutonium (the major HAZMAT in many nuclear weapons), uranium is not very hazardous. In a nuclear weapon accident in which both plutonium and uranium have been dispersed, the hazard from plutonium is far more serious than that from uranium. Although uranium emits alpha radiation (that may result in internal radiation doses if taken into the body) very much like plutonium, pound-for-pound, uranium is from 1,000 to 100,000 times less radioactive than plutonium. A person would have to inhale roughly 1,000 to 100,000 times as much uranium mass to get the same dose as they would from plutonium. In addition, uranium does not stay in the body as long as plutonium; therefore, the radiation dose received by the organs is somewhat lower.

Depleted and natural uranium is at least 100 times less radioactive than HEU. It is unlikely that accidents involving dispersal of depleted or natural uranium will result in any significant radiation doses. HEU contamination presents more of a problem than depleted or natural uranium, but is still far less of a problem than plutonium contamination.

If a person is directly exposed to a smoke plume from a fire or explosion involving uranium, he or she may have been exposed to significant levels of airborne uranium. If he or she is in areas where the ground was contaminated, he or she may have been exposed to a much lower level of uranium than was re-suspended into the air. If a person thinks he or she may have been exposed to uranium (as described above) he or she should contact the appropriate Federal or State authorities and let them know. The authorities will arrange for appropriate radiation detection tests to be made. These tests may include collecting urine samples and/or scheduling for a "lung count" examination. Depending on the chemical form of the uranium that has been inhaled, some part of the uranium in the body is excreted in the urine. Urine samples may be analyzed for the presence of uranium. (All people have a low concentration of uranium in their urine from the trace quantities of uranium in the normal diet.) Lung count is a procedure performed by placing very sensitive radiation detectors near a person's chest to look for low-energy X rays emitted by the uranium mixture. Typically, the person reclines on a table or in a chair while the detectors are placed near the chest wall. A lung count is not like an X-ray exam. A lung count is a completely passive exam; the detectors do not emit any radiation, and the person does not receive any radiation dose from the exam. A "quick" screening lung scan may be performed in about 10 or 15 minutes. A more sensitive exam performed at a special "whole body counting" facility typically takes about 45 to 50 minutes.

In general, uranium is more hazardous to children than adults, due to the smaller size and different metabolism of children. To assure that children are adequately protected, PAGs established by the EPA take this increased sensitivity into account.

If uranium stays outside of the body, it is not particularly hazardous. The beta and gamma radiation emitted by uranium is relatively weak, and uranium emits only low levels of this radiation. The intensity of these gamma rays is so low that the measurable radiation field from uranium only extends a few feet away from solid uranium metal. Even high levels of uranium contamination on the ground do not produce any significant external radiation hazards.

Figure 11. Fact Sheet 5: Characteristics, Hazards, and Health Considerations of Tritium

FACT SHEET 5

CHARACTERISTICS, HAZARDS, AND
HEALTH CONSIDERATIONS OF TRITIUM

(For Operational Commanders)

Some nuclear weapons have small metal bottles that contain tritium, a radioactive gas. In an accident involving nuclear weapons, it is possible that these gas bottle systems may be damaged, and that some or all of the tritium gas is released into the air. Tritium gas that is released into the air is quickly diluted and dispersed, and is not likely to be a significant hazard, unless there was a fire or explosion at the accident, and then it should only be a hazard to people in the immediate area of the accident.

Tritium is a radioactive form of the element hydrogen. From a chemical standpoint, tritium atoms behave just like hydrogen atoms. Tritium is often stored and used in the form of a gas. Like stable hydrogen, tritium combines readily with many other elements. In a fire, tritium combines spontaneously with oxygen in the air and also replaces ordinary hydrogen in water, forming tritiated water, sometimes called "tritium oxide" or "HTO." It may also replace the stable hydrogen in other hydrogenous material (grease or oil), causing these materials to become radioactive. Metals can react with tritium in two ways: plating, the deposition of a thin film of tritium on the surface of the metal; or hydriding, the chemical combination with the metal. In either case, the surface of the metal becomes contaminated.

Some tritium is produced naturally, by the interaction of cosmic rays in the earth's atmosphere. These cosmic ray interactions produce about 4 million Ci of tritium every year worldwide. This tritium is incorporated into rainwater, resulting in a low, but measurable "background," level of tritium in almost all water. The concentration of tritium in surface water is typically on the order of 10 to 50 picocuries per liter.

Tritium is also produced in nuclear reactors. This manufactured tritium may be separated and purified for a variety of uses. There is no difference between manufactured tritium and tritium that is produced naturally. Tritium is used in nuclear weapons, fusion research, luminous signs and watches, and in biomedical research.

Tritium gas is relatively harmless, since very little of it is absorbed into the body, even if inhaled; however, if there were a fire or explosion at the same time as the tritium was released, some or all of the tritium gas would probably be converted to HTO, which behaves like water vapor. When people are exposed to HTO in the air, some of it is inhaled, and some of it may be absorbed through the skin.

The radiation doses that might be received from exposure to the smoke plume decrease rapidly with distance away from the accident. People who were directly exposed to the smoke plume very close to the accident site (within a few hundred yards) might -- although unlikely -- receive radiation doses greater than the occupational limit of 5 rem. Beyond a few hundred yards, doses

Figure 11. Fact Sheet 5: Characteristics, Hazards, and Health Considerations of Tritium,
continued

should be well below a few rem. Beyond about 1/2 mile, the dose to a person who was directly in the smoke plume is likely to be less than the dose a person receives every year from natural background radiation. The key point to remember is that as distance from the plume increases, radiation dose decreases.

Normal RADIACs cannot detect tritium; specialized portable/laboratory instruments are required. Tritium on surfaces may be detected by rubbing a small piece of filter paper over the surface, and then “counting” the radioactivity on the paper (which is placed in a small vial) in an instrument called a “liquid scintillation counter.” Tritium in water or other liquid may be counted by placing a sample of the liquid in a small vial and then counting the vial in the liquid scintillation counter. Tritium in the air may be measured by sampling the air with a “flow-through ionization chamber” instrument, which gives a real time reading of the concentration of tritium in air.

The form of tritium that is most likely to get inside the body is HTO in the form of water vapor (in the air.) Airborne tritium (as HTO vapor) may be inhaled, and may also be absorbed through the skin. When people are exposed to HTO vapor, about 2/3 of the total intake comes from inhalation of the tritium, and about 1/3 comes from absorption of the tritium through the skin. Tritium may also be incorporated into crops, which then may be ingested. Tritium release could be a significant hazard only for personnel close to the accident site.

Once tritium is inside the body, it behaves just like water and is distributed rapidly and uniformly throughout the entire volume of body water, where it may deliver a radiation dose to the soft tissues of the entire body. Tritium is eliminated from the body at the same rate and through the same pathway as water is eliminated from the body, excretion of urine and feces, sweat, and loss through exhalation.

The amount of time required for half of the tritium remaining in the body to be removed from the body is called the “biological half life.” Although the physical half-life of tritium is 12.26 years, because tritium in the body behaves just like water, and since the body’s water is continually eliminated and replaced, the biological half life of tritium is very short – about 10 days.

10. PUBLIC AFFAIRS CHECK LIST

The Public Affairs Checklist is listed in paragraphs 10.a. through .10.j.

- a. Recommend the DoD IC confirms nuclear weapon accident or incident occurred and radiation contamination.
- b. Communicate with the Office of the ASD(PA) and appropriate local and State public affairs personnel. In foreign territory, ensure communication with the theater PIO; the U.S. Embassy; and, as appropriate, foreign, local, national, and military public affairs personnel.
- c. Ensure security review of, coordinate (legal, weapons, medical, radiological, and SR), and authorize release of information about U.S. nuclear weapon accident response.

- d. Establish a JIC/CIB, a media center, and a briefing area with local authorities, and in foreign territory, with the U.S. embassy and, as appropriate, with foreign, local, national, and military personnel.
- e. Develop a public affairs plan with key messages.
- f. Monitor news media reports and provide feedback to response organizations and higher HQ.
- g. Establish an internal information program.
- h. Establish and take part in a public outreach program.
- i. Ensure adequate communications, transportation, logistic, computer and/or information system, and administrative support for public affairs response staff.
- j. Ensure adequate transportation, communications, and logistic support for news media, as appropriate.

SECURITY

1. GENERAL

The presence of nuclear weapons or weapon components at an accident site requires implementation of an effective security program as soon as possible. Accidents occurring in areas where the Department of Defense does not have exclusive jurisdiction might require establishing an NDA to allow control of civilian land by military forces. The equivalent DOE/NNSA area for an accident involving a nuclear weapon in the custody of DOE/NNSA is an NSA. Close coordination with civil law enforcement agencies is critical for an effective security program.

2. SPECIFIC REQUIREMENTS. The security program must allow for situational awareness both inside and outside the bounds of the NDA/NSA, if established. This situational awareness will require close coordination with civil authorities from other Federal agencies and State, local, and tribal governments. The security program is found in the Security Operations Branch of the Operations Section. In general, this section will work with ESF #13 (if present) to ensure provision of technical assistance, public safety and security assessments, badging and credentialing procedures, access control, site security, traffic and crowd control, force protection, security surveillance, security and protection of personnel and temporary storage facilities during distribution of supplies from the Strategic National Stockpile, and specialized security resources. Specifically, this section will:

- a. Provide effective control of the accident area.
- b. Protect nuclear weapons, weapon components, classified material or components, and Government-owned material.
- c. Maintain a Security Control Center.
- d. Provide necessary physical, operational, and informational security and recommend security measures to the DoD IC.
- e. Ensure a secure perimeter for the NDA/NSA. (More than one NDA/NSA may be established, as required.)
- f. Place the Security Area perimeter outside of the fragmentation zone. Coordinate with the ASHG and EOD personnel to determine the required radius.
- g. Establish an Entry Control Point (ECP), as directed by the DoD IC. If necessary, multiple ECPs may be used but should be reduced to the fewest necessary to conduct the operation.
- h. Establish a standardized entry control system for the security area. This will include implementing and using an identification and/or badging system, entry control logs, and a record of all personnel entering and leaving the security area. These logs will be turned over to the Documentation Unit of the Planning Section every shift change, as determined by the operation rhythm.

(1) A locally devised badging system will be in effect. Issuance of these badges will be based upon verification of identity and necessity to be in the security area. Identity can be verified prior to badge issuance with two forms of photo identification, with one form being issued from the individual's Federal agency.

(2) In the event that individuals enter the security area and do not return prior to shift change, the individual's name will be transferred to a new control log and annotated as still in the area on the original control log. A name can only be transferred one time; if a name is about to be transferred more than once, a search for the individual should commence immediately.

i. Have a security element for perimeter security, entry and exit control, and protection of classified information and property. The DoD IC should carefully review with the PLA the RUF to be used by all DoD security personnel responding to the accident and should ensure that the applicable RUF are fully understood by those personnel.

j. Establish a security response force commensurate with the mission, enemy, troops, time, terrain, weather, and civilians in the affected area. Consider the condition of the nuclear weapon/material when assessing the feasibility or proclivity of an adversary to gain unauthorized access.

k. Protect radiological materials, weapons and components, classified materials and information, and Government property.

l. In case of further emergency responses into the NDA, develop procedures that ensure immediate access by fire and medical responders, and the coroner for processing fatalities. Ensure these procedures are provided to the Operations Section Chief so all emergency first responders understand the protocols.

m. Provide for special, independently secured areas within the security area for discussing CNWDI, Top Secret, Sensitive Compartmented Information, or other restricted information. Depending on need and frequency of use, a single area may be used. Members of DoD Special Teams operating within the NDA/NSA (i.e., AFRAT, RAMT, MRAT) require CNWDI clearances.

n. Provide special areas that are independently secured, for storing classified documents, recovered nuclear weapons, weapon components, weapon residue, and other radiological materials.

o. As required, debrief personnel with access to classified information.

p. Coordinate security actions with State and local officials.

q. Review with the PLA the deadly force provisions of the RUF to ensure that they comply with CJCSI 3150.03B (references (aj)).

r. Coordinate with the PLA to ensure that actions of military security personnel do not violate the Posse Comitatus Act (reference (ce)) while allowing for the implementation of force protection initiatives.

s. Notify the DoD IC, the Operations Section Chief, the ASHG, the Legal Element or PLA, and the FRMAC of personnel apprehended within the security area. Ensure these personnel are turned over, if appropriate, to civil authorities. Chain of custody for personal property must be maintained. Accident reports filled out by the apprehending and responding security forces should be forwarded to both the Documentation Unit of the Planning Section, as well as to the apprehending jurisdiction.

t. Coordinate with the ASHG to determine procedures for handling unprotected personnel and human remains encountered in contaminated areas within the NDA/NSA.

u. Coordinate with the Situation Unit of the Planning Section, as well as any intelligence unit of law enforcement or investigative agency within the Law Enforcement and Security Unit of the Operations Section.

v. Coordinate and advise the DoD IC and security staff on Operations Security (OPSEC) matters.

w. When appropriate, coordinate the disestablishment of the NDA/NSA with State or local governments.

3. RESOURCES

a. Department of Defense Resources.

(1) IRF. The IRF will have a security element for perimeter security, entry and exit control, and protection of classified information and property. Since sufficient personnel are not likely to be included in the IRF security elements responding to a nuclear weapon accident, supplementation may be required from civil law enforcement personnel or DoD Components as available. Security forces may expect to encounter large numbers of people attracted to the accident scene, and care should be exercised to ensure that only experienced security personnel are in supervisory positions. Installations with a nuclear weapon capability should maintain equipment to control an accident site. This requirement should include rope and stanchions for delineating the boundary of the accident site, NDA/NSA and ECP signs (bilingual when appropriate), and the hanging portable lights. The IRF should provide security personnel with anti-contamination clothing and protective masks in the event that security requires their presence within the exclusion zone. Riot control gear should be readily available but kept out of sight until needed. Security personnel shall be armed and equipped in accordance with reference (cd) requirements. Special consideration should be given to ensure personal protective gear is issued to first responders.

(2) RTF. The RTF Senior Security Representative should assess workforce requirements and ensure that sufficient additional security personnel are included in the RTF. Upon arrival of the RTF, IRF security personnel may become part of the RTF security element. The Senior Security Representative should be prepared to meet all security requirements on a 24-hour basis without degrading the alertness and capability of his or her personnel to respond. Environmental factors, general stress associated with the accident scene, time on post and post associated time, billeting and messing arrangements, and the duty schedules of other responders should be considered when determining duty schedules and manpower requirements.

b. DOE/NNSA Resources. When DOE/NNSA is the Coordinating Agency, specific requirements, outlined in section 2. and Reference (b), apply. Under DOE policy, DOE/NNSA provides a security element for perimeter security, entry and exit control, and protection of classified information and property. DoD law enforcement and civilian law enforcement may supplement DOE/NNSA security personnel, if requested and approved by the SECDEF.

c. Civilian Response. Civilian law enforcement response depends on the jurisdiction and location of the accident site. If the accident occurs off a military installation near a populated area, local police, fire, and rescue units will be notified and may be on-scene when the IRF or the DOE/NNSA IC arrives. Civilian law enforcement personnel may supplement military and/or DOE/NNSA security personnel, if requested.

4. CONCEPT OF OPERATIONS

a. Accident Assessment. Once at the accident site, the Senior Security Representative must assess the situation. This assessment includes an evaluation of ongoing emergency response operations and actions of local law enforcement agencies, and provides the foundation for the security program. While the assessment is made, security should be established at the accident site in cooperation with civil authorities. Fragmentation hazard distances and the possibility of contamination should be considered when posting initial security personnel around the scene. Once posted, this area will become the security area. This security area should not be confused with the NDA/NSA which may not yet be established and may be different in size. The Senior Security Representatives should consider the following elements in their assessment:

- (1) Threat (real and potential danger to the secure area).
- (2) Location (on or off installation). If on installation, determine the jurisdiction present. Be cognizant that many military installations have different types of jurisdiction. Confer with the PLA to determine applicable jurisdictions.
- (3) Demographics and accident environment (remote, rural, suburban, and urban).
- (4) Terrain characteristics (critical or dominating features).
- (5) Contamination (radiation intensity and extent and other HAZMATs).
- (6) Accident hazards (HEs, rocket motors, or toxic chemicals).
- (7) Local meteorological conditions (include speed and direction of prevailing winds, temperatures, precipitation, and nighttime illumination).
- (8) Transportation network in the accident area to include key avenues of approach (access routes, types, and quantities of vehicles).
- (9) Structures in the accident area (type and quantity).
- (10) Safety of security personnel (fragmentation distances, contamination, and cold and/or hot weather).

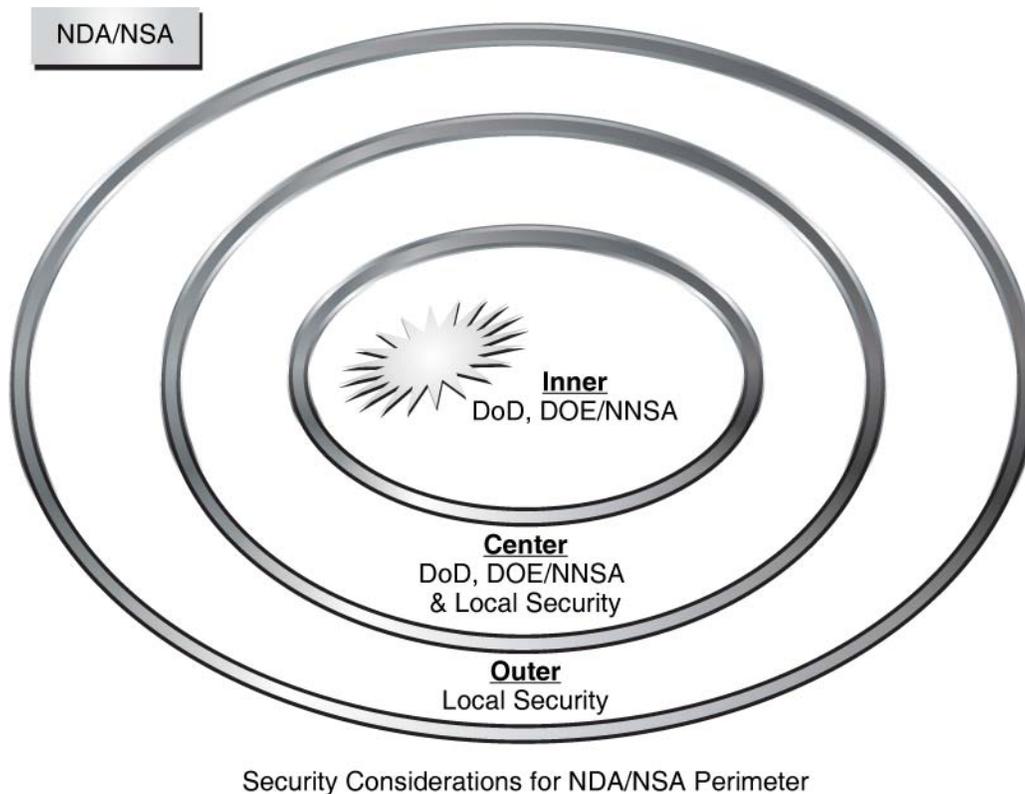
(11) Presence of casualties or fatalities.

b. NDA/NSA.

(1) An NDA/NSA may be required any time an accident involving nuclear weapons or components occurs on property where the Department of Defense or DOE does not have exclusive jurisdiction. The NDA/NSA, which usually is initially conterminous with the fragmentation zone for the pertinent weapon, should be determined after consultation with the PLA. Security of any part of the area contaminated by radiation existing outside the NDA/NSA is a matter of public safety and should be provided by civilian authorities and/or officials. However, military assistance may be requested. If requested, consult with the PLA to ensure all applicable laws are followed. To complement security for an NDA/NSA, consider the following concept: Military only, control the actual NDA/NSA perimeter. Extending out, another perimeter is staffed by military and civilian law enforcement. Out further, another perimeter is staffed by civilian law enforcement. This concept allows for two perimeters with law enforcement personnel to contain and/or control the civilian population before gaining access to the actual security area. This concept is shown in Figure 1.

(2) The Internal Security Act of 1950 (reference (cf)) provides the basis for establishing an NDA/NSA only in the United States. For a DoD-led response, reference (be) should also be consulted when establishing an NDA. For a DOE/NNSA-led response, see subsection 162(i) of the AEA of 1954 as amended (Section 2201 of reference (ba)). An NDA/NSA is established specifically to enhance the safeguarding of classified material and Government-owned property located on non-Federal land. Senior DoD or DOE/NNSA representatives may designate an NDA/NSA, and then only to safeguard Government resources, irrespective of other factors. The DoD IC should seek legal advice on any decisions about establishing, disestablishing, or modifying the NDA.

(3) The DoD IC designating the NDA (or the DOE IC designating the NSA) must ensure its boundaries are clearly defined and marked. Area boundaries are established to reduce interference with other lawful activities and uses of the property. Initially, the dimensions of the NDA/NSA may be quite large, which is necessary until more specific information is available on the location of the Government-owned material. The boundary is defined by some form of temporary barrier, for example, rope and wire. Warning signs as described in reference (be) should be posted at the entry control station and along the boundary and be visible from any direction of approach. In areas where languages other than English are spoken, bilingual signs are required.

Figure 1. Security Concept

(4) Once the NDA/NSA has been established, the DoD IC must determine whether overflight restrictions are necessary to ensure the security and safety of the area. If so, a request should be made to the Air Traffic Control Center responsible for the geographic area in which the NDA/NSA is located. The physical dimensions of the restricted area must be reasonable, while affording the security and safety the DoD IC seeks. The restrictions should be relaxed as conditions allow and removed as soon as practical.

(5) The DoD IC who establishes the NDA should advise civil authorities and/or officials of the authority and need for the NDA and the security controls in effect. If possible, the DoD IC should secure the landowners' consent and cooperation; however, getting such consent is not a prerequisite for establishing the NDA.

(6) In maintaining security of the NDA/NSA, personnel should use the minimum degree of control and force necessary, recognizing that the use of deadly force is only authorized for protecting nuclear weapons. Sentries should be briefed thoroughly and given specific instructions for dealing with civilians and the applicable RUF. All personnel should be aware of the sensitive nature of issues surrounding an accident. Moreover, controls should be implemented to ensure that public affairs policy is strictly adhered to, and that requests for interviews and queries about the accident are referred to public affairs personnel. Civilians should be treated courteously, and in a helpful but watchful manner. No one may remove anything or touch any suspicious objects. Special provisions should be made to provide unencumbered access by medical and health physics personnel in treating casualties, and handling the deceased, within the security area.

(7) Local civil authorities and/or officials should be asked to help military personnel prevent unauthorized entry and remove unauthorized personnel who enter the NDA/NSA. Civilian authorities should usually apprehend or arrest civilian personnel who violate any security requirements at the NDA/NSA. If local civil authorities are unavailable, or refuse to give assistance, on-scene military personnel should detain violators or trespassers. Civilians detained by military security personnel should be turned over to civilian law enforcement as soon as possible and such detention should be brought to the attention of the PLA. The DoD IC should be notified of each detention and the actions taken. To avoid violating those conditions of reference (cf) that may limit the use of DoD personnel in certain civilian law enforcement activities, the DoD IC should discuss with the PLA any actions that would appear to involve military personnel in law enforcement matters.

(8) When all Government resources have been located, the DoD IC will consider reducing the size of the NDA. When all classified and hazardous (if present) Government resources have been removed, the NDA will be disestablished. Early coordination with State and local officials allows an orderly transfer of responsibility to State and local agencies when reducing or disestablishing the NDA.

c. Security Procedures.

(1) Sentry posts around the NDA/NSA should be in locations that enable guards to maintain good visual contact with adjacent posts, as well as all approaches to the post, both from within and outside the NDS/NSA. This action prevents unauthorized persons from entering the NDA/NSA undetected between posts. Lighting will be provided, night vision equipment supplied, or guard spacing adjusted, to ensure that visual contact is maintained at night or in periods of reduced visibility. Each guard will have a means of summoning assistance, preferably a radio, or be in contact with someone who does. Consider getting portable intrusion detection system sensors. This type of equipment will reduce security personnel requirements and the possibility of radiation exposure to security personnel.

(2) During the initial emergency response, entry and exit of emergency units and other personnel may be largely uncontrolled. The Senior Security Representative will recognize that during initial response, necessary life-saving, fire suppression, and other emergency activities may temporarily take priority over security procedures; however, as response operations progress, standard security measures specified in DoD Directive O-5210.41, DOE Order 470.1, DOE Order 474.1A, and DOE Manual 474.1-1A (references (cg) through (cj)) must be enforced. As soon as possible, an ECP will be established. When personnel from various Federal and/or civilian authorities and/or agencies arrive at the entry control point, leaders of the groups should be escorted to the operations center. An identification and badging system will be implemented, entry control logs established, and a record of all personnel entering and exiting the accident area made and kept by the security personnel.

(3) A Joint Security Control Center (JSCC) or control point should be established as the focal point for security operations and be located close to the ECP. Its location should be fixed so that personnel become familiar with the location. Representatives of all participating law enforcement and security agencies will be at the JSCC and be able to communicate with their personnel.

(4) A security response force is required when practicable. Early in the accident response, sufficient personnel may be unavailable to form such a force.

d. Security Considerations.

(1) Some components in nuclear weapons may reveal classified information by their shape, form, or outline. Specified classified components must be protected from sight and overhead photographic surveillance.

(2) Individuals with varying degrees of knowledge and appreciation for security requirements will assist in response operations. For a DoD-led response, a comprehensive and effective information security program is available as outlined in DoD 5200.1-R (reference (ck)), and should be issued in coordination with the SEO. For a DOE/NNSA-led response, the DOE/NNSA IC should consult DOE Order 471.2A (reference (cl)). The content of the information security program will be briefed to everyone in the weapon recovery effort.

(3) CNWDI access verification may have to be waived temporarily during the initial phases of accident response. When the urgency of the initial response is over and order has been established, compliance with DoD, DOE/NNSA, and Service directives, regulations and/or instructions should prevail. For a DoD-led response, access procedures must be in compliance with DoD Directive 5210.2 (reference (cm)). For a DOE/NNSA-led response, access procedures must be in compliance with references (cg) through (cj).

(4) The two-person concept is addressed in DoD and Service directives, including reference (cn). Senior Security Representatives establish and enforce procedures to ensure only authorized personnel are granted access to the site areas that require two-person concept compliance.

(5) In the initial emergency response, reliability program (PRP/HRP) requirements may be waived due to a lack of PRP/HRP certified personnel, in accordance with DoD Directive 5210.42 and title 10, Code of Federal Regulations, Chapter 3, Part 711 (references (cn) and (co)). When certified personnel are available, they should be used in security positions that require them. Security personnel assigned to directly guard nuclear weapons and nuclear components containing Special Nuclear Material (SNM) must be PRP or HRP certified, if available. PRP/HRP personnel should be used on the perimeter, if available.

(6) An area should be available within the security perimeter where EOD and DOE/NNSA personnel may discuss CNWDI related to weapon(s) recovery operations. Also, areas shall be established for storing classified documents, recovered weapons, and weapon components. The Senior Security Representative must ensure that adequate security is provided for these areas.

(7) If a base camp is established to support the response operation, traffic control signs should be posted, law enforcement procedures developed, and a base camp ECP established. Verification of vehicle trip authorization, restriction of curiosity seekers, access to the camp, and maintaining order and discipline within the camp may be parts of base camp security functions. All activities must be accomplished in accordance with local laws. If the base camp is established in an area where the Department of Defense does not have exclusive jurisdiction,

assistance will be required from civil authorities when dealing with personnel not subject to the Uniform Code of Military Justice.

e. Intelligence. The intelligence function of the accident response operation is located with the Planning Section. However, some law enforcement agencies may respond with an intelligence capability. When present, intelligence personnel should be used to the fullest extent and incorporated actively in the overall security posture, including, but not limited to:

- (1) Advice and assistance in counterintelligence to the DoD IC and security staff.
- (2) Liaison and coordination with Federal, State, and local agencies and civilian authorities and/or officials, on threats to response operations (for example, hostile intelligence collection efforts and terrorist activities).
- (3) Coordination and advice to the DoD IC and security staff on operations security.
- (4) Investigating and reporting incidents of immediate security interest to the DoD IC and the security staff (in cooperation with the local office of the FBI).
- (5) Advise and assist the DoD IC and security staff on matters of personnel and information security necessary to maintain high standards of security.
- (6) Receiving requests for large-scale photographic coverage of the accident site.

CONTAMINATION CONTROL

1. GENERAL. Contamination control reduces the spread of contamination; therefore, rigid, established operating procedures must be followed to achieve the objective of contamination control. Procedures consist of:

a. Initial monitoring on arrival to determine the preliminary site characterization and personnel contamination.

b. Anti-contamination procedures to reduce the spread of contamination.

c. Strict Contamination Control Line (CCL) procedures to control contamination spread during response, recovery, and/or remediation operations.

d. A contamination control capability must be available on-site beginning with the IRF initial reconnaissance through to RTF final recovery operations. It is imperative to personnel safety that a Contamination Control Station (CCS) is established and operating while personnel are in the contaminated area.

2. PERSONNEL MONITORING AND DECONTAMINATION. Personnel who were potentially exposed during the accident, later cloud passage, or post-accident entry into the contaminated area should be given a high priority in response actions. People to be considered include casualties, bystanders and sightseers, military and civilian response personnel, residents, business employees, and customers in the contaminated area. Early definition of the perimeter is important so that potentially contaminated people may be identified and measures taken to prevent the contamination of additional people. Initially, the military may have the only effective radiation detection instruments at the scene and may monitor potentially contaminated civilians. Responsibility for monitoring civilians shifts to DOE, State radiation control personnel, or civilian authorities and/or representatives as they arrive on-scene with appropriate instruments. Personnel are usually monitored at a CCS; however, during the initial response when the number of radiation detection instruments and monitoring personnel is limited, alternative procedures must be devised if large numbers of people are involved. Depending on resources and requirements, the DoD IC may decide to establish more than one CCS. If sufficient resources exist to support multiple stations, processing contaminated or potentially contaminated civilian residents through a station separate from that used for response force personnel may be desirable.

a. Monitoring and Decontaminating Potentially Exposed Medical Treatment Facilities. Immediately after an accident, injured personnel may be removed for medical treatment, or fatalities may be moved to a hospital or morgue without being monitored for contamination. The potential contamination of a medical treatment facility, morgue, or ambulance might present a health problem for the staff and other patients. Therefore, judgments must be made as to whether casualties have been removed from the contaminated area and, if so, what facilities are involved. Those facilities and the transportation resources used should be notified of the potential problem. Paragraph 4.a.(1)(l) of the Medical page describes procedures a medical facility may use to control the spread of contamination. Deployment of a radiological monitoring team to check the contamination of vehicles and facilities involved, and to assist in decontamination or other

measures, as appropriate, in order to prevent the spread of contamination should be given the highest priority.

b. The Contamination Control Station

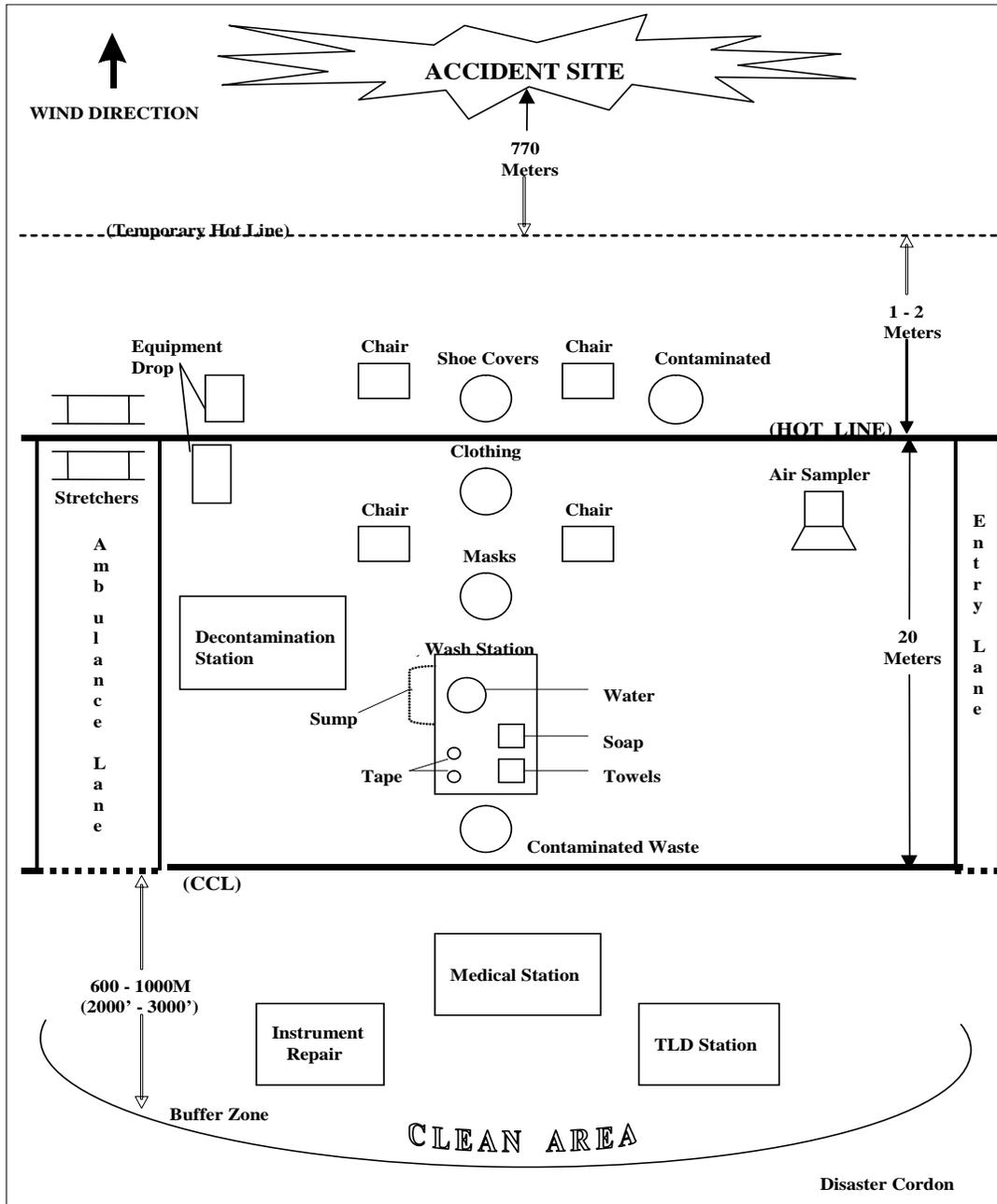
(1) The CCS is used to ensure radioactive contamination is not transferred from an area that is already contaminated to an area that is not contaminated through the orderly processing of personnel, equipment, and vehicles entering and leaving the contaminated area. The quantities of material, workforce requirements, and physical layout of the CCS discussed in this chapter are notional and are provided for information only. The actual amounts of material used and physical location of CCS elements shall depend on conditions on-scene at an actual accident.

(2) Persons present at the accident site or in known contaminated areas must be identified and screened to determine whether decontamination or other corrective action is required. Usually this action is done at a CCS. Casualties should be monitored and decontaminated to the extent injuries allow; however, urgent medical treatment has priority and exceptions may be necessary. Procedures for handling contaminated casualties are outlined on the Medical page. An example of a CCS is shown in Figure 1. When processing a large group of people, this type of station is capable of processing a person about every four minutes if no contamination is found. If equipment and monitors are available, additional lines should be established in the station to process large numbers of people. When processing people whose personal clothing is contaminated, the clothing should be bagged separately and a receipt issued for those articles kept. A priority system should be established to allow immediate processing of EOD personnel, monitoring team leaders, and others whose presence or information is needed to ease other response operations. The location of the CCS should be governed by the following constraints:

(a) It must be in an area free of contamination.

(b) Ideally, it should be directly upwind of the accident, but terrain or other considerations may dictate another location. If not upwind, it must be far enough away to prevent airborne or resuspended contamination from entering the CCS.

Figure 1. Personnel CCS (Example)



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(c) Initially, it should be outside the fragmentation zone and beyond the perimeter of the contaminated area. After all explosives have been rendered safe, the CCS may be moved closer to the accident site, if appropriate.

(d) It should be in an area relatively free of weeds, bushes, and rocks. A paved or flat compacted surface is recommended. Select an area away from drainage ditches, sewers, or similar features that might collect contamination from the CCS and distribute it throughout a wide area. If the CCS must be established near these areas, dam or dyke the entry or downstream area to prevent uncontrolled runoff or contamination spread.

c. Materials and Workforce.

(1) Where possible, video the CCS processing to help identify personnel who process through the CCS, support post-accident assessment, and for inclusion in the permanent event record. Video is particularly useful when large numbers of people are processed through the CCS by the first responders. If video capability is not available, use still photography to record CCS events.

(2) The materials listed in Table 1. are necessary to establish a CCS. Some items are expendable and need replacement over time. Suitable items may be substituted, as necessary. Frequency and volume of personnel and equipment processing should determine if additional items are needed. Use of National Stock Numbers (NSNs) when ordering shall speed the process. Add additional equipment and supplies, such as cold weather or rain gear, to enable operations under the expected local environmental conditions.

Table 1. CCS Materials List

Equipment	Quantity
Alpha particle monitoring equipment	4
Lighting for night operations	as needed
Low-level beta and/or gamma monitoring instrument	4
Dosimeters	as needed
2-inch or wider masking tape	3 rolls
NBC marking kit or substitute	1
Stools or chairs	4
55-gallon drums or equivalent for storing contaminated items	4
Plastic bags; sized to fit the barrels and/or drums used	20
Brushes	4
Whisk brooms	4
Shovels	4
Traffic cones, ropes, and stakes	as needed
Protective masks (SCBA, if available)	as needed
Personal Protective suits	as needed
Cotton gloves	as needed
Booties or foot covers	as needed
Water container; 5 gallons or larger	1

Table 1. CCS Materials List, continued

Paper towels or substitute	as required
Liquid soap; 1 gallon or more	1
Tables	5
Craft paper, butcher paper, or substitute	1 roll
Rain suits, ponchos, or substitute	as needed
Surgical masks	1 box
Organic solvents; 1 gallon or more	1
Large tent (20 or 40 men) or trailer with popup sun covers	as needed
Portable generator (as needed)	1
Portable heaters, air-conditioners, fans	as needed
Blankets	as needed
Litters	4
Non-slip plastic sheeting	1 roll
Bar Soap (Dozen) and/or Shampoo	as needed
Towels	as needed
Cotton Swabs	as needed
Bioassay Containers	as needed
Hair Brushes	as needed

(3) Each shift of the CCS must have the personnel listed in Table 2. All should be dressed in personal protective suits and masks. Volume and frequency of equipment and personnel processing shall determine if more are needed.

Table 2. CCS Personnel

Position	Function
One medical doctor	Monitor general health and treat personnel injuries.
One health physicist/bioenvironmental engineer	Monitor personnel, area, and facilities for contamination; estimates exposure and assesses effectiveness of decontamination and other contamination control measures.
One CCS supervisor	Monitor supply levels and control flow through the CCS.
One security guard	Monitor for unauthorized or unprocessed access and/or egress.
Eight assistants	Accomplish activities as directed by the CCS supervisor.
One RADIAC repair person	Repair any RADIAC equipment from the CCS.
One TLD and/or dosimeter monitor	Issue dosimetry, log out and log in personnel that go to and from site.

d. Procedures for Personnel Entering the Contaminated Area.

- (1) Don procedures:
 - (a) Don personal protective suits or coveralls.
 - (b) Using masking tape, write the individual's name and team name or function on the front and back of each suit.
 - (c) Put on shoe covers.
 - (d) Using masking tape, tape the bottom of the suit legs over the top of the shoe covers.
 - (e) Don and adjust mask; then remove.
 - (f) Ensure that all equipment has been functionally checked before donning gloves.
 - (g) Don gloves.
 - (h) Using masking tape, tape the end of sleeves over the gloves.
 - (i) Put on mask.
 - (j) Don hood and tape the bottom of the hood to the coveralls. For masks without an integral hood, tape the opening of the protective garment hood to the edge of the mask.

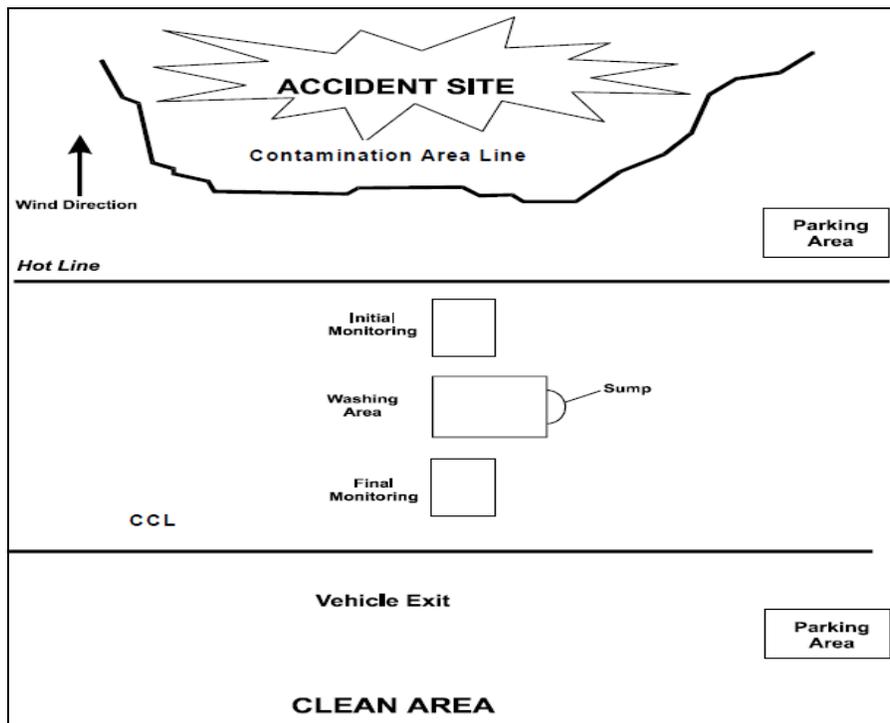
e. CCS Processing. If an accident occurs near a populated area and several hundred people are potentially contaminated, available radiation detection instruments and monitoring personnel may be inadequate to process the people fully and quickly. The assumption is that the potentially contaminated people are not response personnel. If only a few radiation detection instruments are available, use of an abbreviated monitoring procedure may be considered to speed processing. The hands, seat, and shoes or lower legs may be contaminated by handling contaminated objects or moving and sitting in contaminated areas. Contamination of the upper chest or neck and head area is indicative of exposure to airborne contamination. Contamination around the nose or mouth is an indicator of potential internal contamination. Nasal swipes should be used to follow up on individuals with positive indications of contamination around the nose and mouth. In order for a nasal swab to provide meaningful data, the sample must be collected within one hour of the termination of exposure. There is no such thing as a pre-exposure or baseline nasal swab. If radiation detection instruments are unavailable to monitor the people involved, procedures to decontaminate all people coming from the contaminated area should be used immediately. Provisions should be made to monitor them later when instruments are available. Such a procedure should require provisions to: collect and distribute receipts for clothing, shower and shampoo the people, and issue replacement clothing. Each article of clothing should be bagged separately, if possible, and all clothing placed in a single large bag for which a receipt is issued. Watches, jewelry, and the contents of pockets and pocketbooks should not be highly contaminated, if at all, and should be kept by the individual. If those items are highly contaminated they should be inventoried, bagged, and an itemized receipt issued. Although the contamination may be kept with the clothing, an overriding need exists to assure the people they

are being cared for; therefore, a gym or other facility with dressing rooms and high capacity showers may be appropriate for processing people. Soap, shampoo, towels, and stocks of replacement clothing must be obtained. People processed in this manner, and their collected clothing, should be monitored as soon as possible. Uncontaminated clothing should be returned at the earliest possible time.

3. VEHICLE MONITORING

Vehicles used by the response force in the contaminated area shall stay there for future use and not require immediate monitoring or decontamination. After the initial response, focus decontamination efforts on fire trucks and ambulances to reduce the possibility of contamination spread if these vehicles must respond to other incidents outside of the contaminated area. If members of the public in the contaminated area are sent, or go, to the CCS or other processing points using their own vehicles, the vehicle should be monitored before being moved away from the area. All outer surfaces and the air filter may have been contaminated by airborne contamination, while wheel wells, tires, and the rear end may be contaminated from driving across contaminated areas. Unless the windows were down, or ventilators open, detectable contamination of the interior is most likely on those surfaces in contact with the vehicle occupants, for example, floorboards and seats. If only external surfaces of a vehicle are contaminated, decontamination should be relatively easy to perform, if done before bonding between the contaminant and the vehicle paint occurs. Also, rapid decontamination and return of private vehicles may reassure the public that their interests and property are being considered. Monitoring and decontaminating vehicles is time consuming and may not yield a “clean” vehicle. Recommend individuals drive to multiple collection sites, park, and transfer to commuter buses for transport to CCS areas. The vehicles may be monitored, time permitting, without spreading contamination.

Figure 2. Vehicle CCS (Example)



TRAINING AND READINESS STANDARDS

1. **TRAINING STANDARDS.** Successful nuclear weapon accident or incident management relies on the maintenance of a high level of training and proficiency, as well as frequent exercising of response capabilities by all personnel involved in the operation. Comprehensive and standardized training, as well as regular exercise participation will ensure personnel operate with a common understanding and foundation. The following paragraphs outline the full spectrum of training required for all DoD personnel assigned to an RTF or assigned to a team responsible for responding to a nuclear weapon accident or incident; these personnel are hereafter referred to as “DoD components” operating under this Manual.

2. **MANDATORY FEMA INDEPENDENT STUDY (IS) WEB-BASED TRAINING COURSES (FOUND ON THE FEMA WEBSITE).** The FEMA website has multiple courses that will benefit all those having nuclear weapon accident or incident responsibilities. The following FEMA Independent Study courses are MANDATORY for all DoD components operating under this Manual.

- a. **IS 100.** Introduction to the Incident Command System.
- b. **IS 200.** ICS for Single Resources and Initial Actions Incidents.
- c. **IS 700.** National Incident Management System, an Introduction.
- d. **IS 800.B.** National Response Framework, an Introduction.

3. **SUGGESTED (OPTIONAL) FEMA IS COURSES.** The FEMA website has many courses tailored to specific aspects of emergency response operations. Nuclear weapon accident and incident response organizations are encouraged to review the course offerings and select courses they feel will be particularly suited to their specific roles; nuclear weapon accident and incident response organizations should pay particular attention to IS 3, Radiological Emergency Management and IS 301, Radiological Emergency Response.

4. **THE DEFENSE THREAT REDUCTION AGENCY COURSES.** DTRA is the DoD executive agent for nuclear weapons general interest training. DTRA is currently expanding its training efforts with the development of the Defense Threat Reduction University (DTRU). This new organization provides a one-stop single entry point for Agency Combating WMD (CbtWMD) training and education efforts, providing appropriate linkages to, and partnerships with, other Federal, State, local and tribal response organizations. The DTRU, a capabilities-based entity, offers a full-range of courseware in support of all mission areas associated with CbtWMD. The DTRU is a knowledge-based organization working toward appropriate virtual capabilities and linkages to the Joint National Training Capability (JNTC), non-DoD training and education, and academe. Executive Agency for training is expanding first into the Radiological and High-Yield Explosive arenas and DTRA will continue to strengthen its partnership with the Department of Homeland Security for Chemical, Biological, Radiological, Nuclear, or High-Yield Explosive Response Training. The planned end state is a consortium of Federal, State,

local, and international education, training, and research organizations. Current DTRA training and exercise offerings are listed in the following subparagraphs; mandatory courses are identified.

a. Defense Nuclear Weapons School (DNWS) Nuclear Weapons Incident Command and Control Courses. The DNWS conducts training specifically designed for DoD and federal personnel to address the mechanics and procedures associated with DoD response to WMD incidents. Completion of appropriate course work listed in the following subparagraphs is essential to DoD consequence management and coordination of nuclear accident or incident response.

(1) Nuclear and Radiological Incident Management (NRIM) Course (MANDATORY). A four-day resident course covering Federal, State, and local nuclear accident response roles and responsibilities, lessons learned, and key response issues. Media training and skill application exercises are included. This course (or the mobile version, Commander and Staff Radiological Accident Response (CASRAR)) is mandatory for RTF personnel.

(2) Commander and Staff Nuclear Accident Response (CASNAR) Workshop or Seminar (MANDATORY). A one-day workshop or two-day seminar is a supervisory-level mobile training course that mirrors the NRIM content. The CASNAR can be tailored to the needs of a specific audience and is mandatory for RTF personnel (unless they have attended NRIM).

(3) Joint Nuclear Explosives Ordnance Disposal Course (JNEODC) (OPTIONAL). A five-day resident course in nuclear operations with a focus on hazards and weapons stockpile safety features and safeguards. This course is specifically designed for EOD personnel. This course is optional for personnel responsible for conducting on-scene operations.

(4) Hazard Prediction and Assessment Capability (HPAC) Course Levels 1, 2, and 3 (OPTIONAL). These four-day resident courses train consequence modelers in the use of HPAC computer modeling software. These courses are optional for personnel responsible for conducting on-scene operations.

(5) Consequence Assessment Tool Set (CATS) Course Levels 1 and 2 (OPTIONAL). Three-day courses on methods to model damage and casualties from CBRN and meteorological sources. Students learn how to apply the CATS software and to integrate geographical information system (GIS) material into hazard accident models. This course is optional for personnel responsible for conducting on-scene operations.

(6) Joint DoD-DOE/NNSA Nuclear Surety Executive Course (JNSEC) (OPTIONAL). This is an executive-level program offering an overview of safety, security, and control aspects of the U.S. nuclear weapons program. JNSEC is a 1-day program conducted in the Washington DC area, and a second iteration is a 1 ½ -day version offered at the DNWS to accommodate the Weapons Display Area tour. This course is optional for personnel responsible for conducting on-scene operations.

(7) Weapons of Mass Destruction Command, Control, and Coordination (WMDC3) Course (OPTIONAL). This is a 4-day course designed for DoD and Federal agency personnel covering the procedures and mechanics involved in DoD support of WMD/CBRNE disaster response operations. The course focuses on command-level plans and constructs used when providing consequence management support to domestic CBRNE emergencies. The course

provides training on the DoD CBRNE disaster response structure and concludes with an interactive computer-based exercise. This course is optional for personnel responsible for conducting on-scene operations.

(8) Weapons of Mass Destruction Staff Support Seminar (WMDS3) (OPTIONAL). This is a 1-day course designed to instruct Combatant Commanders and their planning staff on the procedures and mechanics involved in DoD support to Federal WMD/CBRNE emergency response operations and methods to incorporate those processes into their relevant OPLANS/CONPLANS/FUNCPLANS. The course focuses on the DoD CBRNE disaster response structure, how the structure associates with the U.S. government domestic and foreign consequence management response processes, and the mechanics and units used to provide DoD support. This course is optional for personnel responsible for conducting on-scene operations.

(9) Joint EOD Improvised Radiological Dispersal Device (RDD) and Recognition Course (JEIRRC) (OPTIONAL). This five-day course, designed as a follow-course to JNEODC, focuses on RDD and IDD federal assets, capabilities, and radiography interpretation. The course includes discussion of WMD incident notification structure, passive interrogation, and device information triage procedures. This class is offered for EOD personnel only.

b. DNWS Incident Response Courses.

(1) The Defense Threat Reduction Agency RTF Commander's Course (MANDATORY). This course is available in two different forms – a full-scale two-day course and a one-day course; the differences are outlined in paragraphs 4.b.(1)(a). and 4.b.(1)(b). Both are designed to train RTF Commanders and their staffs on nuclear weapon accident management. One of these courses is required for RTF Commanders within 120 days of their assumption of command and when more than 50% of their staff has rotated since the last course. The table top nuclear weapon accident exercise (TTX) conducted during both courses meets the requirement listed in section 5. Operational level Federal, State, local, and tribal responders and supporting agencies are encouraged to attend and participate in these courses. One of the versions of this course is mandatory for personnel responsible for conducting on-scene operations.

(a) 2-Day Staff Course with TTX. This course is designed to train RTF staff members on nuclear weapon accident response and management. It delves more deeply into roles and responsibilities than the one-day course. While designed primarily for staff members, attendance and active involvement by the RTF Commander is encouraged. The TTX scenario conducted during this course meets the TTX requirements listed in section 5.

(b) 1-Day Commander/Staff Course with TTX. This course is an abbreviated version of the 2-day course and is designed to prepare RTF Commanders to execute nuclear weapon accident management activities. Although designed for commanders, RTF staff members are required to attend as well since their interaction with the RTF commander is vital to nuclear weapon accident management operations. The TTX scenario conducted during this course meets the TTX requirements listed in section 5.

(2) Civil Support Team Radiological Training Course (CST-RTC) (OPTIONAL). This is a 3- to 5-day training event covering the response elements to a radiological accident. Training is tailored to the mission requirements of National Guard Civil Support Teams. Modules can include: effects of radiation, plans and capabilities, detection equipment, surveying, and

command and control. This course is optional for personnel responsible for conducting on-scene operations.

(3) Joint Planners Course (JPC) for Combating WMD (OPTIONAL). This is a 5-day course that provides the student with a firm understanding of how to perform planning functions related to CbtWMD activities, threats, and accidents. The course is geared toward the Joint Staff, Combatant and Component Commands, Combat Support Agencies, and Service HQs. The course covers weapons elimination operations, force protection, U.S. nuclear operations, foreign and domestic consequence management, nonproliferation, counter-proliferation, and the Joint Planning and Execution System (JOPES), as they apply to WMD planners. This course is optional for personnel responsible for conducting on-scene operations.

(4) DTRA RTF Commander and Staff Refresher Course. This course is designed to serve as a refresher course for RTF Commanders and their staffs. Modeled after the DTRA Commander's Course (see paragraph 4.b.(1)), the course re-examines the basic tenets of nuclear weapon accident management operations. The course is one day in length, but can be conducted in conjunction with the yearly Command Post Exercise (CPX) or TTX (See paragraph 5.) or preparation for the required FSE (see paragraph 5.). If combined with a CPX or TTX, the course will be two-days in duration. Operational level Federal, State, local, and tribal responders are encouraged to attend and participate in this course. This course is OPTIONAL as preparation for the CPX or TTX, but MANDATORY for completion no more than 180-days prior to the FSE.

(5) Nuclear Emergency Team Operations (NETOPS) Course (OPTIONAL). A ten-day resident course providing hands-on, high-fidelity training for members of a nuclear emergency response team. Course content includes medical effects, response plans, detection equipment operation, contamination control, radiation surveys, and C2. Several high-fidelity exercises on the DNWS accident training sites are included. This course is optional for personnel responsible for conducting on-scene operations.

(6) Nuclear Emergency Team Orientation (NETOR) Course (OPTIONAL). A five-day mobile training course tailored to the needs of the requesting organization. Content and audience mirrors the RETOPS, but without the high-fidelity field exercises available in the resident course. This course is optional for personnel responsible for conducting on-scene operations.

5. MEDICAL EDUCATION. Clinical military personnel must be well versed in radiation casualty management. The following courses provide the appropriate level of post-graduate medical, nursing and health physics education for RTF and special team medical professionals.

a. Medical Effects of Ionizing Radiation (MEIR). MANDATORY for RTF and military Special Team physicians, physician assistants, nurses, health physicists and health physics technicians. OPTIONAL for medical planners, CBRN specialists, medics, corpsmen, and other military medical personnel. The MEIR course is a five day course taught by subject matter experts from the Armed Forces Radiobiology Research Institute (AFRRI). The course focuses on radiation injury signs/symptoms, treatment, patient decontamination, nuclear weapon effects on humans, radiobiology, bioassay and health physics.

b. REAC/TS Radiation Emergency Medicine. MANDATORY for RAMT and MRAT physicians, PAs and nurses. OPTIONAL for other military medical personnel. This 3 1/2-day

course is intended for physicians, nurses, and physicians' assistants who may be called upon to provide emergency medical service in the event of a radiation emergency.

c. REAC/TS Advanced Radiation Medicine. MANDATORY for RAMT and MRAT physicians, PAs and nurses. OPTIONAL for other military medical personnel. This 4 1/2-day course, designed primarily for physicians, PAs and nurses presents an advanced level of information on the diagnosis and treatment of a wide range of ionizing radiation injuries and illnesses.

d. REAC/TS Health Physics in Radiation Emergencies. MANDATORY for RAMT and MRAT physicists. OPTIONAL for other military medical personnel. This 4 1/2-day course is designed primarily for health physicists, medical physicists, radiation safety officers, and others who have radiation dose assessment and/or radiological control responsibilities.

6. ADDITIONAL COURSES.

a. National Guard JTF State Commanders Course. This O-6 to O-8 level course is presented by USNORTHCOM and provides extensive JTF leadership training for RTF Commanders and their staffs in the areas of capability assessment, the NRF and NIMS organizational structures, and practical exercises that utilize each day's lecture materials.

7. EXERCISES.

In addition to the training requirements listed in paragraphs 2. through 4., each RTF will participate in one exercise per year. The annual exercise will be part of a triennial rotation, where one year the RTF will participate in a TTX, then a CPX the second year, followed by a Full Scale Exercise (FSE) the third year (e.g., FY 1 – TTX; FY 2 – CPX; FY 3 – FSE; FY 4 – TTX; etc.).

a. High Demand/Low Density Assets. Several DoD components participating in nuclear weapon accident response frequently perform like-duties during non-nuclear weapon accident exercises or real world events. With the approval of the Combatant Commands (NORTHCOM, EUCOM, and PACOM), these components may petition the NWAIRS for "credit" for the requirements listed in this Manual based upon participation in other non-nuclear weapon incident exercises or real world events.

b. In addition to these exercise requirements, Combatant Commands and the Services may require additional exercises. The After Action Reports for these exercises will be forwarded to the NWAIRS and the executive agent of this Manual to facilitate the required reviews outlined in section 5 of DoD 3150.08-M.

c. National Exercise Program. Nuclear weapon accident or incident exercises are a part of the National Exercise Program; further, the NSPD-28 Committee of Principles has mandated the execution of one national-level nuclear weapon accident exercise each year as part of the DoD five-year nuclear weapon accident, incident, and other nuclear radiological incident exercise program (NUWAIX). This exercise will involve one RTF to ensure each of the five RTFs participate in one national level exercise once every five years. This national-level exercise will fulfill the requirements for a FSE set forth in paragraph 7.

8. READINESS.

RTFs and other DoD components tasked by this DoD 3150.08-M will be considered mission ready for training once they have met the requirements outlined in this page. Additionally, each Combatant Command may require the Services to undergo additional training and report readiness. These standards will be relayed by the Combatant Commands and the Services to the RTFs, as well as to the NWAIRS, for inclusion in future editions of DoD 3150.08-M.

a. Readiness Reporting. Readiness status of RTFs will be reported to the appropriate Combatant Commands IAW standard reporting protocols using the DOTMLPF construct.

9. CONFERENCES. In addition to the training and exercise requirements listed in this chapter, RTF Commanders, SEOs, and potential Senior Officials (SOs) should meet on a regular basis to discuss current events and issues related to nuclear weapon accident response, lessons learned from Combatant Command exercises, and any other topics to aid in effective, efficient, and cohesive nuclear weapon accident response.

a. DTRA 1-day SO, SEO, and RTF Conference. This conference is to be completed at least annually. The primary focus of the conference is to provide one mechanism for achieving nuclear weapon incident response and management standards, facilitate interagency communications, and ensure a cohesive, effective, and efficient nuclear weapon accident response with NORTHCOM, PACOM, EUCOM, DOE and other key Military and Federal agencies.



DoD 3150.08-M
"Nuclear Weapon Accident Response Procedures"
(NARP)

INTERNET SUPPLEMENT



RADIATION DATA



RADIOLOGICAL MONITORING EQUIPMENT

Tables 1. through 5., below, show instruments and instrument sets.

Table 1. Alpha Survey Instruments

Alpha Survey Instruments				
Instrument	Type	Scale	Indicator	Description
AN/PDR-56	Scintillation	0 to 1000K, 4 ranges	CPM/100cm ²	Small auxiliary probe provided for monitoring irregular objects. Mylar® probe face is very fragile; a puncture disables the instrument. Accompanying X-ray probe is calibrated for 17 kilo electron volt (keV) with associated meter scale from 0 to 10/m ² in four ranges.
AN/PDR-77	Scintillation	0 to 999K CPM Digital Auto Ranging	123cm ²	See the instrument sets in table AP7.T3.
ADM-300 (with alpha probe AP-100A)	Scintillation	0 to 1.2M CPM	CPM; microcuries per meter squared ($\mu\text{Ci}/\text{m}^2$); dintegrations per minute (DPM) per 123 cm ²	Portable alpha probe with three units of alpha measurement possible. High-range.
PRM-5	Scintillation	0 to 500K, 4 ranges	CPM	Portable, high- and low-range instrument for detecting plutonium contamination by measuring associated X rays and low-energy gamma radiation. Effective in inclement weather and much less subject to damage during field use.
Ludlum Model 3 (See table AP7.T2., below)	Scintillation	0 to 400K	CPM	Portable, high- and low-range instrument. Similar in operation and function to the AN/PDR-60.
Ludlum Model 2220	Scintillation	0 to 500K, 4 ranges	CPM	Liquid crystal display and integral digital readout.

Table 2. Beta and Gamma Survey Instruments

Beta and Gamma Survey Instruments				
Instrument	Type	Scale	Indicator	Description
AN/VDR-2	GM	Digital Auto Ranging 0 to 9.99Gy/hr	Gy/hr	Portable beta and/or gamma survey instrument. Displays total accumulated dose or dose rate. (Replaces the AN/PDR-27 for Army applications.)
AN/PDQ-1	GM	1 Milliroentgen(mR) /h to 1000R/hr	R/hr	Uses ancillary probes; Detecting Head (DT)-680 for gamma/beta, DT-685 for beta probe interface, DT-681 for alpha, DT-682 for X ray, DT-683 for Neutron Indicator, DT-684 for Neutron, DT-686 for Radiography.
AN/PDQ-2	GM	1 mR/hr to 1000 R/hr	R/hr	Uses ancillary probes; DT-680 for gamma/beta, DT-685 for beta probe interface, DT-681 for alpha, DT-682 for X ray, DT-683 for Neutron Indicator, DT-684 for Neutron, DT-686 for Radiography.
AN/PDR – 78	Photo Multiplier	30 keV to 1.6 million electron volts (MeV)	Detector only. Uses an indicator light.	For underwater use to 300 feet.
Ludlum Model 3 (See table AP4.T1.)	GM	0 to 200 mR/hr	mR/hr	Portable high- and low-range analyzer similar to AN/PDR-60. Probe 44-6 uses a GM tube to detect beta and gamma. Probe 44-9 detects low-energy gamma, 0 to 200 mR/hr. Both the 44-9 and 44-6 are sensitive to photon and medium & high energy - particle radiations. The 44-9 has an active area of 15.5 cm ² and is sensitive to low-energy -and -particles because the entrance window is sufficiently thin, i.e. 1.7±0.3 mg/cm ² .
AN/PDR-27	GM	0 to 500; 4 ranges	mR/hr	Low-range; suitable for personnel monitoring for beta and/or gamma emitters only. Not useful for alpha emissions. May saturate and read 0 in high radiation fields above 1,000 R/hr.
AN/PDR-43	GM	0 to 500; 3 ranges	R/hr	High-range; does not saturate in high radiation area. Readings in gamma fields other than Co-60 may be inaccurate to greater than 20 percent.
Army, Navy/General Utility, RADIAC, Passive Detecting-13	1 GM tube. Pin Diode / Prompt Gammas	.01-999 1 – 999	cGy/hr	As a rate meter, it measures residual gamma radiation. As a tactical dosimeter, it measures prompt radiation and residual dose.

Table 2. Beta and Gamma Survey Instruments, continued

ADM-300A	GM	Gamma: 10 to 10,000	μ R/hr R/hr	Portable beta and/or gamma survey instrument (with beta probe-100 or beta gamma probe (BGP)-100). Built in beta gamma detection and monitoring capability without additional probes. High-range. BGP-100 may be up to 300 feet from the ADM-300. Saturation level of 100,000 R/hr.
		Beta: 10 to 5	μ R/hr R/hr	

Table 3. Instrument Sets

Instrument Sets	
Instrument	Description
AN/PDR-77 RADIAC Set	The AN/PDR-77 shall accept a maximum of eight different probes. Each probe is automatically recognized and has unique calibration information stored in non-volatile memory. The AN/PDR-77 comes with three probes. A 123cm ² Zinc Sulfide (ZnS) alpha probe, a two Geiger tube beta and/or gamma probe, and a 5-inch Sodium Iodide (NaI) low-energy X ray probe able to measure and find surface contamination levels of Plutonium and Americium (Am)-241 in μ Ci/m ² . An accessory kit is available that contains a GM pancake probe and a 1" x 1.5" NaI micro-R probe.
Violinist III - FIDLER Instrument Set	Includes the FIDLER, high-voltage power supply, pre-amplifier, and the Violinist III. The Violinist III consists of a battery operated 256-channel analyzer and a pre-programmed microprocessor. When calibrated appropriately, it measures and determines surface contamination levels of Plutonium and Am-241 in μ Ci/m ² .
Ranger	Includes the FIDLER (Field Instrument for the Detection of Low-Energy Radiation), a positioning determining system (GPS) , and a hand-held data collection platform (4096 MCA and PDA). The FIDLER is specifically designed to detect the low-energy (17- and 60- keV) photons associated with plutonium and americium. The system can be used as a stand-alone data collection unit (storing data on internal compact-flash cards) or as a system consisting of a base station and mobile field units. The mobile units send FIDLER radiation data along with the positional data to the base station for subsequent graphical display. The surface radiation ground deposition values are displayed in near real time. Ranging is typically limited to near line of sight, roughly about 5 miles, but dense vegetation, buildings, and hills can affect the signal. The current system can also use various other low-resolution gamma detectors coupled to the MCA unit allowing for identification and determination of surface contamination from numerous radionuclides.
Berkeley Nucleonic Corp SAM-935	The SAM-935, as equipped for AF units, have an external 2 x 2 NaI(Tl) detector with a multi-channel analyzer capable of isotope identification based on discrete energy photon emissions.

Table 4. Tritium Survey Instruments

Tritium Survey Instruments			
Instrument	Scale	Indicator	Description
T-446	0 to 10	Microcuries per cubic meter ($\mu\text{Ci}/\text{m}^3$)	Portable, automatic scale switching, trickle charger for Nickel Cadmium F-sized cells. With adapter kit, has urinalysis capability with 5-minute response. Filters particulate to .3 microns; not sensitive to smoke and paint fumes.
AN/PDR-73	0 to 10K; four ranges	$\mu\text{Ci}/\text{m}^3$	Portable air monitor comprising radiacmeter Intensity Measuring (IM)-245/Portable Detector Radiation, designed to detect gaseous radioactive contamination in the ambient air. The instrument is capable of continuous air sampling and is calibrated to read directly the level of tritium. Powered by twelve internal rechargeable "C" cell batteries or by 115 Alternating Current Volt, 60 Hz when in continuous use.
AN/PDR-74	0 to 100K; three ranges	$\mu\text{Ci}/\text{m}^3$	The portable RADIAC set contains an IM-246 air monitor to detect gases. Calibrated in terms of tritium activity but may be used to monitor other radio gases. Powered by "D" cell batteries. Alarm sounds at preset meter reading.

Table 5. Dosimeters

Dosimeters	
Instrument	Capability and Limitations
Self-Reading Ionization Chamber Dosimeter	Reusable device for measuring exposure to X rays and gamma radiation. May provide false positive readings due to charge leakage and sensitivity to mechanical shock.
Non-Self-Reading Ionization Chamber Dosimeter	Reusable device for measuring exposure to X rays and gamma radiation. May provide false positive readings due to charge leakage and sensitivity to mechanical shock. Requires separate reading device.
Film Badge	Provides measurement and permanent record of beta and gamma doses over a wide dosage range. Special neutron films are available. 10 percent dose accuracy depending on quality control (QC) during development. Sensitive to light, humidity, aging, and exposure to X rays. Delay between exposure and dose reading due to processing time.
Thermo-Luminescent Dosimeter (TLD)	Measures gamma radiation dose equivalents up to 10,000 rem. Accurate to within a factor of two when the energy of the neutrons is unknown. After long periods of exposure, damaged or bent cards delay processing, static electric discharge causes spurious readings, and temperatures greater than 115°F reduce sensitivity. Delay between exposure and dose reading due to central processing of TLDs.
Electronic Personal Dosimeter	Detects and measures gamma, beta, and X-ray radiation. Most have an audible alarm as well as a digital readout. There are many models available on the market. Specifications vary from system to system.

SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

1. GENERAL

a. This appendix provides information on service radiation monitoring teams (health physics, bioassay specialists, and a radiation equipment repair team) and on the DOE/NNSA and related monitoring and assessment capabilities.

b. The methods of detecting and/or measuring of different types of radiation and their inherent difficulties have been listed; however, in the event of an accident, radiation must be detected and/or measured. The need of preliminary data on the absence and/or presence of radiation for the DoD IC is imperative. Many military units and some civilian firms and/or agencies have alpha and gamma detection capabilities. These units and/or firms have equipment and individual monitoring capabilities that may provide radiation measurements and preliminary survey data; however, a finite definition of the accident area is needed to plan, initiate, and complete SR.

c. The radiological characterization of the accident site is an iterative process involving the systematic integration of data produced by several assessment techniques. Section 2 describes those resources available to enable theoretical, preliminary, and definitive site characterization for the DoD IC.

d. The radiological assessment of accident victims, bystanders, patients and response personnel operating in contaminated areas requires definitive results. Interpretation of radiological patient data and recommending treatments, as well as, interpretation of site data and recommending protective actions requires subject matter expertise. Next to rendering the weapon safe, taking care of the people is likely the DoD IC's prime concern. Sections 2.c and 2.d describe the capabilities of the military medical Special Teams.

2. THE DEPARTMENT OF DEFENSE

a. DTRA HPAC. HPAC is a forward deployable and/or reachback modeling capability available for Government, Government-related, or academic use. This software tool assists in emergency response to hazardous agent releases. Its fast running, physics-based algorithms enable users to model and predict hazard areas and human collateral effects in minutes. HPAC provides the capability to accurately predict the effects of HAZMAT releases into the atmosphere and their impact on civilian and military populations. Subparagraphs 2.a.(1) through 2.a.(5) provide information on HPAC modeling prediction shown in Figures 1 and 2.

(1) HPAC software uses integrated source terms, high-resolution weather forecasts, and particulate transport to model hazard areas produced by accidents. One of HPAC's strengths is fast access to real-time weather data through Meteorological Data Servers (MDS). HPAC also has embedded climatology or historical weather data for use when real weather data is not available.

Figure 1. HPAC Modeling Prediction: Surface Dose

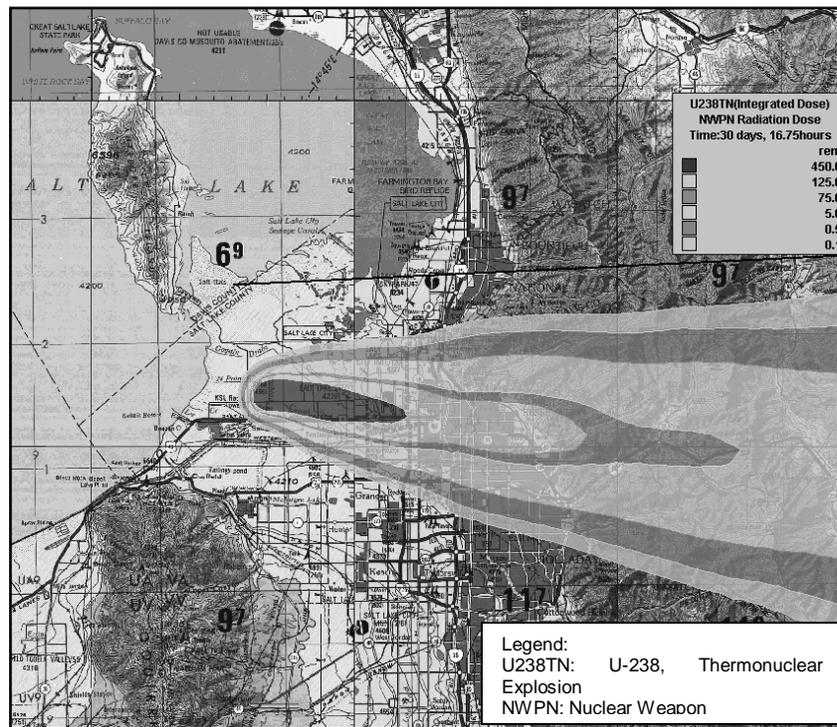
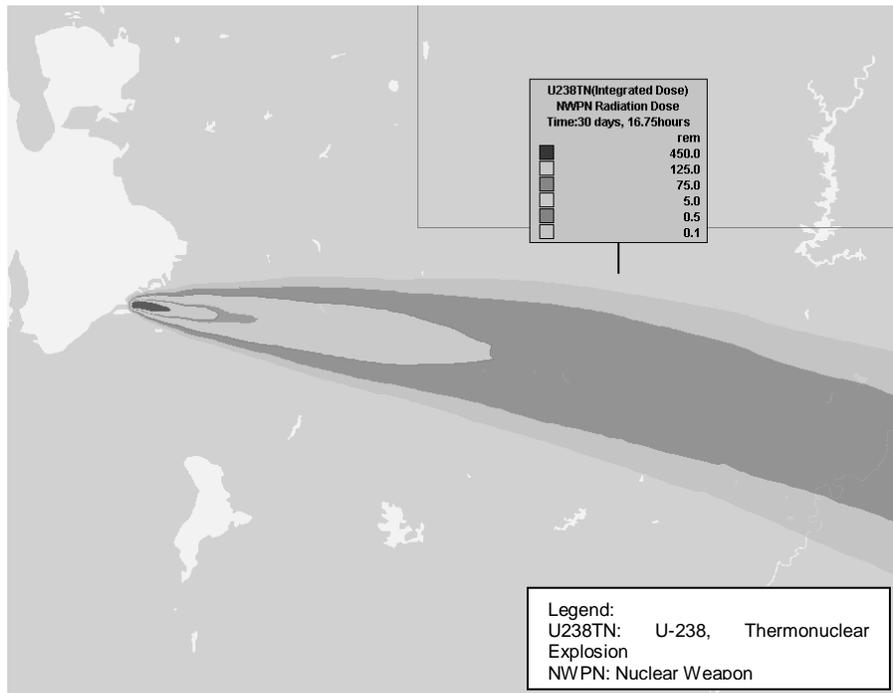


Figure 2. HPAC Modeling Prediction: Hazards Area Effects

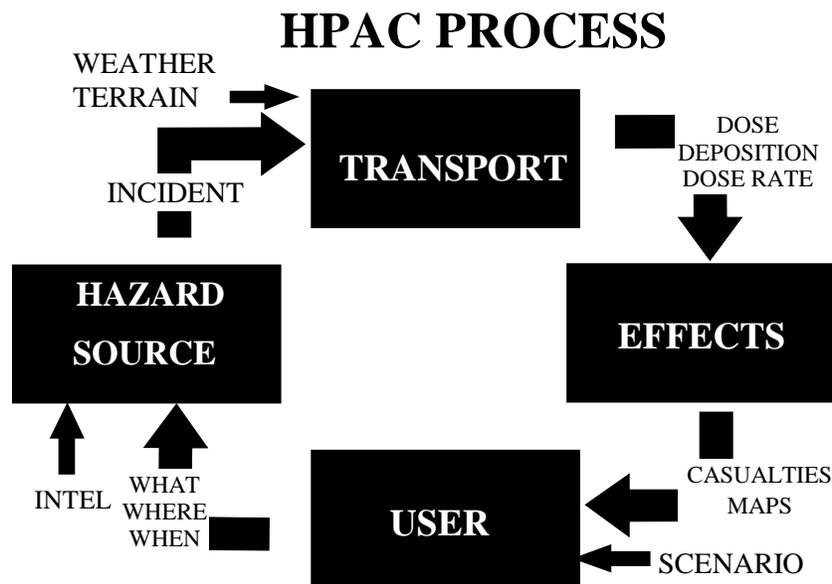


(2) HPAC models nuclear collateral effects of concern that may result from military or industrial accidents. HPAC provides source information on potential radioactive releases from nuclear weapons or reactor accidents.

(3) HPAC includes the SCIPUFF model for turbulent transport, a new and advanced technology that provides a highly efficient and accurate prediction for a wide range of hazard scenarios. HPAC may also help answer the question, "How good is the prediction?" by providing probabilistic solutions to the atmospheric transport problem. HPAC builds source terms for hazardous releases for input to the atmospheric transport model, SCIPUFF. The current code hosts operator-friendly "incident" setup capability. Sample HPAC projects are provided that may be edited to suit a wide range of user requirements or accidents. Additional improvements in the software are planned, but user feedback shall ensure that these improvements include a user's perspective, not just a scientist's.

(4) The HPAC Process. The overall process starts first with the need to assess a hazard, then the statement of the problem in detail, followed by the definition of the hazardous event or source in HPAC. Meteorological data must be available. Then the SCIPUFF code transports the hazardous cloud (or "puffs") in the turbulent atmosphere. Effects of the HAZMAT at geographical locations are computed, and the results are provided to the user on a map or as a cross-section of the atmosphere. The overall process is summarized in Figure 3. The wide arrows indicate the major steps in the HPAC process. The narrow arrows indicate critical inputs to the process. The weather, terrain, and hazard particle size mainly determine where a HAZMAT goes. The accuracy of the effects of the hazard depends on such details, as well as the detailed knowledge of the hazard itself.

Figure 3. HPAC Process



(5) Weather and Terrain. Weather is a key ingredient to the HPAC process. Although the SCIPUFF is an accurate and efficient transport model, the results of a hazardous release are first and foremost affected by weather and how well the meteorology is defined. There are two types of inputs: observations and gridded numerical model data. Meteorological data are time

sensitive. To keep the level of understanding required to use HPAC and logistics to a minimum, the simpler meteorological inputs to the SCIPUFF (surface and upper air observations) are presented here. More advanced and accurate capabilities, such as very high resolution mesoscale weather models, are available on DTRA's MDS.

(a) In general, meteorological observations are very representative of the real world at the time and location where the data are taken. Assuming the weather does not change, reasonable results may be obtained for a period of two to four hours after the surface observations are taken. Upper air observations may be representative of a somewhat longer period of time. Observations at more locations, over a longer time period, are needed to accurately assess longer duration, longer range, and more lethal releases.

(b) Forecasts and/or updated observations are needed for longer duration releases, but gridded forecast data are sometimes difficult to get and often are not accurate for transport applications. A single set of meteorological observations becomes less representative with distance from the observation site, with time from which the data are taken, around complex terrain, near sunrise and sunset, near weather fronts, near urban areas, and near land and/or water interfaces.

(c) Fast access to weather data for HPAC users became highly advanced with the introduction of the DTRA MDS. Getting weather data is as easy as a click on a mouse with the HPAC's weather request generator, which provides access to forecast model and observation data in minutes.

(d) Terrain may have a large effect on where a HAZMAT is transported. In addition to working with a variety of weather data types, HPAC works with two types of terrain data. By default, HPAC assumes a flat earth for the terrain, and this may be a reasonable approximation for small spatial domains; however, users may choose to use complex, 3-D terrain data describing the topographic variations. When the complex terrain option is used, it automatically invokes a mass consistent wind and turbulence model that is embedded within HPAC. The digital terrain data files in HPAC were developed using Digital Terrain Elevation Data Level 0, a product of the National Imagery and Mapping Agency. HPAC terrain models include an urban setting to closely approximate the effects of high-rise buildings.

b. Air Force Institute for Operational Health (AFIOH). The AFIOH, Brooks-City Base, TX, provides the following radiation protection services:

(1) Conducts calibration, traceable to the National Institute of Standards and Technology, and minor repair services for portable instruments used and owned by the USAF Medical Service for detecting and measuring electromagnetic and ionizing radiation.

(2) Maintains the USAF stock of low-energy photon field survey instruments with trained operators to support disaster operations.

(3) Deploys a field-qualified team of health physicists, health physics technicians, and equipment called the AFRAT. This team is capable of responding worldwide to radiation accidents with air transportable equipment for detecting, identifying, and quantifying any type of radiation hazard; radioisotope analysis of selected environmental, biological, and manufactured materials; and on-site equipment maintenance and calibration.

(4) Conducts special projects dealing with long- and short-term evaluations of radiation exposures.

(5) Requests for additional information should be directed to AFIOH personnel. AFIOH services may be requested through the appropriate chain of command, i.e. the Combatant Command Operations Center.

c. U.S. Army. The Army maintains the primary DoD medical response nuclear team called the Radiological Advisory Medical Team (RAMT). The RAMT is based at Walter Reed Army Medical Center (WRAMC) in Washington, D.C. A mini-RAMT is also located in Landstuhl, Germany. The RAMT is a well-trained, well-equipped, robust team of physicians, health physicists and health physics technicians that provide both advice and assistance. The RAMT is a rapid response asset with a 2 hour assemble time and 4 hour departure time once notified. Radiological capabilities include patient monitoring and decontamination (20 litter patients per hour or 200 ambulatory patients per hour), bioassay program assistance and oversight, lung counting, gamma spectrometry, personnel portal monitor screening, dose assessment, alpha/beta/gamma/x-ray/neutron detection, exposure rate measurement, contamination and exposure limits guidance, protective action recommendations, and reoccupation guidance. The RAMT is CNWDI cleared, usually falls under the ASHG and can provide limited medical support during weapon recovery operations within the NDA.

d. Armed Forces Radiobiology Research Institute (AFRRI). The AFRRI maintains the Medical Radiobiology Advisory Team (MRAT) and a DoD-unique reach-back capability to perform gold-standard cytogenic (i.e., chromosome aberration) analysis of blood sample for dose assessment. The MRAT can deploy within 24 hours of notification. The MRAT consists of senior radiation medicine physicians and health physicists with subject matter expertise to provide timely advice to the DoD IC and interpret human data, modeling data and site data. The MRAT is typically configured with one physician and one physicist for deployment as augmentees to the DTRA CMAT. Radiological capabilities include interpreting models and measured data for assessment of radiological hazards, advice on patient treatments and protective actions for responders and the public. The MRAT is CNWDI cleared for split operations in the NDA and at the JOC.

3. THE DEPARTMENT OF ENERGY. Services of the DOE/NNSA capabilities shall be requested by the DOE SEO.

a. Hotspot Health Physics Codes.

(1) The LLNL developed the Hotspot Health Physics Codes for the DOE ARG to provide emergency response personnel and emergency planners with a fast, field-portable set of software tools for evaluating accidents involving radioactive material. The software is also used for safety-analysis of facilities handling nuclear material.

(2) Hotspot codes are a first-order approximation of the radiation effects associated with the atmospheric release of radioactive materials. The Hotspot atmospheric dispersion models are designed to determine close-in effects for short-term releases (up to a few hours) during steady wind conditions over flat terrain. Users requiring more detailed consequence assessments for

complex or large releases, or for releases over longer times, such as during conditions with spatial and temporal varying meteorology, or for flows affected by terrain effects, etc., are directed to more sophisticated modeling capabilities as DOE's NARAC. The Hotspot codes have been completely revised to take advantage of the WindowsTM 95/98/00/XP/NT operating system environment.

(3) Four general programs, Plume, Explosion, Fire, and Resuspension, estimate the downwind radiological impact after the release of radioactive material resulting from a continuous or puff release, explosive release, fuel fire, or an area contamination event. Additional programs deal specifically with the release of plutonium, uranium, and tritium to hasten an initial assessment of accidents involving nuclear weapons.

(4) The FIDLER program is a tool for calibrating radiation survey instruments for ground-survey measurements and initial screening of personnel for possible plutonium uptake in the lung.

(5) The Nuclear Explosion program estimates the effects of a surface-burst nuclear weapon. These include prompt effects (neutron and gamma, blast, and thermal), and fallout information. Fallout includes arrival time, dose rate at arrival time, and integrated dose contours for several time periods e.g., first six hours, first day, first week, etc.

(6) Hotspot is a hybrid of the well-established Gaussian plume model, widely used for initial emergency assessment or safety-analysis planning. Virtual source terms are used to model the initial atmospheric distribution of source material after an explosion, fire, resuspension, or user-input geometry.

(7) Hotspot incorporates both reference (ct) and the Federal Guidance Report No.13 (reference (cu)) DCFs for inhalation, submersion, and ground shine. In addition to the inhalation 50-year CEDE DCFs, acute (24-hour) DCFs are available for estimating non-stochastic effects. This acute mode may be used to estimate the immediate radiological impact associated with high acute radiation doses (applicable target organs are the lung, small intestine wall, and red bone marrow). Individual target organ doses are optionally output by Hotspot. Hotspot supports both classic units (rem, rad, Ci) and International System units (Sv, Gy, Bq). Users may add radionuclides and custom mixtures (up to 50 radionuclides per mixture).

(8) Tables and graphical output may be directed to the computer screen, printer, or a disk file. The graphical output consists of dose and ground contamination as a function of plume centerline downwind distance (see Figure 4), and radiation dose and ground contamination contours (see Figure 5). Users have the option of displaying scenario text on the plots.

Figure 4. Hotspot Downwind Plume Centerline (Stability A-F)

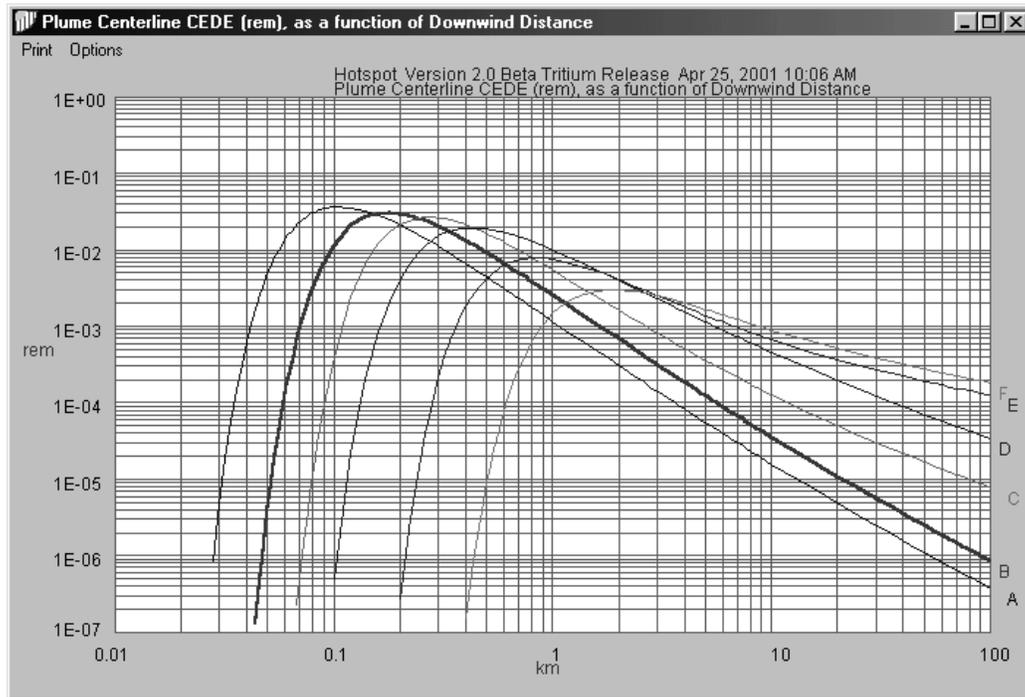
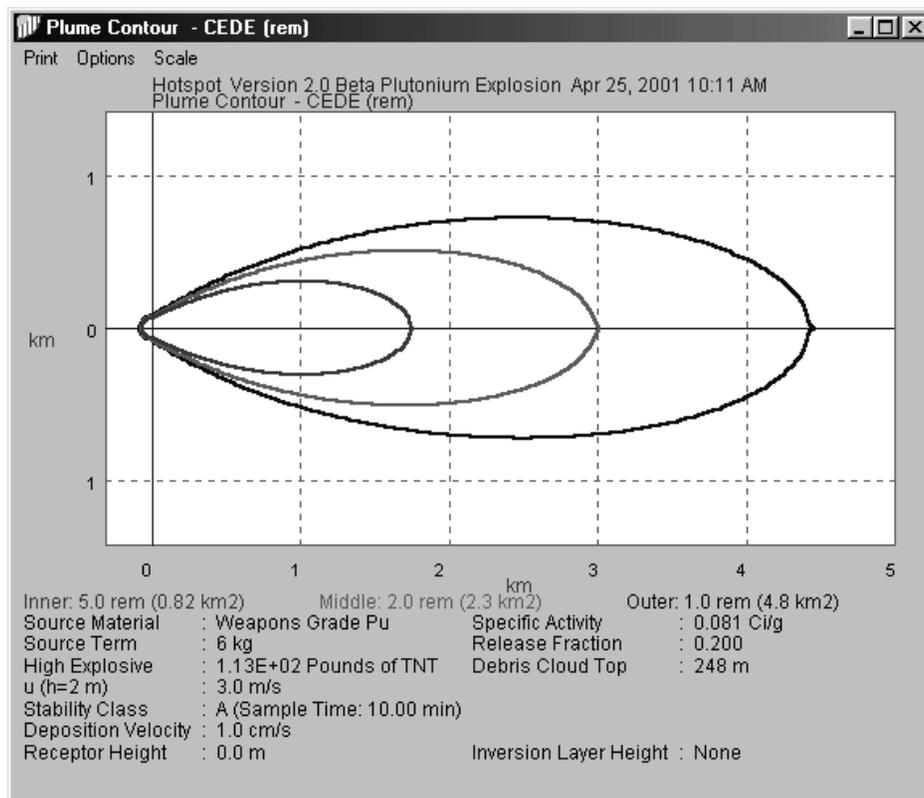
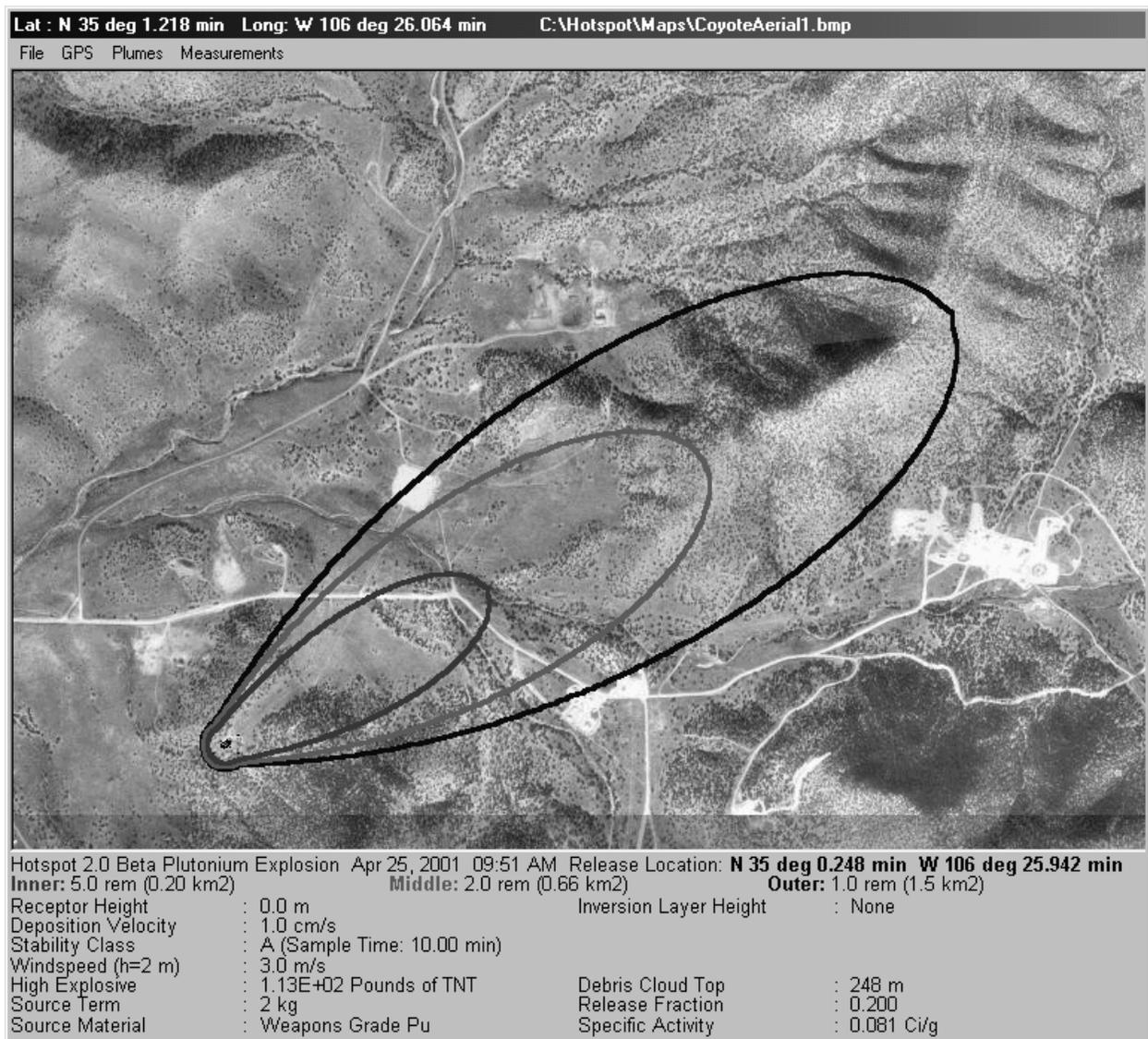


Figure 5. Hotspot Plume Contour Plot



(9) Radiation dose and ground contamination contours may also be saved as mapping files for display on geographical maps. Latitude and Longitude, Universal Transverse Mercator, and Military Grid Reference System geographical coordinate systems are supported for interfacing Hotspot dispersion contours with commercial mapping systems. Dose and Deposition plume contours may also be overlaid on geographical maps (see Figure 6).

Figure 6. Hotspot Plume Contours Displayed on Aerial Photograph



(10) Image files (bitmap format) may easily be georegistered and added to a user's map library. GPS units may be used to generate real-time instrument response for exercise support. Users may add additional instruments as desired. Hotspot has an on-board selection of plutonium-detecting instruments (FIDLER, Violinist, alpha probes, etc.) that may interact with the GPS unit and/or map. Users may select an instrument and emulate the instrument's response to the current atmospheric concentration and ground contamination. The current GPS location

(Latitude, Longitude, Altitude) or mouse location is used for determining the applicable output values (see Figure 7).

Figure 7. Virtual FIDLER Detector for Exercise Support



(11) Hotspot strictly follows the well-established Gaussian model, and does not use any “black-box” techniques. All algorithms are presented and referenced in the onboard documentation.

b. Atmospheric Release Advisory Capability (ARAC). ARAC is a DOE/NNSA and DoD resource, directed by the LLNL, that supports emergency response teams during accidents involving radioactive materials.

(1) ARAC provides the user with computer model estimates of the contamination distribution resulting from a nuclear weapon accident. ARAC products include computer-generated estimates of the location and contamination levels of deposited radiological material and radiation dosage to the exposed population in the surrounding areas. Until time and equipment allow completion of extensive radiation surveys and bioassays, ARAC projections

shall help assess the potential impact of an accident and identify areas for initial investigation by response force radiological teams.

(2) In the event of a nuclear weapon accident, at or near an ARAC-serviced facility, the ARAC Center shall be alerted by the facility's personnel using the ARAC site system computer located at the installation, immediately after the initial report to the NMCC is completed. If the accident occurred in a CONUS area, remote from an ARAC-serviced DoD installation, the NMCC's JNAIRT shall notify ARAC; however, ARAC may be contacted directly by the installation initiating the OPREP-3 by calling the ARAC's emergency number: commercial (925) 422-9100.

(3) During normal working hours (currently 0730 to 1615 Pacific Time), initial estimates of the extent of contamination may be ready for transmission from ARAC about 30 minutes after ARAC has been notified of the:

- (a) Accident location.
- (b) Time of accident.
- (c) Type and quantity of weapons involved in the accident.

(4) Responses outside the hours listed above are subject to an additional 60- to 90-minute delay.

(5) Every effort should be made to provide updated or supplementary information to the ARAC Center as soon as it is available. Desired information includes:

(a) Observed wind speed and wind direction during the accident and later weather changes.

(b) Description of accident particulars, including line numbers for the specific weapon(s) releasing contamination, type and amount of fuel involved (ARAC has typical values for DoD aircraft and other transport vehicles), and measured contamination at specific locations with respect to the contamination source, if available.

(c) Specific details of accident fire or explosion, such as mechanism of the release (HE detonation or fire), duration of any fire, and height and size of the plume or cloud (if available from reliable observers).

(6) About 30 minutes after the ARAC facility has been notified of the necessary accident information, a computer-generated estimate of maximum credible ground-level contamination spread and projected whole-body effective dose to exposed persons in the downwind area shall be available. Conservative assumptions are made in computing the amount of radiological material released so that these initial projections place an upper bound on levels of resulting contamination and dose. Weapons at risk, when exposed to unusual stress during the accident, may undergo a non-nuclear HE detonation. It is assumed that all the nuclear material at risk shall be released in an aerosolized form. Similar conservative assumptions are made where specific accident information is missing or unknown. If the accident location is not close to an ARAC-serviced CONUS site, the initial projections are not likely to include geographic features (roads, city boundaries, etc.). ARAC-projected doses shall help initial response efforts evaluate the potential

hazard to the general public until comprehensive radiation measurements and bioassays may be performed. Projected deposition patterns shall assist estimates of SR efforts.

(7) About 60 to 90 minutes after notification of ARAC, a more refined projection shall be available if somewhat less conservative assumptions are made in estimating the actual amount of material at risk released during the accident. (Estimates are now based on only those weapons known to have undergone an HE detonation or to have been consumed in a fire.) For consequence analyses, ARAC may generate a computation based on a meteorological forecast to give projected contamination patterns in case of dispersal during a weapon safing operation. Although the initial projections are shown typically on a 30 by 30-kilometer grid, these refined projections may cover either a larger or smaller area depending on the downwind extent of the contamination. Note that ARAC may generate projection plots to match a given map scale (for example, 1:50,000) for ease of overlaying the projected deposition pattern.

(8) When available, ARAC projections may be sent to the ARAC site system computer located at most ARAC-serviced sites. If the site does not have a site system computer, the projections may be telefaxed. Subparagraphs 3.b.(8)(a) through 3.b.(9)(c) provide information on the ARAC example “initial” projections shown in Figures 8 and 9.

(a) Geographic Contour Display. Release location is centered in this area (refined projections may have release location offset from center) with a 2,000-foot fragmentation circle drawn around the release point. The display is always oriented with north toward the top. A maximum of three contoured areas shall be shown emanating from the release point that shall, in most cases, overlay a geographic representation, showing road networks and waterways, etc., of the area around the accident site. Printed across the top of each graphic display area shall be the title of the underlying computer estimation denoting either a “50-Year Whole Body Effective Dose” or “Cumulative Deposition” plot.

Figure 8. ARAC Plot: Lung Dose

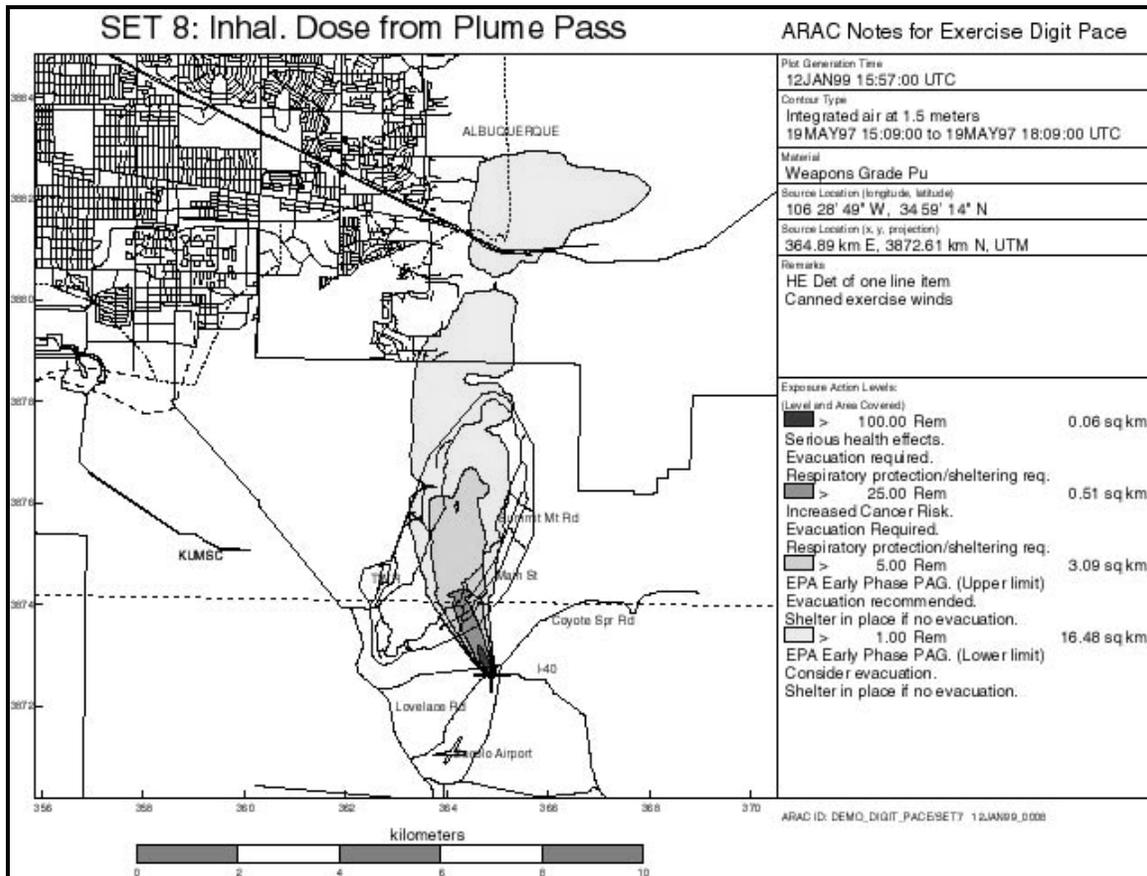
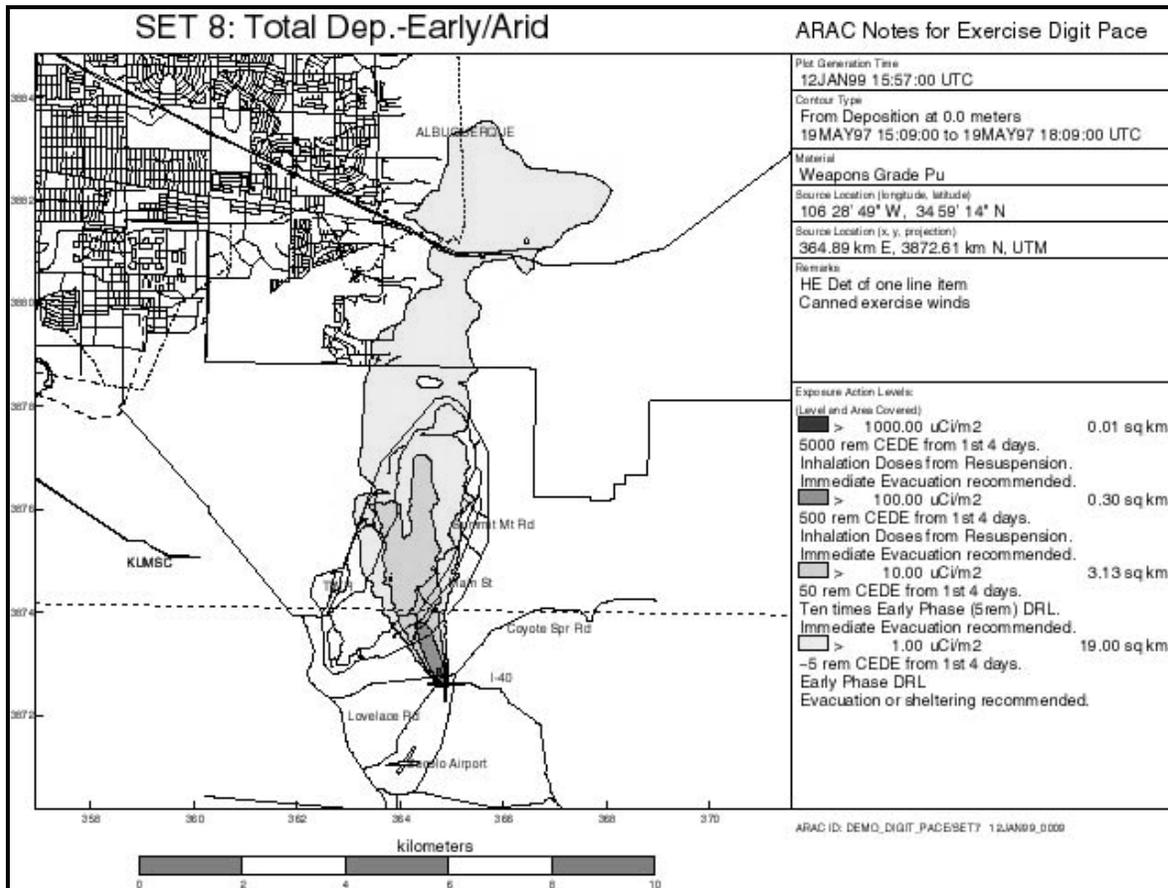


Figure 9. ARAC Plot: Deposition



(b) Descriptive Notes. To the right of the contour display shall be a legend. The first line is a title line for these notes. The second line shall denote the date and time that the specific computer model estimation was produced. Lines three through six shall be reserved for general amplifying remarks about the computer estimation. Line seven identifies either the dose integration period or total deposition period time, as appropriate. (All times shall be shown as “Z” or Zulu time. “Z” is equal to Universal Coordinated Time (UCT), which has replaced the more familiar Greenwich Mean Time.) Line nine shows the radiological material modeled, and the height above ground level at which the contour levels are computed and displayed. Lines 10 through 22 shall show the specific computer estimation action levels as computed for that particular plot. The next several lines (down to the scale of the display shown in both kilometers and feet) comprise three separate blocks of information. Within each block is an area showing a particular contour crosshatch pattern used to mark areas in the contour display where the dose or deposition is greater than the stated value, the area covered by this particular pattern in square kilometers, and abbreviated, generalized actions that may be considered within this area. Note that the area given shall include the area of all higher levels shown (for example, the area given for exceeding 25 rem is the sum of the area covered by the 25 and 150 rem contour patterns). At most, projections are made for three cumulative deposition and four dose exposure levels. Only the areas with the three highest projected levels shall be shown on any ARAC plot. Projected

cumulative depositions are for levels greater than 600, 60, and 6 $\mu\text{Ci}/\text{m}^2$. Dose exposures are projected for levels greater than 150, 25, 5, and 0.5 rem, which refer to a 50-year whole body effective dose through the inhalation pathway.

(9) Wording that Accompanies the Action Levels in the Legend.

(a) 50-Year Whole Body Effective Dose “Exposure Action Levels.” Projected doses apply only to people outdoors without respiratory protection from the time of the accident until the valid time of the plot, and recommended actions are to reduce the projected dose to those people exposed.

1. Greater than 50 rem. Immediate respiratory protection and evacuation recommended.

2. Greater than 25 rem. Prompt action required; respiratory protection required; consider sheltering or evacuation.

3. Greater than 5 rem. Respiratory protection required; recommend sheltering; consider evacuation.

4. Greater than 0.5 rem. Consider sheltering.

(b) Cumulative Deposition “Exposure Action Levels”.

1. Greater than 600 $\mu\text{Ci}/\text{m}^2$. Immediate action may be required until the contamination is stabilized or removed; issue sheltering instructions; recommend controlled evacuation.

2. Greater than 60 $\mu\text{Ci}/\text{m}^2$. Supervised area; issue sheltering instructions; recommend controlled evacuation for 2 to 14 days.

3. Greater than 6 $\mu\text{Ci}/\text{m}^2$. Restricted Area (RA); access on need-only basis; possible controlled evacuation required.

(c) The wording of the deposition action levels in subparagraph 3.b.(9)(b) was contracted because of space limitations on the ARAC plots. The full wording follows:

1. Greater than 600 $\mu\text{Ci}/\text{m}^2$. Immediate action required. Urgent remedial action may be needed from within a few hours up to two days. Full personal protective clothing and respiratory protection required by all emergency staff in this area. Residents should stay indoors with doors and windows closed. Consider turning off heating, ventilation, and air conditioning (including room air conditioners). Controlled evacuation of children and adults should be considered urgent. All work on, or the use of, agricultural products and/or meat and poultry must be controlled and further action on them assessed.

2. Greater than 60 $\mu\text{Ci}/\text{m}^2$. Supervised Area. Controlled evacuation should be considered and may have to occur, lasting between two days and two weeks or more. All activities should be carefully considered and supervised. Full anti-contamination clothing and respirators should be required for all personnel engaged in heavy work or dusty, windy

operations. Residents should stay indoors with windows closed unless evacuation is in progress or there is no significant airborne hazard and none forecasted to occur through resuspension.

3. Greater than 6 $\mu\text{Ci}/\text{m}^2$. Restricted Area. Entry restricted to those who live, work, and/or have a need to be there. Decontamination personnel and public health and safety staff should wear limited personal protective clothing. Controlled evacuation of residents, especially children, is possible during decontamination if there is a possibility of airborne contamination through resuspension.

c. Aerial Measuring System (AMS).

(1) General. The DOE/NNSA AMS has four capabilities available to support a weapon accident: aerial radiological mapping; aerial search for weapons and/or weapon components; multispectral, hyperspectral, and/or thermal imagery; and aerial photography.

(2) Aerial Radiological Mapping. Aerial radiological surveys provide rapid assessment and thorough coverage of large areas and yield average ground concentration of the contaminant. The system may also be used to quickly prepare lower sensitivity, but appropriately scaled, incident site maps. Instrumentation includes large volume, NaI gamma-ray detectors, data formatting and recording equipment, positioning equipment, meteorological instruments, direct readout hardware, and data analysis equipment. A variety of DOE/NNSA-owned aerial platforms (fixed-wing and helicopter) are dedicated to supporting this mission; in the near future, unmanned aerial vehicles (UAVs) may also be available. Also, equipment capable of being mounted on a variety of DoD helicopters is available to perform survey missions, as needed. The availability of North Atlantic Treaty Organization (NATO)-standard pods reduces the time required for airframe preparation.

(a) In a nuclear weapon accident, a preliminary radiological survey would establish whether radioactive materials had been dispersed from the weapon. Dispersion patterns and relative radiation intensities, immediately available from the initial survey, may be used to guide radiation survey teams to the areas of heaviest contamination. AMS personnel shall help interpret and coordinate their information with other radiological survey data through the FRMAC. Additional data processing shall establish the identity and concentration of the isotopes involved. Later surveys might provide data on the progress of cleanup operations.

(b) The first radiological survey conducted after a nuclear weapon accident is likely to follow this protocol and timeframe:

1. The fixed-wing aircraft should arrive six to 12 hours after notification.
2. The fixed-wing aircraft should be refueled and the crew should get instructions within two hours.
3. A survey should be conducted in a serpentine pattern of survey lines 0.5 to 5 miles apart to find:
 - a. Radiological deposition outline.
 - b. Direction of the plume centerline.

c. Approximate radiation levels along the plume centerline.

d. Dominant isotopes.

4. The survey information should be sent by radio or satellite telephone to the FRMAC during the survey.

5. The analysis laboratory should arrive four hours (plus driving time) after notification.

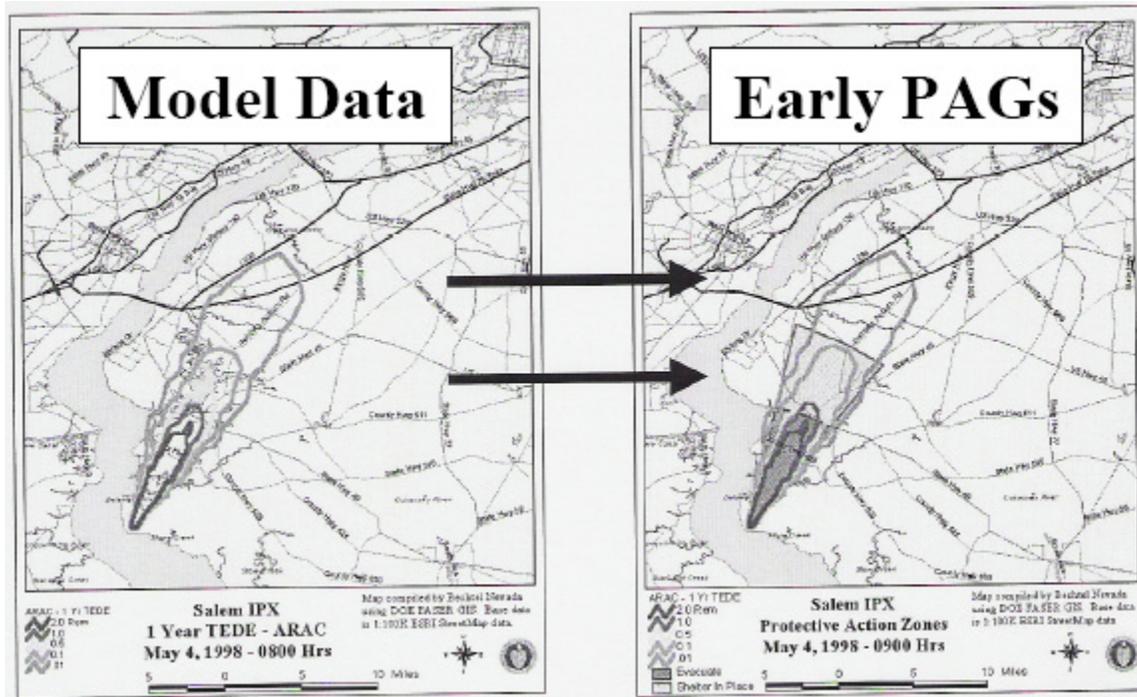
6. Full analysis of flight results should be available six to 12 hours after the flight is completed or after the analysis laboratory arrives.

(c) After the first broad survey is completed, a series of smaller area surveys should be initiated with the AMS helicopter. The flight altitude is likely to be 100 to 150 feet with 200-foot line spacings. The AMS helicopter has a detector field of view around 300 feet in diameter. The purpose of these surveys should be to map the contaminated area in detail. The length of time required to complete this series of surveys may be from one to five days, depending on the area to be surveyed and the weather.

(d) Another survey that might be initiated is called the KIWI. The KIWI uses the same system used on a helicopter, but is mounted on a four-wheel drive vehicle instead. Unlike the AMS helicopter, the KIWI is about three feet above the ground and has a detector field of view around 10 feet in diameter. The KIWI gives a high-spatial resolution mapping of contamination.

(e) The results of an aerial survey to produce early phase radiological data and radiological data measurements are shown in Figures 10 through 12.

Figure 10. Aerial Survey Results: Early Phase Radiological Data



Legend:

ESRI: Environmental Systems Research Institute

IPX: Ingestion Pathway Exercise

TEDE: Total Effective Dose Equivalent

DOE FASER GIS: DOE Field Analysis System for Emergency Response, Geographic Information System

Figure 11. Aerial Survey Results: Radiological Data Measurements, AMS Serpentine, and Field Measurements

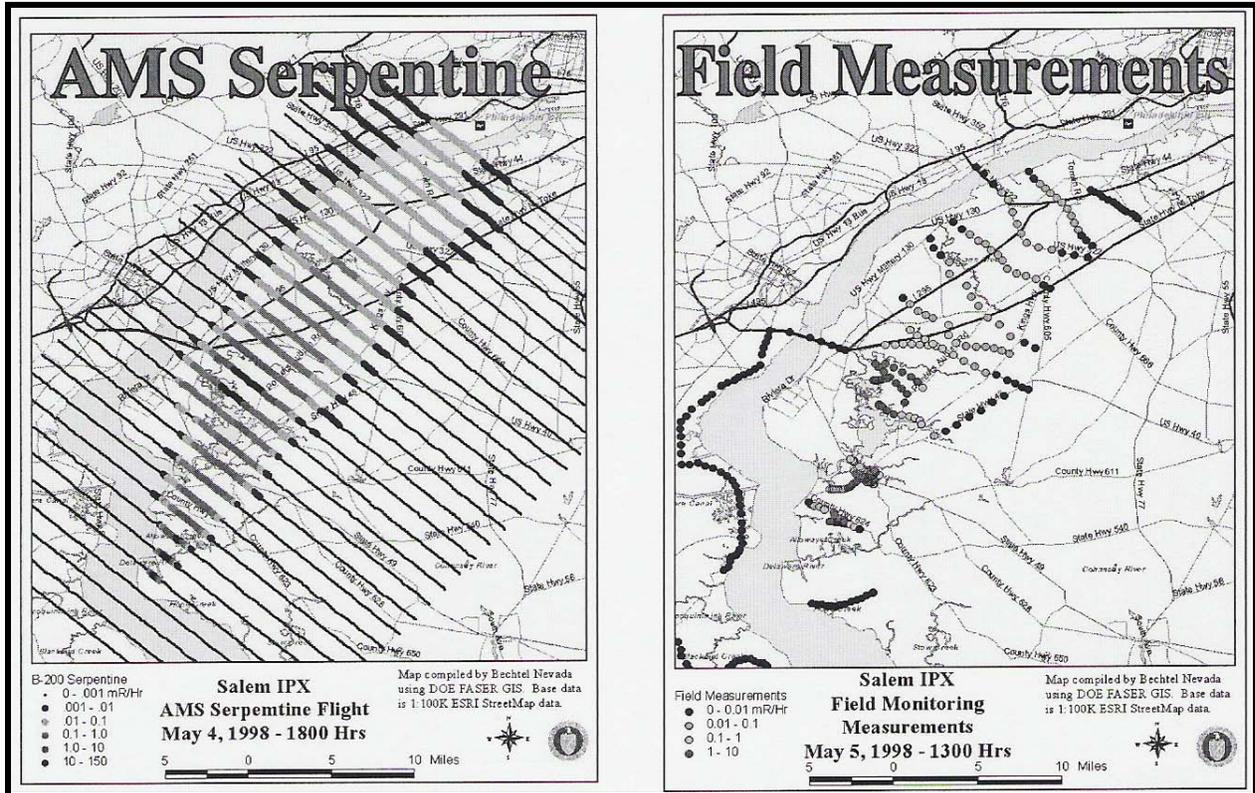
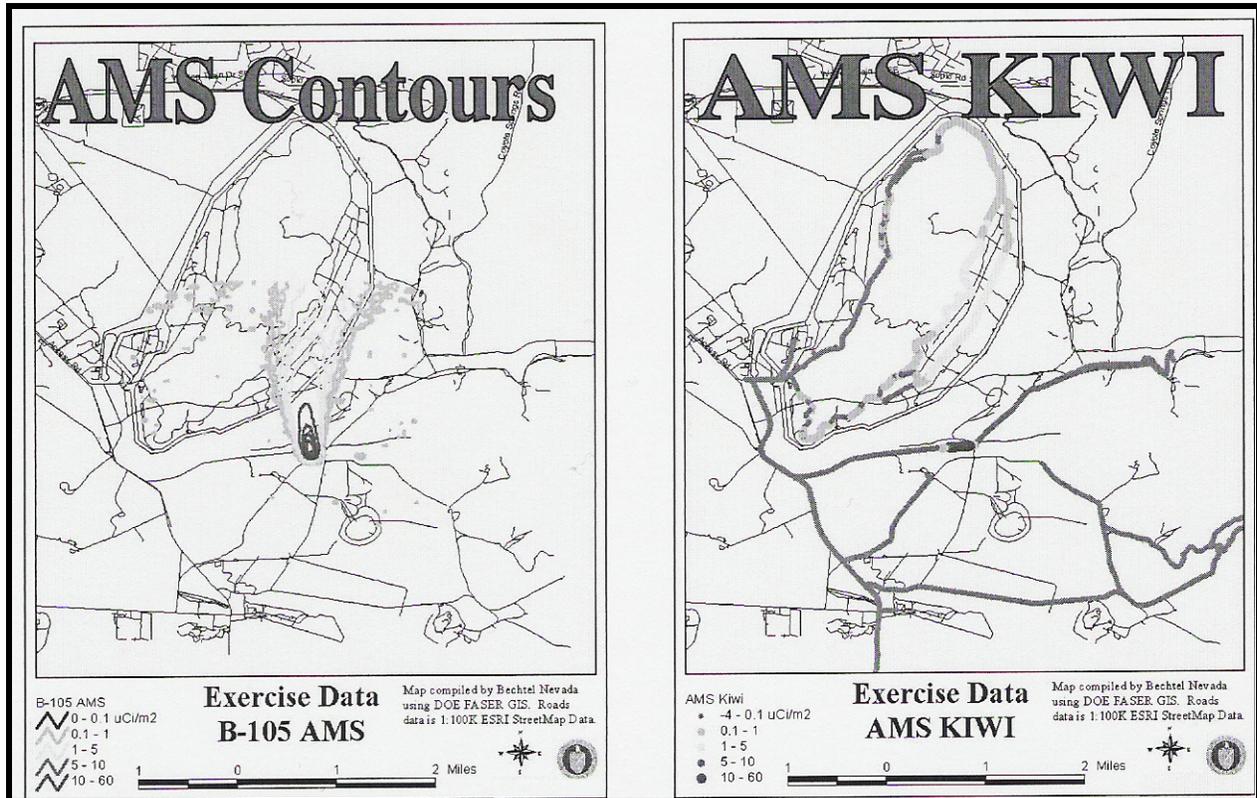


Figure 12. Aerial Survey Results: Radiological Data Measurements, AMS Contours, and AMS KIWI



(f) The sensitivity of the system depends on the flight altitude, area of contamination, and the interference of other isotopes (both natural and manmade). Experience has shown that the lower level of detectability of Am-241 may be expected to be 0.03 to 1.0 $\mu\text{Ci}/\text{m}^2$, and 0.03 to 0.3 $\mu\text{Ci}/\text{m}^2$ for both Cesium-137 and Iodine-131. The americium concentrations shown are on the order of one to 10 $\mu\text{Ci}/\text{m}^2$ of plutonium.

(g) Comparison with ground-based survey and sample results should be done with caution. The area sampled in a single aerial measurement is on the order of 1,000 times the area sampled by a FIDLER-type instrument at one foot above the ground and 1,000,000 times larger than the area sampled by an alpha probe or a soil sample. The aerial survey results weight the average of each scale and take into account the overall effect of roads, ditches, water bodies, vegetation cover, and terrain effects.

(3) Aerial Search. In certain scenarios, the aerial search capabilities available from AMS capabilities may need to be used. These consist of gamma and neutron detector modules designed for the DOE/NNSA-owned B0-105 or Bell 412 helicopters or portable modules that may be used in helicopters, such as the UH-60 and UH-72 with appropriate modifications. This capability may be useful only for certain sources of known detectability and usually requires low altitudes (100 feet or less) and slow speeds (about 60 knots). Aerial search personnel shall be able to determine the appropriate flight limits when notified of the particular scenario.

(4) Aerial Multispectral, Hyperspectral, and/or Thermal Imagery. Aerial imagery using a variety of sophisticated sensor suites may be used to find debris that has scattered around the accident site. Rigorous analyses allow for specific georeferences to be applied to each pixel of an image.

(5) Aerial Photography. Two major photographic systems are used to acquire detailed aerial photos over a site. One system consists of a large format aerial mapping camera operated in fixed-wing aircraft, which produces detailed aerial photographs. A second system operates out of helicopters, using the Hasselblad 70mm cameras to produce color photographs. Film from the Hasselblad system may be produced and printed under field conditions. Large prints up to 20 x 24 inches produced to map scales may be printed on-site, usually within hours of the completion of the flight. Digital photography is also available.

RADIATION DETECTION AND MEASUREMENT

1. OVERVIEW

a. Quantitative measurements of radioactive contamination in the field are difficult to accomplish properly. Particles having short ranges, such as alpha and low-energy beta radiation, are significantly and incalculably affected by minute amounts of overburden; e.g., dust or precipitation. Therefore, detection rather than measurement is a more realistic goal for alpha-beta surveys. More penetrating radiations, such as gamma and higher energy X-rays, are affected less by such overburden; however, quantification of isotopes through photon emissions requires isotopic- and geometry-specific response functions.

b. Although uranium and plutonium are both alpha emitters, field survey of uranium is best accomplished by measuring beta emissions from the thorium and protactinium progeny. For plutonium, the best technique is to detect the accompanying contaminant Am-241, which emits a 60-keV gamma ray. Knowing the original assay and the age of the weapon, the ratio of plutonium to americium may be computed accurately and the total plutonium contamination determined.

c. Many of the factors that may not be controlled in a field environment may be managed in a mobile laboratory that may be brought to an accident site. Typically, the capabilities include gamma spectroscopy, low background counting for very thin alpha- and beta-emitting samples, and liquid scintillation counters for extremely low-energy beta emitters such as tritium.

2. GENERAL

a. Scope. This appendix provides detailed information on the instrumentation and associated techniques used to perform radiological monitoring at an accident involving the release of radioactive material. This appendix is not intended to serve as a "user's manual" for the various instruments; however, it includes sufficient detail to provide an understanding of the limitations of field measurement techniques and provides for proper application and the use of techniques in an emergency. For completeness, some basic characteristics of different kinds of radiation are included. Throughout this appendix, the word "radiation" refers only to nuclear radiation found at a nuclear accident site.

b. Detection Versus Measurement.

(1) Nuclear radiation is not easy to quantify properly. Radiation detection is always a multi-step, highly indirect process. For example, in a scintillation detector, incident radiation excites a fluorescence material that de-excites by emitting photons of light. The light is focused onto the photocathode of a photomultiplier tube that triggers an electron avalanche. The electron shower produces an electrical pulse that activates a meter read by the operator. Not surprisingly, the quantitative relationship between the amount of radiation actually emitted and the reading on the meter is a complex function of many factors -- factors that may only be controlled within a laboratory.

(2) On the other hand, detection is the qualitative determination that radioactivity is or is not present. Although the evaluation of minimum levels of detectability is a considerable quantitative challenge for instrumentation engineers, the task of determining whether a meter records anything is considered much easier than the quantitative interpretation of that reading.

(3) The discussion in subparagraphs 2.b.(1) and 2.b.(2) suggests that the same equipment may be used for either detection or measurement. In fact, detectors usually have meters from which numbers may be extracted; however, to the extent that the user is unable to control factors that influence the readings, those readings must be recognized as indications of the presence of activity (detection) only and not measurements.

(4) In the discussions that follow in sections 3. through 7. below, personnel must be aware of the limitations imposed by field conditions and their implications on the meaning of readings taken; therefore, instructions shall carefully indicate the extent to which various instruments may be used as measurement devices or may be used only as detectors.

3. TYPES OF RADIATION

a. General. Four major forms of radiation are commonly found emanating from radioactive matter: alpha, beta, gamma, and X radiation. The marked differences in the characteristics of these radiations strongly influence their difficulty in detection and consequently, the detection methods used.

b. Alpha. An alpha particle is the heaviest and most highly charged of the common nuclear radiations. As a result, alpha particles very quickly give up their energy to any medium through which they pass, rapidly coming to equilibrium with, and disappearing in, the medium. Since nearly all common alpha radioactive contaminants emit particles of about the same energy, 5 MeV, some general statements may be made about the penetration length of alpha radiation. Generally speaking, a sheet of paper, a thin layer (a few hundredths of a millimeter) of dust, any coating of water or less than 4 cm of air are sufficient to stop alpha radiation. As a result, alpha radiation is the most difficult to detect. Moreover, since even traces of such materials are sufficient to stop some of the alpha particles and thus change detector readings, quantitative measurement of alpha radiation is impossible outside of a laboratory environment where special care may be given to sample preparation and detector efficiency.

c. Beta. Beta particles are energetic electrons emitted from the nuclei of many natural and manmade materials. Being much lighter than alpha particles, beta particles are much more penetrating. For example, a 500-keV beta particle has a range in air that is orders of magnitude longer than that of the alpha particle from plutonium, even though the latter has 10 times more energy; however, many beta-active elements emit particles with very low energies. For example, tritium emits a (maximum energy) 18.6-keV beta particle. At this low an energy, beta particles are less penetrating than common alpha particles, requiring very special techniques for detection.

d. Gamma and X Radiation. Gamma rays are a form of electromagnetic radiation and, as such, are the most penetrating of the four radiations and easiest to detect. Once emitted, gamma rays differ from X-rays only in their energies, with X-rays usually lying below a few hundred keV. As a result, X-rays are less penetrating and harder to detect; however, even a 60- keV gamma ray has a typical range of a 100 meters in air and might penetrate a centimeter of

aluminum. In situations in which several kinds of radiations are present, these penetration properties make X-ray and/or gamma-ray detection the technique of choice.

e. Radiations from the Common Contaminants. Table 1., below, lists some of the commonly considered radioactive contaminants and their primary associated radiations.

Table 1. Commonly Considered Radioactive Contaminants and Their Primary Associated Radioactive Emissions

	Alpha	Beta	Photons
Am-241	X		X
H-3		X	
Pu-239	X		X
Thorium Alloys	X	X	X
U-Natural	X	X	X
U-Depleted	X	X	X
U-Highly Enriched	X	X	X

4. ALPHA DETECTION

a. Because of the extremely low penetration of alpha particles, special techniques must be used to allow the particles to enter the active region of a detector. In field instruments such as the AN/PDR-56, AN/PDR-77, and ADM-300, an extremely thin piece of aluminized Mylar® film is used on the face of the detector probe to cover a thin layer of florescent material. Energy attenuation of the incident alpha radiation by the Mylar® is estimated to be less than 10 percent; however, use of this film makes the detector extremely fragile. Thus, contact with literally any hard object, such as a blade of hard grass, may puncture the film, allowing ambient light to enter the detection region and overwhelm the photomultiplier and meter. (Even sudden temperature changes have been shown to introduce stresses that may destroy a film.) In addition, contact with a contaminated item might transfer contamination onto the detector; thus, monitoring techniques must be used that keep the detector from contacting any surface (however, recall that the range of the alpha radiation is less than 4 cm in air). This requirement to be within a few centimeters of monitored locations without ever touching one makes using such detectors impractical except for special, controlled situations (for example, monitoring individuals at the hot line or air sampler filters).

b. The sensitivity (minimum detectability) of an alpha detector is not dictated by the ability of the active region of the detector to respond to the passage of an alpha particle; counting efficiency for alpha detectors is 25 to 60 percent of the alpha particles from a distributed source that reach the detector probe. Fortunately, alpha detectors in good repair usually have a fairly low background interference. There are few counts from cosmic and other spurious radiation sources and state-of-the-art instruments easily eliminate most electronic noise. As a result, count rates in the order of a few hundred CPM are easily detectable on instruments such as the AN/PDR-77. However, the detectability is dominated by the ability of the alpha particles to get into the active region of the detector, which depends on such factors as overburden (amount of dust and/or moisture lying between the alpha emitters and the detector) and the proximity of the detector to the emitters.

c. In demonstrations conducted in the laboratory, a sealed alpha source (Am-241) was monitored with a well maintained AN/PDR-60 alpha probe and meter. Dust and water were sprinkled onto the source and changes noted. It was found that a drop of water, a heavy piece of lint, or a single thickness of tissue paper totally eliminated all readings. A light spray of water, comparable to a light dew, reduced readings by 40 to 50 percent. A layer of dust that was just visible on the shiny source had minimal effect on the count rate; however, a dust level that was only thick enough to show finger tracks reduced readings by 25 percent. These simple demonstrations reinforced the knowledge that detecting alpha particles in any but the most ideal situations is most problematic. The leaching or settling of contaminants into a grassy area or the dust stirred up by vehicular traffic on paved areas significantly decreases or eliminates alpha detection.

5. BETA AND/OR GAMMA DETECTION

a. Gamma rays and high-energy (>1 MeV) beta particles are highly penetrating radiations. As a result, the major problems listed for alpha detection do not apply. Furthermore, at the energies of concern in nuclear weapon accidents, detection efficiency for most detectors is relatively high. Thus, beta and/or gamma detection is relatively easy.

b. From a detection standpoint, unfortunately, high-energy beta and gamma radiations are not the primary decay products of the most likely radioactive contaminants (for example, plutonium, uranium, or tritium). Rather, the major potential source of beta and/or gamma emitters is from fission products that might be produced in the extremely unlikely event of a partial nuclear yield. Beta and/or gamma detection, therefore, has no quantitative use in determining the extent of plutonium or uranium contamination, but is used as a safety precaution to determine any areas containing hazardous fission products.

c. Common gamma detectors are scintillation detectors (using scintillation media different from that described in section 4. above for alpha detection) or gas ionization type detectors (ion chambers, proportional counters, or GM counters). In either case, the high penetrability of the radiation allows the detector to have reasonably heavy aluminum, beryllium, or plastic windows and to be carried at a 0.5 to 1.0 m height. Dimensions of the active region of the detector (for example, the thickness of a scintillation crystal) may be made larger to increase sensitivity. Because the detection efficiencies are reasonably insensitive to energies in the energy regions of interest, the detectors may be calibrated in terms of dosage (rad or rem) rather than in terms of activity. This practice reflects the common use for beta and/or gamma detectors.

d. The Ludlum Model 3 with a Ludlum 44-9 "pancake" (GM) probe is a typical beta and/or gamma detector, but is sensitive to gamma particles. Minimum detectability for such a detector is a radiation field that produces readings two to three times greater than the background (no contaminant, natural radiation plus electronic noise) reading. All beta and/or gamma survey instruments are listed in the Radiological Monitoring Equipment page.

6. X-RAY DETECTION

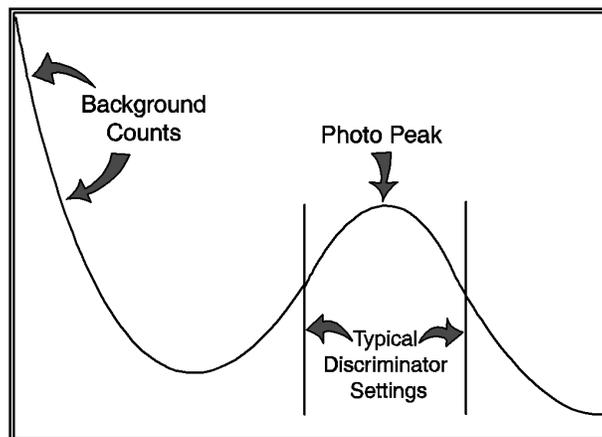
a. For low-energy (17 to 100-keV) X-rays, the scintillation detector is again the instrument of choice. Window thickness is again a factor, though not as much as with alpha particles. For

example, the half-thickness for absorption of 17-keV X-rays in aluminum is 0.4 mm and in air is about 4m. These factors increase rapidly with energy. For 60-keV X-rays, the distances become 2.5 cm and 190m, respectively. Thus, for X-rays above 15 keV, an X-ray detector may be held at a comfortable height (0.5 m) above the contaminated surface.

b. The size of an electronic pulse produced by an X-ray in a scintillation-type detector is proportional to the energy of the X-ray. This has a most important application, commonly called pulse-height discrimination. Because of the relatively low (tens of keV) energy of the X-rays of interest, an X-ray detector and its electronics must be quite sensitive. Unfortunately, such a detector is sensitive also to the myriad radiations from natural sources and to common low-level electronic noise. The result is a deluge of signals that overwhelm the pulses from sought after X-rays. To remove the unwanted signals, circuitry is installed in the meter to ignore all pulses with sizes that lie below a user-selectable lower level (threshold). In cases of high (natural) background, it is also useful to discard all pulses with sizes greater than a user-selectable upper level. The accepted pulses, therefore, are only those from the desired X-rays and that small amount of background that happens to fall in the same pulse size region.

c. Unfortunately, pulse-height discrimination is not as “easy” as described above. In fact, the signals from the detection of identical X-rays are not identical in size; rather, a large number of such detections produce a distribution of pulse sizes that cluster about a mean pulse size. If one sets the lower-level discriminator slightly below and the upper level slightly above the mean pulse size, a large fraction of the desired pulses are eliminated, resulting in a significant decrease in detector response; however, setting the discriminator levels far from the mean admits too much background, masking the true signals (see Figure 1.). Thus, the setting of discriminator levels requires a qualitative judgment that may significantly affect the readings from a given contamination. Furthermore, since the width of the pulse size distribution depends in a most complicated way on the condition and age of the detector, it is impossible to specify one setting for all similar instruments. Rather, techniques have been developed to establish the sensitivity of a given detector, with its electronics, in a field environment. This technique is described in section 7 below.

Figure 1. Spectral Plot



d. Figure 1. shows the normal spread of pulses from a mono-energetic source mixed with a typical background spectrum and shows typical discriminator settings.

e. In spite of the complications detailed in paragraph 6.c., the scintillation detector is still the instrument of choice for detecting X-ray emitting radioactive contamination. One such detector is the FIDLER. A FIDLER (4 inches x 1 mm. NaI [T1]) probe, in good condition, mated to a Ludlum 2220 electronics package, may detect 60-keV activity as low as 0.2 $\mu\text{Ci}/\text{m}^2$. In a typical weapon grade mix for a medium-aged weapon, this mix should correspond to about 1 microcurie of plutonium per square meter. Furthermore, since the X-rays are much less affected by overburden than are alpha particles, the radiation monitor has much better control of the factors that influence its meter readings. As a result, the monitor may make quantitative measurements of the amount of radiation and infer the actual amount of contamination with far greater confidence than with any other field technique.

7. DETECTION OF URANIUM AND PLUTONIUM

a. Although uranium and plutonium are alpha emitters, they and their progeny also emit X-rays; therefore, as discussed above in section 6., the instrument of choice for detecting these elements is a scintillation detector.

b. Detecting uranium contamination is fairly straightforward. Among the radiations emitted in the decay of U-235 and its progeny is an 80-keV X-ray. The 185.7-keV X-ray is one of the most readily detectable photons from highly-enriched uranium, and has better penetrability of the entrance windows of scintillators than low-energy X-rays. Setup and field calibration of the detector, as described in this appendix, allows measurement of the X-ray activity per square meter and thus evaluation of the uranium contamination. Confidence in the accuracy of these measurements is in the 11 to 25 percent range.

c. Detecting plutonium is somewhat more complicated. Pu-239 and its progeny emit a 17-keV X-ray that may be detected with a FIDLER detector. However, absorption of that relatively low-energy X-ray by overburden plus interference by background signals in the same range as the desired X-ray make measuring the 17 keV a highly uncertain technique. Plutonium contamination may be determined more confidently through the following, indirect technique:

(1) Weapons grade plutonium contains several isotopes. In addition to the dominant Pu-239, there is always a small amount of Pu-241. Pu-241 beta decays, with a half-life of 14.35 years, to Am-241. Am-241 subsequently decays with the emission of a 60-keV X-ray which, like the 80-keV X-ray of uranium, is relatively easy to detect under field conditions. Thus, a most sensitive technique for detecting weapons grade plutonium is to detect the contaminant Am-241 and infer the accompanying plutonium.

(2) Clearly, this technique requires more information than the direct detection of radiation from the most plentiful isotope, such as knowledge of the age and original assay of the weapon material; however, decay times, weapon age, and assay are known or controllable quantities, while overburden and its effect on alpha and low-energy X-rays are not. Thus, the safeguards community has standardized on detecting plutonium through its americium progeny.

d. To ease the computations and calibration needed to measure plutonium contamination by X-ray detection in the field, the LLNL has produced a series of utility codes called the Hotspot Codes. The Hotspot HP Codes are available for all Windows platforms through XP. The Hotspot Codes include an interactive, user-friendly utility routine called FIDLER that steps a user through

the process of calibrating an X-ray detector. The FIDLER code is applicable to any X-ray detector if the full calibration technique, involving a known americium calibration source, is used.

e. Particularly useful in the FIDLER code is the provision to aid in the measurement of the geometric factor for any specific detector. Measurements made at the Ballistic Research Laboratory and the LLNL have shown that the value of $K(h)$ for $h = 30$ cm may vary from less than 0.4 m^2 to more than 1.0 m^2 , apparently depending on external configuration and subtle internal details of a particular FIDLER probe. For this reason, the FIDLER code contains both a detailed laboratory procedure and a field expedient procedure for determining $K(h)$ for a given detector. The code also provides a default value of 0.5 m^2 . This value was chosen to give a relatively conservative reading indication of contamination per count rate.

8. LABORATORY TECHNIQUES

Laboratory procedures are necessary to quantitatively measure radiation contamination. For this reason, mobile laboratories are available within the Department of Defense and the DOE/NNSA for deployment to an accident site. Although specific instrumentation shall vary, the types of laboratory analyses fall into three categories: gamma and X-ray spectroscopy, alpha-beta counting, and liquid scintillation.

a. Gamma and X-Ray Spectroscopy. The major tools involved in gamma and X-ray spectroscopy are a reasonably high-resolution gamma and/or X-ray detector (such as a High Purity Germanium or selectively high resolution NaI) and a multi-channel analyzer. With this equipment it is possible to accurately determine the energies of the gamma and X-rays emitted by a contaminated sample. Usually, spectroscopic techniques are not used for absolute measurements of amount of contamination (i.e., microcuries (μCi)) in a sample; however, by adjusting for the energy dependence of detection efficiencies and using standard spectral unfolding techniques, the relative amounts of various isotopes present in the contaminant may be determined accurately. Recalling the discussions in sections 6. through 7.h., immediate application may be seen for such information. For example, spectroscopy allows determination of the relative abundance of Am-241 to Pu-239, resulting in accurate calibration of the most sensitive (FIDLER) survey techniques.

b. Alpha and/or Beta Counting.

(1) Another laboratory technique, alpha and/or beta counting, results in a reasonably accurate determination of the absolute amount of contamination in a sample. Two types of counters are common and both are fairly simple in principle. In one, a reasonably sensitive alpha and/or beta detector, such as a thin layer of ZnS mated to a photomultiplier tube, is mounted in a chamber that is shielded to remove background radiation. A sample, made very thin to reduce self-absorption, is inserted into the chamber under the detector. In some apparatus, air is evacuated from the chamber to eliminate air absorption of the radiation. The count rate is then measured. Knowing the geometry of the experiment allows translating the count rate to an absolute evaluation of sample activity.

(2) Another alpha and/or beta technique involves gas-flow proportional counters. In these devices, a sample is inserted into the chamber of a proportional counter. Any emitted radiation causes ionization of the gas in the counter that is electronically amplified and counted.

(3) In both types of alpha and/or beta counters, the most difficult, sensitive part of the experiment is the sample preparation. To achieve absolute measurements of activity, radiation absorption must be reduced by the overburden caused by the sample itself. Techniques used include dissolving the sample onto a sample holder; evaporation of the solvent leaves a very thin, negligibly absorbing sample. Clearly, quantitative alpha and/or beta counting is a difficult, time-consuming process.

c. Liquid Scintillation.

(1) In a few cases, notably in detecting beta radiation from tritium, the energy of the radiation is so low, and the resultant absorption is so high, that solid samples may not be used for quantitative analysis. In these cases, dissolving the contaminant in a scintillating liquid may be possible. Glass vials of such liquid may then be placed in a dark chamber and the resulting scintillation light pulses counted using photomultipliers.

(2) Again, the outstanding difficulty with this process is in the sample preparation. Scintillation liquids are extremely sensitive to most impurities that tend to quench the output of light pulses. As a result, the most common technique for liquid scintillation sample gathering is to wipe a fixed area (typically 100 square centimeters) of a hard surface in the contaminated area with a small piece of filter paper. The cloth may then be immersed totally in scintillation liquid in such a way that subsequent light emission shall be visible to one of the photomultipliers in the analysis chamber. Alternatively, the filter paper may be replaced by a special plastic material that dissolves in scintillation liquid without significantly quenching light output. In either case, the technique works best when the contamination is gathered without large amounts of local dirt, oil, etc.

AREA AND RESOURCE SURVEYS

1. GENERAL

Extensive radiation predictions and surveys will be required to identify and characterize the area for decontamination and to develop and evaluate remediation plans. During the initial hours of the response, available radiation survey instruments and monitoring personnel for survey operations will be limited. Determining whether contamination was released by the accident must be done immediately. If a release occurred, priority must be given to those actions required to identify and reduce the hazards to people. These actions include identifying the affected area (perimeter survey) to allow identification of potentially contaminated people. Each successive survey operation will be based in part on the information gained from earlier operations. Initial radiation surveys may be based on ARAC information, if available, or only on the knowledge that contamination is dispersed downwind. Later surveys will be based on the initial survey data and AMS plots. Days will be required to complete comprehensive contamination characterization.

2. GENERAL SURVEY PROCEDURES

Selection of instrumentation, identification of the edge of contamination, determination of the location of measurements made, and data recording procedures are similar for most survey operations.

a. Selection of Instrumentation.

(1) Alpha Instruments. Instruments that detect alpha radiation may detect lower levels of contamination than instruments that detect low-energy gamma radiation. Under field conditions, however, alpha radiation has an extremely short detection range and its detection may be blocked by nothing more than surface moisture. Decaying alpha particles emit low-level gamma radiation and may be detected with the ADM-300 with X-ray probe under dust or morning dew conditions. The fragility of the Mylar® probe face on most alpha instruments combined with the short detection range of alpha radiation results in a high rate of instrument failure when field use requires measurement of contamination on rough ground or other irregular surfaces. Alpha instruments should therefore be used primarily for personnel and equipment monitoring at the hot line. Field use should be limited to only smooth surfaces like pavement and buildings.

(2) Low-energy Gamma Instruments. Instruments capable of detecting the low-energy gamma ray and X-ray radiations from plutonium, and its americium progeny, may be used to detect contamination; an example of this is the Berkeley Nucleonic Corporation SAM-935 present at many Air Force installations. Low-energy gamma and/or X-ray instruments are not subject to damage by surfaces being monitored and field surveys may be rapidly conducted. Low-energy gamma instruments are, therefore, the recommended instruments for field surveys of plutonium contamination, while the SPA 3 probe is more useful for measuring the medium energy gamma radiation from uranium. For the best detection efficiency, low-energy X-ray surveys should be conducted before any rainfall and during the first five days after the accident before part of the measurable low-energy radiation present is screened by the plutonium migrating into the soil. The best instrumentation for low-energy gamma and/or X-ray surveys

uses FIDLER probes, which are not usually available until the specialized teams arrive. The type and amount of low-energy gamma and X-ray radiation present depends on the age of the plutonium. Many weapons contain plutonium more than 10 years old, resulting in higher signal strengths for the same level of contamination as that produced by a “new” weapon; therefore, the age of the plutonium and projected signal strength should be determined in order to quantify the relationship between the Am-241 measurements and the actual levels of weapons-grade Pu on the ground. The age of the plutonium in a weapon may be obtained from the DOE/NNSA ARG.

b. Perimeter Contamination Levels. Perimeter contamination levels should be below about 0.5 microcurie/square meter where possible. This equates to the following instrument readings:

Table 1. Contamination Instrument Readings

Instrument	Probe (area in square cm)	Activity (microcurie/ square meter)	Instrument Indication†
AN-PDR-56	*DT224B (17)	0.5	~850 cpm
ADM-300	#ASP 100 (100)	0.5	~2,200 cpm
E-600	‡SHP 380 (100)	0.5	~5,500 cpm

† Above background

* assumed α efficiency (4π) for DT224B is 45%

assumed α efficiency (4π) for ASP 100 is 20%

‡ assumed α efficiency (4π) for SHP380 is 50%

If instrument efficiencies are different than those assumed, instrument indications will need to be corrected.

When low-energy gamma and/or X-ray instruments are used to establish the perimeter, a reading of twice the background is recommended to mark the perimeter. FIDLERs are recommended to perform perimeter surveys, with alpha instruments as the second choice. If FIDLERs are unavailable, and if weather or field conditions prevent the use of alpha instruments, the AN/PDR-56F or ADM-300, with the X-ray probe attached, may be used. If fission products were caused by the accident, priority should be given to establishing a 10 mR/hr perimeter.

c. Fixing Survey Points. For radiation monitoring data to be useful, the point where it is collected must be identifiable on a map or aerial photo of the area. Global positioning equipment may be unavailable to determine precise positions in the early phases of response, or the immediate need for radiological data may outweigh the time required to determine precise positions.

(1) Data points should be marked in some manner so that the point may be later relocated for other actions, or the position determined precisely for later correlation of the data with other information.

(2) A numbered or uniquely identified stake may be used to mark the location on soil and a similar unique identification painted or otherwise marked on pavement or other hard surfaces for later reference. When engineering survey equipment is not being used, the monitoring log, or data collection record, should show the identification marking used at each point, and an estimated position to use immediately after data collection.

(3) Estimated positions may be street addresses in urban areas, the estimated distance down a street or road from an identifiable intersection, compass bearings taken on two or more identified reference points, or any other reference that may be located on the maps being used. If a vehicle is used during the initial perimeter survey, the odometer mileage from an intersection or other known point may be adequate for identifying positions in sparsely populated areas.

d. Recording Survey Data. If an engineering survey is being performed concurrently with the radiological survey, recording procedures must ensure that positional data being recorded at the transit position and radiological data being recorded by the monitors may be correlated. Monitoring and survey teams' records should include the following information:

- (1) Team member names.
- (2) Type instrument and serial number.
- (3) Date and start and stop times of survey.
- (4) Data location mark (stake number or other marking) when used.
- (5) Estimated or surveyed position.

(6) Instrument reading indicating if the reading is "Gross," meaning the background radiation reading has not been subtracted or "Net," meaning the background radiation reading has been subtracted from the instrument reading.

e. Perimeter Surveys.

(1) Initial Perimeter Survey. Rapid identification of the perimeter of the contaminated area is required to prevent undue alarm, to help identify affected people, and to establish controls to prevent the spread of contamination. The IC and civil authorities need at least a rough plot of the perimeter as soon as possible on which to base their actions. The urgency of perimeter definition is directly related to the population in the area. Streets and roads usually provide rapid access to populated areas, although the location of rivers or other terrain features that may hinder access to parts of the potentially contaminated area must be considered when directing the perimeter survey. The contaminated area may be a mile or more wide and several miles long, therefore use of widely separated monitoring points and a vehicle to move between monitoring points should be considered when directing the initial perimeter survey. ARAC projections, if available, shall help determine the area and distance the perimeter survey teams may be required to cover, and perimeter survey procedures may be adjusted accordingly. If perimeter survey teams are equipped with a radio, a position report at the perimeter locations on each traverse shall provide an immediate location of the perimeter to the command center and allow team progress to be tracked. While not classified, transmission of radiation readings should be discouraged on unsecured nets. Results of the perimeter survey (measurement data, pattern sketch, etc.) should be sent to the ARAC, which may then be used to refine the source term and the disposition pattern.

(2) Full Perimeter Survey. FIDLERs should be used when performing a full survey of the perimeter. This may not be possible until after the specialized teams arrive and may take weeks to complete. The procedure most likely to be used consists of monitoring in and out along

the edge of the area with readings being taken about every 50 feet. If weather or terrain requires the use of the AN/PDR-56 or ADM-300 X-ray probe on the initial perimeter survey, the full perimeter survey may result in an expansion of the perimeter. If an alpha instrument was used for the initial perimeter survey, the perimeter established by the full perimeter survey should be about the same size or slightly smaller.

f. Area Surveys. Radiological surveys of the contaminated area are required to identify areas requiring the application of fixatives, to support decontamination and remediation planning, and to determine decontamination effectiveness. The first survey covering the entire area is provided most times by the AMS. The initial AMS helicopter data are expected to be available four to five hours after completion of survey flights. Fixed wing survey results are usually available one hour after flight completion. The AMS plot requires interpretation by trained analysts. Ground survey data are required to confirm and support analysis of the plot. Some of the supporting ground data may be provided by the initial perimeter survey. Ground surveys to support decontamination planning should be performed with FIDLERs. Usually some form of grid survey is used with the grid size determined by the desired accuracy of estimated activity between grid points and measurement errors associated with the instruments. Several days to over a week may be required to complete a ground survey of the entire area. Ground surveys confirming decontamination effectiveness may require several months to complete due to the low levels of contamination remaining and the desired precision.

g. Building Surveys.

(1) Radiological surveys of buildings within the contaminated area will be required to determine the appropriate decontamination actions. Alpha instruments may be used on most building surfaces; however, use of FIDLERs may be necessary on surfaces that may damage alpha instruments, or on materials such as carpets, where contamination may be below the surface and screened from alpha instruments. The amount of removable contamination present must be determined by wiping surfaces with a piece of material, or swipe, which is then monitored for contamination. Laboratory counting equipment should be used to determine the amount of removable contamination picked up on the swipe. Initial building surveys should be done only on the exterior unless the building is in use.

(2) Civil authorities should establish procedures for either building owners and/or tenants, or an appropriate civil authority, such as a policeman, to accompany monitors when surveying building interiors. If interiors are surveyed before the surrounding area has been decontaminated, methods that reduce tracking of contamination into buildings should be used (for example, cover shoes with plastic bag immediately before entering buildings and ensure gloves are uncontaminated). Interior contamination levels shall vary because of the time of year, the type of heating or cooling system used, and whether people were in the building during, or following the accident. Interior contamination levels are expected to be only a fraction of the exterior levels at the same location. The primary source of interior contamination is expected to be airborne contaminants entering the building through heating or cooling systems, and doors, windows, or other openings during the initial cloud passage; or contamination tracked or carried into the building by people or animals. The sealing of doors, windows, chimneys, and ventilators on evacuated buildings in highly contaminated areas may reduce further contamination of the interior during decontamination of the surrounding area. When monitoring the interior of a building, initial monitoring should be on the floor in the main traffic pattern (doorways, halls, and stairs), and on top of horizontal surfaces near heating or cooling duct outlets, windows, and other

openings into the building. If no contamination is found at these locations, it is very likely no contamination entered the building. If contamination is found, additional monitoring should be performed. Monitoring results from furnace and air-conditioning filters should be included in building survey records.

ENVIRONMENTAL SAMPLING

1. **GENERAL.** Collecting and analyzing samples provides numerical data that describe a particular situation. The ASHG shall direct sampling procedures. The sampling criteria shall be situation and site dependent. The results then may be used for preparing a course of action. This page addresses air, soil, vegetation, water, and swipe samples.

2. **AIR SAMPLING.** Air sampling is conducted to determine if airborne contamination is present. It provides a basis for estimating the radiation dose that people without respiratory protection may have received. The time required to respond to an accident and initiate an air sampling program usually results in little or no data being obtained during the initial release of contamination when the highest levels of airborne contamination are expected. Most air sampling data obtained during an accident response shall reflect airborne contamination caused by resuspension. Even though this discussion is directed mainly at airborne contamination caused by resuspension, the recommended priorities and procedures shall allow as much information as possible to be collected on the initial release if air samplers are positioned soon enough. Priority should, therefore, be given to initiating an air sampling program as soon as possible after arrival on-scene. Whether or not data are obtained on the initial release, air sampling data are needed immediately to assess the hazard to people still in the area, to identify areas and operations that require respiratory protection, and to identify actions required to fix the contaminant to reduce the airborne hazard and spread of contamination. When using filtration to collect particulate samples, the selection of filter medium is extremely important. The filter used must have a high collection efficiency for particle sizes that deposit readily in the lung (5 microns or less).

a. Response plans should include provisions for establishing an air sampling program. This plan should include sufficient air monitors (battery powered or a sufficient number of portable electric generators), air monitor stands, filter paper, personnel to deploy samplers and collect filters, analysis capability, and a method to mark and secure the area monitors against tampering. Also important is a means to ensure that air samplers are properly calibrated (see Table 1.). Staplex® air samplers use the High Volume Calibration Kit (CKHV) calibrator for a 4-inch filter and CKHV-810 calibrator for the 8 x 10-inch filters. Usually, 1,000 cubic feet of air must be sampled for accurate results.

Table 1. Air Sampler Calibration

Filter Type	Calibration Kit	Flow Rate	Operation Time
4" TFA #41	CKHV	18 CFM	55 min
4" TFA #2133	CKHV	36 CFM	28 min
4" TFA "S"	CKHV	70 CFM	15 min
8" x 10" TFA-810	CKHV-810	50 CFM	20 min

3. AIR SAMPLING TIME

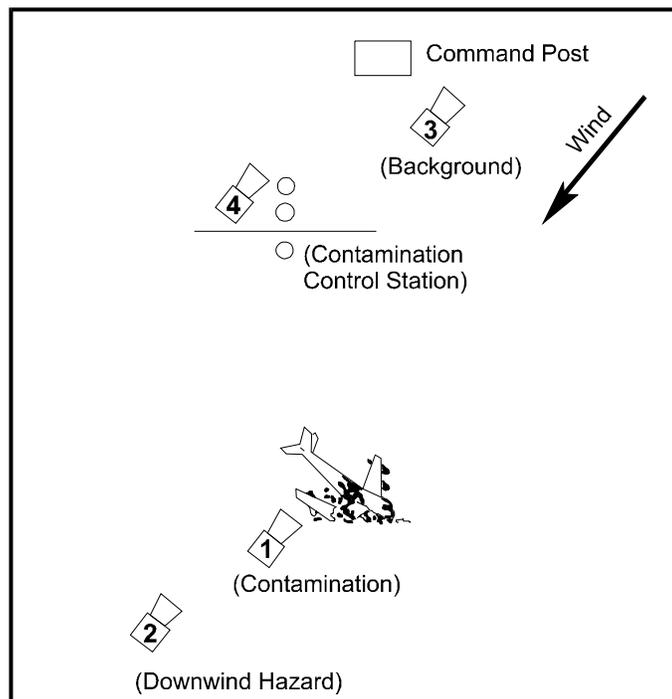
The period of time over which an air sample is collected and the volumetric sampling rate determine the volume of air sampled. Variables that affect the accuracy of air sampling results include the type of sampling equipment used, the accuracy with which contaminants on the filter may be measured, and the size of the sample. The sum of the errors may be offset, in part, by increasing the total volume of the sample collected. Increasing sample time presents no real difficulty when the interest is in long-term average concentrations, precision of results, or in detecting very low levels of contamination, as is the case during decontamination and remediation operations. During the initial response, when the interest is in rapid evaluation of air contamination to identify areas where high concentrations of airborne contamination might pose a hazard to unprotected persons in relatively short periods of time, short sampling times are appropriate. When taking samples for rapid evaluation, samplers should be operated long enough to sample at least 1,000 cubic feet of air. Once the data required for prompt evaluation are obtained, an air sampling program should be established to obtain 24-hour samples (equipment allowing), or high volume samples on a regular basis.

4. AIR SAMPLER PLACEMENT

Sampler positioning is directed toward the accident scene for the first 24 to 48 hours after an accident, or until an air sampling program tailored to the specific situation may be implemented. During this period, the number of air samplers available shall be limited and should be placed to get the maximum amount of information possible.

a. The amount of airborne contamination caused by resuspension varies from location to location as a function of surface type, physical activity, surface wind patterns, and the level of contamination on the ground. Recommendations on the initial placement of samplers assume that the mix of surface types is relatively constant throughout the area, that air samplers are placed to reduce any localized wind effects, and that the location of physical activity in the area (for example, response actions or evacuation) is known and controlled. The main variables in determining the amount of airborne contamination are ground contamination levels and wind speed. To provide the quickest and most accurate estimate of the maximum concentrations of airborne contamination, priority should be given to placing an air sampler at or near the most highly contaminated area that is accessible.

Figure 1. Air Sampler Placement



D31-I

b. Figure 1. shows the recommended placement of air samplers. The sampler number indicates the priority that should be given to placement. All air sampling locations should be marked with a unique number or symbol on a stake so that data may be correlated with other information in the following days. During the initial response, sampler No. 1 is placed downwind from the accident site to determine the hazard in the immediate area of the accident and should operate continuously. The distance should be modified in a downwind direction, if necessary, to allow access by a clear path for placement and periodic readings and filter changes. The time of readings and/or filter changes should be coordinated with EOD personnel. Sampler No. 2 is placed downwind from the accident at a distance dependent on the wind velocity (see Table 2.). Changes to this location should be considered based on accessibility, the location of nearby populated areas, and microclimatology. Downwind samplers should be operated until it is found that no airborne contamination exists at their locations and that actions taken upwind of the location or changes in meteorological conditions do not result in airborne contamination. Sampler No. 3 is placed about 610m upwind of all contamination and outside the CCA to get simultaneous background air samples for use in interpreting other readings. Background samples should be collected concurrently with the sample of interest, if possible, since the amount of naturally occurring airborne radioactive particulates may vary as a function of time due to wind changes. Air sampler No. 4 is placed at the CCS and operated continuously during CCS operations, since personnel leaving the contaminated area may carry and resuspend contaminants. The amount of contamination resuspended in this manner is expected to be small. During the initial phases of response, consider using all additional samplers, if available, in downwind locations to supplement sampler No. 2, particularly when populated areas are in or near the contaminated area.

Table 2. Air Sampler Placement (No. 2) Distance

Wind Speed		Approximate Downwind Distance	
Miles Per Hour (MPH)	(Knots)	(Meters)	(Feet)
6 to 10	4 to 9	1,000	3,300
11 to 15	10 to 13	1,500	5,100
16 to 20	14 to 17	2,000	6,600
Above 20	Above 17	2,500	8,200

5. AIR SAMPLE DATA RECORDING

For air sampling data used in the overall radiological assessment and confirmation of field computations and confirmed later by laboratory analysis, all pertinent data must be recorded. An air sampling log containing all of the data in paragraphs 4.a. through 4.j. should be maintained. When filters are changed, they should be placed in a plastic bag for laboratory analysis and annotated with the following information:

- a. Type and serial number of sampler.
- b. Location of sampler, including identification of field marking (stake) used to mark location.
- c. Average flow rate and/or volume of air.
- d. Date.
- e. Start and stop time of sample.
- f. Wind direction and weather conditions.
- g. Type of filter.
- h. Field readings on filter and time made, particularly if readings were taken without changing filter, including radiation detection instrument type and serial number, as well as designation of attached probe used to monitor the filter.
- i. Laboratory facility to which the filter was sent for processing.

6. AIR SAMPLE ANALYSIS

Air sampler filters may be analyzed using radioanalytical techniques by DOE/NNSA and AFRAT personnel, or by using a computation method. The computations shown in paragraphs 6.a. and 6.b. are for field use in computing gross activity on the filter. Any background radiation from naturally occurring radionuclides (i.e., radon, thoron(radon-220 isotope), and their progeny) should be subtracted when applying the computed results to protection standards. This is computed by subtracting the gross activity of the background sampler (No. 3) from the gross

activity of the sampler of interest when making rapid evaluations. Background corrected results may also be obtained by letting the naturally occurring radon, thoron, and their progeny decay to background. The radon chain may be considered completely decayed after almost four hours, and the thoron chain after almost three days. Remeasurement after these times allows identification of the amount of sample activity caused by these elements. During rapid field computations early in the response, the check for radon is appropriate if, or when, levels of airborne contamination detected are at or slightly above the established levels. The three-day decay time prevents checking for thoron during the initial response.

a. The equation in Figure 2., below, may be used for initial field evaluation of air sampling data to get rough estimates of airborne contamination using the ADM-300, AN/PDR-77, or AN/PDR-56 (with the large probe attached) and 8 x 10-inch or 4-inch (round) Whatman #41 filters. Results measured in dpm/m^3 .

Figure 2. Equation for Initial Field Evaluation of Air Sampling Data

dpm/m^3	=	$\frac{\text{CPM} \times \text{CF}}{\text{AFR} \times \text{T (min)}} - \text{Background Reading}$
where:		
CPM	=	Alpha meter reading on air filter in counts per minute
CF	=	Conversion factor (3,000 for ADM-300; 4,000 for AN/PDR-56) includes unit conversions, area correction factors, and other constants, assuming use of 8 x 10-inch Whatman #41 filter paper. For 4-inch, (round) filter paper, the conversion factors are 200 and 800 for the AN/PDR-77 and AN/PDR-56, respectively.
AFR	=	Average Flow Rate of the air sampler in CFM
T	=	Time in minutes the air sampler was running

b. If other alpha instruments or filters are being used, the equation in Figure 3. should be used for field evaluation of air sampling data. Results are measured in dpm/m^3 .

Figure 3. Equation for Field Evaluation of Air Sampling Data

dpm/m^3	=	$\frac{\text{CPM} \times \text{A}_f}{0.5 \times \text{m}^3 \times \text{F} \times \text{E}_f \times \text{E}_c \times \text{A}_c}$
where		
CPM	=	Alpha meter reading on air filter in counts per minute
A_f	=	Area of filter used (any units)
m^3	=	Total volume of sampled air in cubic meters
F	=	Alpha absorption factor for filter used (from manufacturer's specifications)
E_f	=	Collection efficiency of filter used (from manufacturer's specifications)
E_c	=	Efficiency of counting instrument
A_c	=	Area of filter actually counted by the instrument (same units as A_f)

7. ENVIRONMENTAL SAMPLES

a. Soil. Soil sampling procedures depend on the purpose of the sampling program. In all cases, careful selection of control (background) samples is required to allow interpretation of results. The following minimum quantities are necessary for analysis:

(1) Gamma spectrometry plus gross alpha and/or gross beta: 2 kilograms of soil (about 1 square-foot area 3 inches deep).

(2) Gross alpha and/or gross beta only: 100 grams.

(3) For a specific alpha and/or beta radionuclide, particularly Pu-239, consult the appropriate Service laboratory.

b. Water. The following minimum quantities are necessary for analysis:

(1) Surface and/or waste discharge sources: 2 liters.

(2) Drinking water sources: 1 liter.

c. Vegetation. The minimum sample volume is 3 liters of densely packed sample and should be double plastic bagged or packed in a 1-gallon widemouth plastic jar.

d. Swipes. Filter paper discs are used for taking swipe tests. Whatman #41 filter paper, 4.25 cm, is recommended for swipes. If this is unavailable, other filter paper with a maximum diameter of 1¾ inches may be substituted. Place a small "x" IN PENCIL ONLY on the outer edge of the filter paper on the side that is to touch the radioactive source or area being tested for contamination. Each swipe should be taken from an area of about 100 cm² by gently rubbing two or three times with the dry filter paper disc. The swipe is then placed, unfolded, in a properly completed Service form for a Swipe Container. If forms are unavailable, a plain envelope containing the required collection information may be substituted.

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

1. INTRODUCTION

a. The FRMAC Monitoring and Sampling Working Group has developed universal radiological field monitoring and sampling forms that may be used by a variety of emergency response organizations. Although designed by the FRMAC, input was gathered from the ARG, the RAP, and other emergency response agencies to ensure that the forms may be applied to a variety of organizations. These forms can be found at:

<http://www.nv.doe.gov/nationalsecurity/homelandsecurity/frmac/forms.aspx>

b. The working group hopes that radiological emergency response organizations throughout the nation are able to incorporate these forms into their organization's response procedures. During an emergency response, different agencies often work together and share a common workforce. Common forms allow for better exchange of data and few entry errors during a major radiological emergency response.

2. FORMS

a. FRMAC Form 1: Field Monitoring Log. This log is used by Monitoring and Sampling Teams to record field monitoring data and sample collection by sample number.

b. FRMAC Form 2: Sample Control Form. This form is used to document appropriate information as a sample and is collected by a Monitoring and Sampling Team. One form accompanies each sample to the Sample Receiving Line and from there to the laboratory. Use only one form for each sample.

c. FRMAC Form 3: Team, Instrument, and Equipment Information Log. This form is completed and submitted to the Field Team Supervisor before leaving the FRMAC.

d. FRMAC Form 4: Daily Instrument QC Checks Form. This form is used to record QC information for each instrument at the beginning and the end of every shift.

e. FRMAC Form 5: Data Acquisition Log. This log and/or form is used by the Data Acquisition Officer to record field monitoring data reported by Monitoring and Sampling Teams.

f. FRMAC Form 6: Local Area Monitoring (LAM) Thermo-Luminescent Dosimeter (TLD) Form. This form is used to record information on the deployment and retrieval of environmental TLDs, called Local Area Monitoring (LAMs).

g. FRMAC Form 7: Personnel TLD Data Sheet. This form is used to record deployment and retrieval information for personnel TLDs.

3. INSTRUCTIONS FOR FRMAC FORM 1: FIELD MONITORING LOG

a. The FRMAC FORM 1: Field Monitoring Log (see Figure 1.) is completed for a series of measurements. This form is intended for legal size paper (8.5" x 14").

b. Before leaving the FRMAC, complete Team Number (1), Monitors' Names, and Date.

c. Form Fields.

- (1) Team Number. Number designated by Field Team Supervisor.
- (2) Time of Measurement. Military time. Time zone is FRMAC time.
- (3) Location. Survey location; street address, town, highway, farm, sector, distance, etc.
- (4) Latitude. In degrees, minutes, and decimal minutes.
- (5) Longitude. In degrees, minutes, and decimal minutes.
- (6) Instrument ID. Number located on day glow sticker.
- (7) Measurement. Data acquired through measurements.
- (8) Units. Units in which the instrument reads; CPM, DPM, $\mu\text{Ci}/\text{m}^2$, Microroentgen (μR)/hr, mR/hr, etc.
- (9) Radiation Type/Energy. α , β/γ , X-ray, neutron, 60 keV γ , Am-241, etc.
- (10) Measurement Surface. Examples include filter, soil, grass, etc.
- (11) Remarks. Any factors pertinent to instrument measurements and any other environmental conditions. Also include information about samples taken at this site.

Figure 1. FRMAC Form 1: Field Monitoring Log

FIELD MONITORING LOG

(I) Team Number: _____ Date(MM/DD/YYYY): _____
 Monitor's Names: _____ Reviewed By: _____

	Instrument and Probe Model & Type:	Entry & Exit QC checks: _____ (initial on return) QC Check Logbook Page #:	GPS Information (if used) Instrument ID: Manufacturer / Model: Deployment Site QA/QC checks: Site: _____ Lat: _____ Long: _____						
	Instrument and Probe Model & Type:	Entry & Exit QC checks: _____ (initial on return) QC Check Logbook Page #:							
	Instrument and Probe Model & Type:	Entry & Exit QC checks: _____ (initial on return) QC Check Logbook Page #:							
Time (Military) (2)	Location Description (Location/Flag ID if used) (Attach map/drawing if necessary) (3)	Latitude (4)	Longitude (5)	Inst ID (6)	Measurement (7)	Units (8)	Radiation Type / Energy (9)	Measurement Surface (10)	Remarks: Include ALL pertinent measurement factors. Environmental: Ground Conditions, mist, rain, etc. If samples are collected at this site, Note Sample ID and type here (11)
(A)									
(B)									
(C)									
(D)									
(E)									
(F)									
(G)									
(H)									
(I)									

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4. INSTRUCTIONS FOR FRMAC FORM 2: SAMPLE CONTROL FORM

The FRMAC Form 2: Sample Control Form (see Figure 2.) is used to document appropriate information as a sample is collected by a Monitoring and Sampling Team. One form accompanies each sample to the Sample Receiving Line and from there to the Radioanalysis Laboratory. USE ONLY ONE FORM FOR EACH SAMPLE.

- a. Top Part. Appropriate sampling team, sample location, and sample type information.
- b. Remarks Section. Information that does not fit in any blank above or any additional pertinent information.
- c. Shaded Part. For use by Sample Control and Radioanalysis Laboratory.
- d. Chain of Custody. Fill in this part of the form every time custody of the sample is changed.

Figure 2. FRMAC Form 2: Sample Control Form

SAMPLE CONTROL FORM & CHAIN OF CUSTODY		<i>"Sample Control Barcode"</i>				
Sampling Information (to be filled out by the Field Team)						
Collection Team ID:		Collector's Name:		Org:		
Location: <input type="checkbox"/> GPS		Latitude: _____	Description: _____			
		Longitude: _____				
Collection Date:		Collection Time (Military):	# of Containers	Contact Dose Rate:		
Remarks: _____						
Sample Type (use only once)	Air	Sampler ID #		Type:	Filter size & Type:	
		Date ON:		Time ON:	Date OFF:	Time OFF:
		Start Flow:		Stop Flow:	OR Total Volume:	Unit:
	Milk	<input type="checkbox"/> Cow <input type="checkbox"/> Goat <input type="checkbox"/> Other _____		<input type="checkbox"/> Stored Feed	<input type="checkbox"/> Pasture	<input type="checkbox"/> Other _____
		Milking Date:		Milking Time:	Number of Animals sampled:	
	Ground	Depth of soil sample: _____ cm		Vegetation collected with soil samples? <input type="checkbox"/> Yes <input type="checkbox"/> No		
		Sample surface area:		If vegetation in separate container, provide sample #:		
	Water	<input type="checkbox"/> Surface <input type="checkbox"/> Ground / Well <input type="checkbox"/> Portable / Tap <input type="checkbox"/> Other:				
	Other	<input type="checkbox"/> Vegetation <input type="checkbox"/> Feed <input type="checkbox"/> Produce <input type="checkbox"/> Swipe <input type="checkbox"/> Other:				
	Describe:					
Sample Receiving (to be filled out by sample receiving technician)						
Processing Priority:		Dup Sample #:		Split Sample #:		
Screening Value:				<input type="checkbox"/> Contamination Check: Forms and sample bags surveyed		
Sample Remarks:						
Analysis Requested:				<input type="checkbox"/> Sample Preparation Required, send to sample preparation area before laboratory		
Laboratory Assignment:						
Special Instructions:						
Custody Transfer (Signatures)						
Relinquished By:		Date	Time	Received By:		
Relinquished By:		Date	Time	Received By:		
Relinquished By:		Date	Time	Received By:		
Relinquished By:		Date	Time	Received By:		

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5. INSTRUCTIONS FOR FRMAC FORM 3: TEAM, INSTRUMENT, AND EQUIPMENT INFORMATION LOG

The FRMAC Form 3: Team, Instrument, And Equipment Information Log (see Figure 3.) is completed and submitted to the Field Team Supervisor before leaving the FRMAC.

- a. Top Part. Complete with team member information.
- b. Bottom Part. Complete with instrument and equipment information, including license information of vehicle(s).

Figure 3. FRMAC Form 3: Team, Instrument, and Equipment Information Log

TEAM, INSTRUMENT, & EQUIPMENT INFORMATION LOG			
Field Team Supervisor Initials _____			
Team Number			
Today's Date		Start Time	
Team Leader (Last, First, MI)			
Team Leader Organization			
TEAM MEMBERS			
	Name (Last, First, Middle Initials)	Organization	
1			
2			
3			
4			
5			
INSTRUMENT AND EQUIPMENT INFORMATION			
Instrument / Equipment Number	Instrument / Equipment Type	Instrument / Equipment Number	Instrument / Equipment Type
Cellular Phone		Radio Number	
Serial Number	Phone Number		
VEHICLE INFORMATION			
License Plate Number	State	License Plate Number	State

This form must be completed and turned in to the Field Team Supervisor prior to field deployment
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6. INSTRUCTIONS FOR FRMAC FORM 4: DAILY INSTRUMENT QC CHECKS FORM

The FRMAC Form 4: Daily Instrument QC Checks Form (see Figure 4.) is used to record QC information for each instrument at the beginning and end of every shift.

- a. Team # . Write team number.
- b. Event. Write name of event.
- c. Instrument Number. Write instrument number from day glow sticker.
- d. Instrument Type. Write instrument type from day glow sticker.
- e. Depart Date/Time. Record departure date and time using military notation
Example: 02 Sep 1997 / 1745
- f. QC Check Source Type. Write the type of check source used (Am-241, background, Pu-238, etc.).
- g. Check Source ID #. Include number of check source, if available.
- h. Check Source Activity. Record activity of source and units. If instrument has different scales, record scale used.
- i. Acceptable Operating Range. Write acceptable range of operation.
- j. Depart Actual Reading. Record actual meter reading (Reading x Scale) at time of departure.
- k. Return Date/Time. Record return date and time following the example in paragraph 6.e., above.
- l. Return Actual Reading. Record actual meter reading (Reading x Scale) on return.

7. INSTRUCTIONS FOR THE FRMAC FORM 5: DATA ACQUISITION LOG

The FRMAC Form 5: Data Acquisition Log (see Figure 5.) is used by the Data Acquisition Officer to record field monitoring data reported by Monitoring and Sampling Teams. Columns on the Data Acquisition Log correspond to those on the Field Monitoring Log. Therefore, report data in the order recorded on the Field Monitoring Log.

- a. (1) Team #. Number of Monitoring and Sampling team reporting data.
- b. (2) Time of Day. In military time. Time zone is FRMAC time.
- c. (3) Location. Description of survey; i.e., street address, town, highway, sector, distance, if applicable.
- d. (4) Latitude. In degrees, minutes, and decimal minutes.
- e. (5) Longitude. In degrees, minutes, and decimal minutes.
- f. (6) Instrument ID. Number located on day glow sticker.
- g. (7) Measurement. Data acquired through measurements.
- h. (8) Units. Units in which instrument reads.
- i. (9) Radiation Type/Energy. Type of radiation/energy measured.
- j. (10) Measurement Surface. Examples: grass, soil, filter, etc.
- k. (11) Remarks. For any factors pertinent to instrument measurements, and any other environmental conditions.

8. INSTRUCTIONS FOR THE FRMAC FORM 6: LAM TLDs FORM

The FRMAC Form 6: LAM TLDs Form (see Figure 6.) is used to record information on the deployment and retrieval of environmental TLDs, called LAMs.

- a. Top Part. Enter information when LAMs are deployed and again when they are retrieved.
- b. Under Station, record:
 - (1) #. The number of the station.
 - (2) Description. Location information.
 - (3) Latitude and Longitude. Latitude and longitude of the station.
- c. Under TLDs, record:
 - (1) Number 1. The number of one of the LAMs.
 - (2) Number 2. The number of the other LAM.
 - (3) Deployed and Retrieved.
 - (a) Date and initial when the LAMs are deployed
 - (b) Date and initial when the LAMs are retrieved.
- d. Under Remarks, include any additional, pertinent information.
- e. Chain of Custody. To be signed when relinquishing LAMs.

Figure 6. FRMAC Form 6: LAM TLDs Form

LOCAL AREA MONITORING (LAM) TLDs

STATION			TLDs			Remarks
#	Description	Latitude	Longitude	Number 1	Number 2	
CHAIN OF CUSTODY						
Relinquished By:				Received By:		
Relinquished By:				Received By:		
Deployment Transit Control TLD Numbers				1)		2)
Retrieval Transit Control TLD Numbers				1)		2)
FOR LABORATORY USE ONLY						
FRMAC-to-Laboratory Transit Control TLD Numbers						

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9. INSTRUCTIONS FOR THE FRMAC FORM 7: PERSONNEL TLD DATA SHEET

The FRMAC Form 7: Personnel TLD Data Sheet (see Figure 7.) is used to record deployment and retrieval information for personnel TLDs.

- a. Top Part. Complete as TLDs are assigned.
- b. TLD #. Record number.
- c. Location and Deployed Information. Record "N.A." (not applicable) if person is mobile rather than at one location. Collected Complete when TLD is retrieved.
- d. Remarks. Any additional information pertinent to TLD, location, or any other environmental information.
- e. Names and Addresses. Include names of all persons at one location receiving TLDs.
- f. Chain of Custody. To be signed when relinquishing TLD.

Figure 7. FRMAC Form 7: Personnel TLD Data Sheet

PERSONNEL TLD DATA SHEET

Privacy Act Statement: *The information on this form is protected by the Privacy Act of 1974. The purpose of requesting this information is to conduct dose tracking. This information will be used by the U.S. Department of Energy, Nevada Operations Office, its contractors, and the home organization of the participant. Failure to provide this information will result in not receiving a dose assessment or proper dose tracking.*

Personnel TLD Data Sheet

Personnel TLD Data Sheet #



40134

Event	TLD #	Latitude	Longitude	Deployed		Retrieved	
				Date/Time (Military)	Initials	Date/Time (Military)	Initials
Location Description:							
Name	Last		First		Middle		
Mailing Address		City		State		Zip Code	
Phone Number (with area code)		Social Security Number *		Date of Birth		Sex	
						M F	
Remarks (Issue/Retrieval):							
CHAIN OF CUSTODY							
Relinquished By:		Received By:		Transit Numbers:			
Date/Time (Military)		Date/Time (Military)		Date/Time (Military)			
Relinquished By:		Received By:		Transit Numbers:			
Date/Time (Military)		Date/Time (Military)		Date/Time (Military)			
Relinquished By:		Received By:		Transit Numbers:			
Date/Time (Military)		Date/Time (Military)		Date/Time (Military)			
Relinquished By:		Received By:		Transit Numbers:			
Date/Time (Military)		Date/Time (Military)		Date/Time (Military)			

Revision Date July 1998

* SSN Disclaimer: The Health and Safety Group requires that Social Security number information be provided. This information is held in strict confidence; it is not released.
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CONVERSION FACTORS FOR WEAPONS GRADE PLUTONIUM

1. ASSUMPTIONS

- a. Conversions are for weapons grade plutonium only, with no americium.
- b. Density of soil 1.5 g/cm³.
- c. Specific activity (alpha only) 0.075 Ci/g.
- d. Contamination of soil is to the depth of 1 cm.

2. CONVERSION TABLES

Tables 1. through 6. provide a variety of conversion factors for weapons grade plutonium.

Table 1. Conversion Factors for Weapons Grade Plutonium

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
$\mu\text{Ci}/\text{m}^2$	$\mu\text{g}/\text{m}^2$	13
$\mu\text{Ci}/\text{m}^2$	dpm/m^2	2.2×10^{-6}
$\mu\text{Ci}/\text{m}^2$	dpm/cm^2	220
$\mu\text{Ci}/\text{m}^2$	dpm/g	150
$\mu\text{Ci}/\text{m}^2$	$\mu\text{Ci}/\text{g}$	6.7×10^{-5}
$\mu\text{Ci}/\text{m}^2$	pCi/g	67
$\mu\text{g}/\text{m}^2$	$\mu\text{Ci}/\text{m}^2$	0.075
$\mu\text{g}/\text{m}^2$	dpm/m^2	1.7×10^5
$\mu\text{g}/\text{m}^2$	dpm/cm^2	17
$\mu\text{g}/\text{m}^2$	dpm/g	11
$\mu\text{g}/\text{m}^2$	$\mu\text{Ci}/\text{g}$	5×10^{-6}
$\mu\text{g}/\text{m}^2$	pCi/g	5
dpm/m^2	$\mu\text{Ci}/\text{m}^2$	4.5×10^{-7}
dpm/m^2	$\mu\text{g}/\text{m}^2$	6.1×10^{-6}
dpm/m^2	dpm/cm^2	10^{-4}
dpm/m^2	dpm/g	6.7×10^{-5}
dpm/m^2	$\mu\text{Ci}/\text{g}$	3.0×10^{-11}
dpm/m^2	$\mu\text{Ci}/\text{m}^2$	3.0×10^{-5}
dpm/cm^2	$\mu\text{Ci}/\text{m}^2$	4.5×10^{-3}
dpm/cm^2	$\mu\text{g}/\text{m}^2$	6.1×10^{-2}

Table 1. Conversion Factors for Weapons Grade Plutonium, continued

<u>To Convert</u>	<u>Into</u>	<u>Multiply by</u>
dpm/cm ²	dpm/m ²	10 ⁴
dpm/cm ²	dpm/g	0.67
dpm/cm ²	μCi/g	3.0 x 10 ⁻⁷
dpm/cm ²	pCi/g	0.3
dpm/g	μCi/m ²	6.8 x 10 ³
dpm/g	μg/m ²	0.091
dpm/g	dpm/m ²	1.5 x 10 ⁴
dpm/g	dpm/cm ²	1.5
dpm/g	μCi/g	4.5 x 10 ⁻⁷
dpm/g	pCi/g	0.45
μCi/g	μCi/m ²	1.5 x 10 ⁴
μCi/g	μg/m ²	2 x 10 ⁵
μCi/g	dpm/m ²	3.3 x 10 ¹⁰
μCi/g	dpm/cm ²	3.3 x 10 ⁶
μCi/g	dpm/g	2.2 x 10 ⁶
μCi/g	pCi/g	10 ⁶
pCi/g	μCi/m ²	1.5 x 10 ⁻²
pCi/g	μg/m ²	0.20
pCi/g	dpm/m ²	3.3 x 10 ⁴
pCi/g	dpm/cm ²	3.3
pCi/g	dpm/g	2.2
pCi/g	μCi/g	10 ⁻⁶
μ units	units	10 ⁻⁶
units	μ units	10 ⁶

a. The conversion of alpha instrument readings in CPM into quantifiable units is affected by the type of surface and meter efficiency. For accurate conversions, a surface sample from the area measured should be analyzed with laboratory equipment, and the conversion factor for that area computed. Table 2. provides approximate factors for converting alpha readings in CPM into μg/m² for various surfaces using the equation: μg/m² - correction factor x CPM.

Table 2. Approximate Factors for Converting Alpha Readings for Various Surface Types

Type of Surface	Correction Factor
Soil	.006
Concrete	.005
Plywood	.004
Stainless Steel	.0025

b. The correction factors consider unit and area conversions, nominal instrument efficiency during field use, and assume a 60-sq-cm probe area (PAC-1S). Correction factors should be multiplied by four for use with the AN/PDR-56. Tables 3. and 4. were prepared fromtable 1. and the equation in paragraph 2.a. for users of the AN/PDR-56.

Table 3. Conversion Table (CPM to $\mu\text{g}/\text{m}^2$ or $\mu\text{Ci}/\text{m}^2$) AN/PDR-56 Alpha Meter

CPM	SOIL		CONCRETE		PLYWOOD		STAINLESS STEEL	
	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239
50	1.2	.09	1.0	.075	.8	.06	.5	.038
100	2.4	.18	2.0	.15	1.6	.12	1.0	.075
200	4.8	.36	4.0	.30	3.2	.24	2.0	.15
400	9.6	.72	8.0	.60	6.4	.48	4.0	.30
600	14.4	1.08	12.0	.90	9.6	.72	6.0	.45
800	19.2	1.44	16.0	1.20	12.8	.96	8.0	.60
1,000	24.0	1.80	20.0	1.50	16.0	1.20	10.0	.75
1,200	28.8	2.16	24.0	1.80	19.2	1.44	12.0	.90
1,500	36.0	2.70	30.0	2.25	24.0	1.80	15.0	1.13
2,000	43.2	3.24	36.0	2.70	28.8	2.16	18.0	1.35
2,200	52.8	3.96	44.0	3.30	35.2	2.64	22.0	1.65
2,500	60.0	4.50	50.0	3.75	40.0	3.00	25.0	1.88
2,800	67.2	5.04	56.0	4.20	44.8	3.36	28.0	2.10
3,000	72.0	5.40	60.0	4.50	48.0	3.60	30.0	2.25
4,000	96.0	7.20	80.0	6.00	64.0	4.80	40.0	3.00
5,000	120.0	9.00	100.0	7.50	80.0	6.00	50.0	3.75
8,000	192.0	14.40	160.0	12.00	128.0	9.60	80.00	6.00
10,000	240.0	18.00	200.0	15.00	160.0	12.00	100.0	7.50
11,000	264.0	19.80	220.0	16.50	176.0	13.20	110.0	8.25
12,000	288.0	21.60	240.0	18.00	192.0	14.40	120.0	9.00
25,000	600.0	45.00	500.0	37.50	400.0	30.00	250.0	18.75
50,000	1,200.0	90.00	1,000.0	75.00	800.0	60.00	500.0	37.50
75,000	1,800.0	135.00	1,500.0	112.50	1,200.0	90.00	750.0	56.25

Table 3. Conversion Table (CPM to $\mu\text{g}/\text{m}^2$ or $\mu\text{Ci}/\text{m}^2$) AN/PDR-56 Alpha Meter, continued

CPM	SOIL		CONCRETE		PLYWOOD		STAINLESS STEEL	
	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239
100,000	2,400.0	180.00	2,000.0	150.00	1,600.0	120.00	1,000.0	75.00
150,000	3,600.0	270.00	3,000.0	225.00	2,400.0	180.00	1,500.0	112.50
200,000	4,800.0	360.00	4,000.0	300.00	3,200.0	240.00	2,000.0	150.00
300,000	7,200.0	540.00	6,000.0	450.00	4,800.0	360.00	3,000.0	225.00

*To convert $\mu\text{Ci}/\text{m}^2$ to Bq/m^2 , multiply by 3.7×10^4 .

Table 4. Conversion Table (CPM to $\mu\text{g}/\text{m}^2$ or $\mu\text{Ci}/\text{m}^2$) ADM-300

CPM ADM - 300	Soil		Concrete		Plywood		Stainless Steel	
	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239	$\mu\text{g}/\text{m}^2$ Pu-239	$\mu\text{Ci}/\text{m}^2$ Pu-239
50	0.19	0.01	0.16	0.01	0.13	0.01	0.08	0.006
100	0.39	0.03	0.33	0.02	0.26	0.02	0.16	0.012
200	0.78	0.06	0.66	0.05	0.52	0.04	0.32	0.024
400	1.56	0.12	1.32	0.10	1.04	0.08	0.64	0.048
600	2.34	0.18	1.98	0.15	1.56	0.12	0.96	0.072
800	3.12	0.23	2.64	0.20	2.08	0.16	1.28	0.096
1,000	3.90	0.29	3.30	0.25	2.60	0.19	1.60	0.12
1,200	4.68	0.35	3.96	0.30	3.12	0.23	1.92	0.14
1,500	5.85	0.44	4.95	0.37	3.90	0.29	2.40	0.18
1,800	7.02	0.53	5.94	0.45	4.68	0.35	2.88	0.22
2,200	8.58	0.64	7.26	0.55	5.72	0.43	3.52	0.26
2,500	9.75	0.73	8.25	0.62	6.50	0.49	4.00	0.30
2,800	10.9	0.82	9.24	0.69	7.28	0.55	4.48	0.34
3,000	11.7	0.88	9.90	0.74	7.80	0.58	4.80	0.36
4,000	15.6	1.17	13.2	0.99	10.4	0.78	6.40	0.48
5,000	19.5	1.46	16.5	1.24	13.0	0.97	8.00	0.60
8,000	31.2	2.34	26.4	1.98	20.8	1.56	12.8	0.96
10,000	39.0	2.93	33.0	2.47	26.0	1.95	16.0	1.20
12,000	46.8	3.51	39.6	2.97	31.2	2.34	19.2	1.44
20,000	78.0	5.85	66.0	4.95	52.0	3.90	32.0	2.40
25,000	97.5	7.31	82.5	6.19	65.0	4.87	40.0	3.00
50,000	195.0	14.62	165.0	12.37	130.0	9.75	80.0	6.00
75,000	292.5	21.94	247.5	18.56	195.0	14.62	120.0	9.00
100,000	390.0	29.25	330.0	24.75	260.0	19.50	160.0	12.0
150,000	585.0	43.87	495.0	37.12	390.0	29.25	240.0	18.0
200,000	780.0	58.50	660.0	49.50	520.0	39.00	320.0	24.0
300,000	1170.0	87.75	990.0	74.25	780.0	58.50	480.0	36.0

Table 5. Conversion Table (Megabequerel (MBq) to Millicuries (mCi) and Microcuries μ Ci)

<u>MBq</u>	<u>mCi</u>	<u>MBq</u>	<u>μCi</u>
7,000	189.	30	810
6,000	162.	20	540
5,000	135.	10	270
4,000	108.	9	240
3,000	81.	8	220
2,000	54.	7	189
1,000	27.	6	162
900	24.	5	135
800	21.6	4	108
700	18.9	3	81
600	16.2	2	54
500	13.5	1	27
400	10.8	0.9	24
300	8.1	0.8	21.6
200	5.4	0.7	18.9
100	2.7	0.6	16.2
90	2.4	0.5	13.5
80	2.16	0.4	10.8
70	1.89	0.3	8.1
60	1.62	0.2	5.4
50	1.35	0.1	2.7
40	1.08		

Table 6. Conversion to International System Units

1 Ci = 3.7×10^{10} Bq	1 rad = 10^{-2} Gy
1 Bq = 2.7×10^{-11} Ci	1 Gy = 100 rad
1 rem = 10^{-2} Sv	
1 Sv = 100 rem	
<u>SI Units:</u>	
Becquerel (Bq)	
Sievert (Sv)	
Gray (Gy)	



DoD 3150.08-M
"Nuclear Weapon Accident Response Procedures"
(NARP)

INTERNET SUPPLEMENT



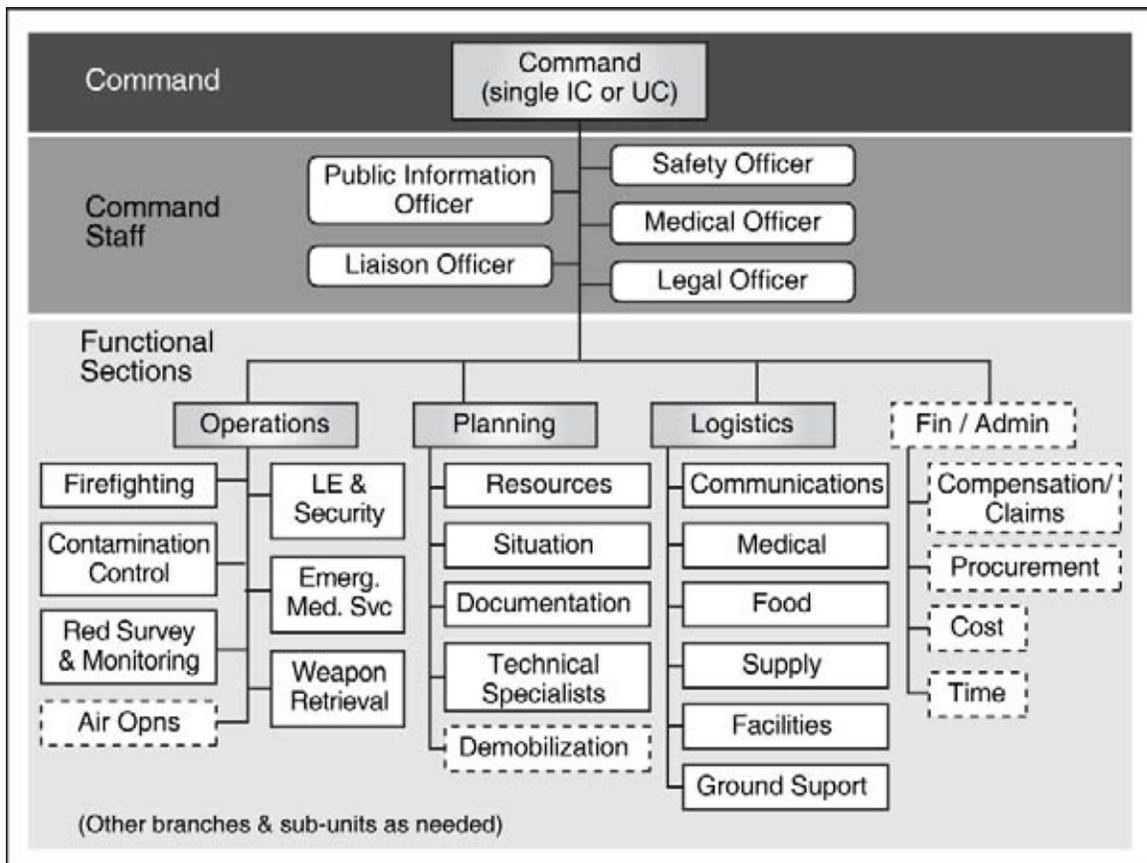
APPENDICES



INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

1. OVERVIEW. This appendix primarily applies to domestic U.S. DoD custody nuclear weapon accidents or incidents but should be used as a guide in foreign accidents; likewise, this appendix can be used by DOE as a guide for DOE custody nuclear weapon accidents or incidents. It is designed to assist IRF and RTF commanders in forming their staffs for training and preparedness before an accident, and to facilitate the transition of the IRF and RTF staffs into the incident management structure upon occurrence of nuclear weapon accident. Enclosure 2, section 2 of DoD 3150.08-M provides the flow of activities required of the DSF and RTF staffs. This page serves as a guide for IRF and RTF commanders to use in integrating DoD staff personnel into the NIMS Incident Command System (ICS) construct. It also provides the DoD SO with general background information on NIMS ICS functional sections and a brief discussion of specialized branches in the Operations Section of a JFO. A more in-depth discussion of the NIMS ICS can be found in reference (d). The NRF provides additional information on the JFO composition and functions.

Figure 1. Notional Nuclear Weapon Accident Incident Command



2. INCIDENT COMMAND SYSTEM. Figure 1. illustrates the structure of the NIMS ICS. Figure 3. illustrates the structure for the ISF; the RTF structure is in Figure 4. The IRF and RTF structures are the same with the exception of the Chief of Staff position in the RTF, as well as the possible addition of a Protocol Officer. The basic ICS functions are Command, to include a

Command Staff, and separate functional sections for Operations, Planning, Logistics, and Finance and Administration. The ICS structure is very similar to the staff structure utilized by the Department of Defense in a joint task force (see reference (cp)), which is comprised of the commander, deputy commander, chief of staff, special staff, and staff directorates. Table 1. shows which DoD staff functions may support the individual ICS staff positions; the table is designed as a guide to aid the DoD IC and is not intended to mandate staffing organizational requirements. The NIMS ICS is flexible and the functional sections and subordinate branches and divisions should be tailored to the needs of the situation.

Table 1. ICS and DoD Staff Equivalency

Incident Command Structure	Applicable DoD Staff Function (J-#)
Incident Commander/(UC)	IRF/RTF Commander
Deputy Commander	Deputy Commander
Chief of Staff	Chief of Staff
Public Information Officer	Public Affairs
Legal Officer	Judge Advocate
Safety Officer	Safety Officer
Protocol Officer	Protocol
Medical Advisor	Medical Advisor
Liaison Officer	Liaison Officers as needed
Operations Section	J-3
Planning Section	J-1, J-2, J-4, J-5
Logistics Section	J-1, J-4, J-6
Finance/Administration Section	J-1, Comptroller

a. DoD Incident Commander (IC). This individual will initially be the IRF commander and then appointed by the Service with the responsibility for providing the deployed RTF. Using the DoD JTF structure, the DoD IC is the IRF/RTF commander. To aid the DoD IC in his duties, there is also a deputy commander to facilitate 24-hour operations.

(1) DoD IC Responsibilities. The DoD IC has overall responsibility for the accident response in single jurisdiction DoD custody accidents, but normally forms a Unified Command (UC) with the DOE SEO. In accidents involving multiple jurisdictions or statutory authorities, the DoD IC remains responsible for the area within the boundaries of an exclusive DoD jurisdiction (the NDA) and expands the collaborative Unified Command to include designated officials from agencies with jurisdictional or statutory authority or with functional responsibility for any or all aspects of accident site areas outside exclusive DoD jurisdiction. To exercise these responsibilities, it is intended for the DoD IC to be at the accident site. Specific responsibilities include:

(a) Making recommendations to the Combatant Commander on the proper employment of assigned and attached forces for accident management operations.

(b) Exercising directive authority for logistics for common support capabilities delegated by the Combatant Commander.

(c) Exercising operational control over assigned and attached DoD forces conducting operations within the NDA.

(d) Approving the IAP for each operational period (normally 12 hours) in conjunction with the other members of the UC.

(e) Ensuring all DoD forces involved at the incident site are fully aware of the RUF that are in effect.

(f) Ensuring that cross-service and interagency support is provided and the entire accident response operates as an effective, mutually supporting unified team.

(g) Establishing force protection policies and guidelines.

(h) Using assigned and attached forces to best perform the mission.

(i) Identifying requirements for additional personnel.

(j) Providing guidance to subordinate units for planning and conducting accident management operations

(k) Maintaining situational awareness and keeping the Combatant Commander informed.

(l) Facilitating interagency coordination and establishing coordination procedures.

(m) Establishing the succession of command.

(n) Assigning specific missions to subordinate elements.

(o) Approving the Weapon Recovery Plan in consultation with the DOE/NNSA SEO.

(p) Providing guidance for redeployment operations upon the conclusion of weapon recovery operations (Phase IV).

(2) Deputy DoD IC Responsibilities. The Deputy DoD IC serves as the principal assistant to the DoD IC and aids the DoD IC in the accomplishment of assigned and implied duties. Additional Deputy DoD IC responsibilities include:

(a) Assuming command for one of the operational periods or whenever the DoD IC is otherwise unable to perform his duties.

(b) Performing special duties as directed by the DoD IC.

(c) Working with liaison officers and the functional sections to keep the DoD IC updated on events.

(d) Working with the PLA to ensure compliance with all applicable laws, regulations, processes, and procedures.

b. Command Staff. The Command Staff reports directly to the incident command (DoD IC or UC). The Command Staff is composed of a Public Information Officer, a Chief of Staff, and may have a Protocol Officer; additionally, a Medical Advisor may be added. A brief description of their responsibilities follows.

(1) Chief of Staff responsibilities include functioning as the principal staff officer and advisor to the DoD IC; coordinating and directing the work of the Command Staff and supervising the preparation of plans and information for the DoD IC; ensuring staff training is conducted when necessary; establishing the daily battle rhythm; managing the information management process in conjunction with the administration section; representing the DoD IC when necessary; ensuring DoD IC instructions are implemented; formulating and announcing staff policies and procedures for developing, tracking, and resolving requests for information; and ensuring all required liaisons are established. If multiple jurisdictions are involved and a UC has been established, the Chief of Staff performs these functions for the UC.

(2) The Public Information Officer is responsible for interfacing with the public and media and/or with other agencies with incident-related information requirements. The PIO develops accurate and complete information on the accident's cause, size, and current situation, resources committed, and other matters of general interest for both internal and external consumption. The PIO serves as the on-scene link to the Joint Information System and may also perform a key public information monitoring role. Whether the command structure is single or unified, only one accident PIO should be designated. Assistants may be assigned from other agencies or departments involved. The DoD IC or UC must approve the release of all accident-related information. Additional specific responsibilities are discussed in the Public Affairs page.

(3) Legal Officer responsibilities include providing legal advice to the DoD IC or UC and the staff, as well as ensuring all plans, RUF, policies, and directives are consistent with military, and Federal, State, local, and tribal law. Additionally, accurate records will need to be maintained. The legal advisor should work closely with the Documentation Unit of the Planning Section to ensure all records are maintained in accordance with all applicable laws and regulations. Finally, the legal officer should be very familiar with CERCLA (reference (av)).

(4) The Safety Officer monitors accident operations and advises the DoD IC on all matters relating to operational safety, including the health and safety of emergency responder personnel. The ultimate responsibility for the safe conduct of accident management operations rests with the DoD IC or UC and supervisors at all levels of accident management. The Safety Officer is, in turn, responsible to the DoD IC or UC for the set of systems and procedures necessary to ensure ongoing assessment of hazardous environments, coordination of multiagency safety efforts, and implementation of measures to promote emergency responder safety, as well as the general safety of accident operations. The Safety Officer has emergency authority to stop and/or prevent unsafe acts during accident operations. In a UC structure, a single Safety Officer should be designated, in spite of the fact that multiple jurisdictions and/or functional agencies may be involved. Assistants may be required and may be assigned from other agencies or departments constituting the UC. The Safety Officer, Operations Section Chief, and Planning Section Chief must coordinate closely regarding operational safety and emergency responder health and safety issues. The Safety Officer must also ensure the coordination of safety

management functions and issues across jurisdictions, across functional agencies, and with private-sector and nongovernmental organizations. Agencies, organizations, or jurisdictions that contribute to joint safety management efforts do not lose their individual identities or responsibility for their own programs, policies, and personnel. Rather, each entity contributes to the overall effort to protect all responder personnel involved in accident management operations.

(5) Protocol Officer responsibilities include coordinating with the interagency, DoD, and SLT elements for distinguished visitors. Distinguished visitors are considered general/flag officers with greater rank than the DoD IC and senior Federal, State, local, and tribal officials.

(6) The Liaison Officer (LNO) is the point of contact for representatives of other governmental agencies, nongovernmental organizations, and/or private entities to provide input on their organization's policies, resource availability, and other incident related matters. In either a single or UC structure, representatives from supporting or cooperating agencies and organizations coordinate through the LNO. Agency or organizational representatives assigned to an accident must have the authority to speak for their parent agencies or organizations on all matters, following appropriate consultations with their agency leadership. Assistants and personnel from other agencies or organizations (public or private) involved in accident management activities may be assigned to the LNO to facilitate coordination. The unity of effort resulting from the UC structure may negate the need for LNOs. The UC should make this determination on a case by case basis.

(7) A Medical Advisor may be designated and assigned directly to the Command Staff to provide advice and recommendations to the IC in the context of a nuclear weapon accident involving medical and mental health services to those personnel working at the accident site. Alternatively, the Medical Advisor could be a member of the ASHG who is designated to assist the IC/UC when needed.

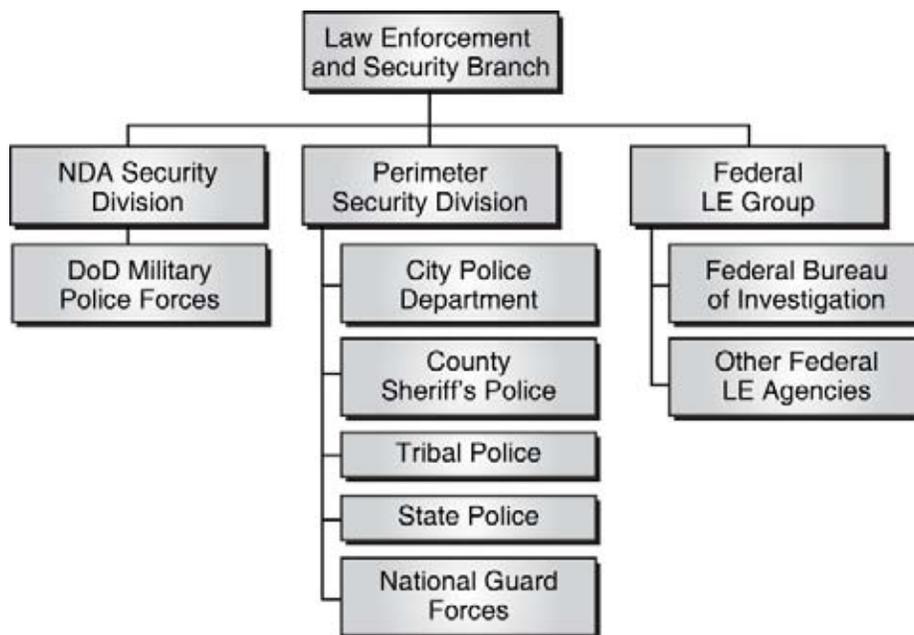
c. Operations Section. The DoD IC or UC will normally use the DoD Operations Officer (J-3) as the Operations Section Chief. The Operations Section is responsible for managing tactical operations at the accident site. It is organized into functional branches to accomplish the tasks of reducing the immediate hazard, saving lives and property, establishing situation and contamination control, and the recovery and disposition of the radioactive, hazardous, and classified materials. Each functional branch integrates the resources and capabilities from applicable jurisdictions, organizations, and levels of government. Figure 2. gives an example of a notional Operations Section.

Figure 2. Notional Operations Section Organizational Structure



Depending upon the scope of the accident and the number of jurisdictions involved, it may become necessary to further divide the functional branches of the Operations Section into Divisions representing different geographical areas or Groups representing sets of specific functions. A notional example of the Law Enforcement Branch sub-divided into geographical Divisions is shown in Figure 3.

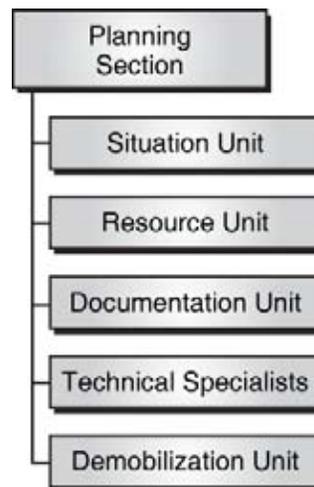
Figure 3. Notional Jurisdictional Divisions



d. Planning Section (J-1, J-2, J-4, and J-5). The DoD IC or UC will normally make the DoD Plans Officer (J-5) the Plans Section Chief and the DoD Intelligence Officer (J-2) the assistant Planning Section Chief. The Planning Section is responsible for collecting, evaluating, and

disseminating tactical information pertaining to the incident. It maintains information and intelligence on the current and forecasted situation, as well as the status of resources at the incident. The Planning Section develops and documents the IAP for each operational period based on guidance from the IC or UC. In essence, the Planning Section is operating 12-24 hours ahead of the Operations Section. The Planning Section has four primary units and may include a number of technical specialists to assist in evaluating the situation and forecasting requirements for additional personnel, expertise, and equipment. Figure 4. gives the organizational structure of the Planning Section.

Figure 4. Notional Planning Section Organizational Structure



(1) Situation Unit. The Situation Unit collects, processes, and organizes ongoing situation information; prepares situation summaries; and develops projections and forecasts of future events related to the incident. This unit also prepares maps and gathers and disseminates information and intelligence for use in the IAP.

(2) Resources Unit. Physical resources consist of personnel, teams, facilities, supplies, and major items of equipment available for assignment to or employment during accident management operations. This unit ensures all assigned personnel and other resources have checked in at the incident command post. The Resources Unit should have a system for keeping track of the current location and status of all assigned resources and should maintain a master list of all resources committed to accident management operations.

(3) Documentation Unit. The Documentation Unit maintains accurate and complete incident files, including a complete record of the major steps taken to resolve the accident; provides duplication services to accident management personnel; and files, maintains, and stores accident management files for legal, analytical, and historical purposes. The Documentation Unit prepares the IAP for each operational period and maintains many of the files and records that are developed as part of the overall IAP and planning function.

(a) The importance of maintaining thorough and accurate records cannot be overstated. It is reasonable to expect inquiries from various levels of government, liability litigation, and medical concerns all drive the need for complete record keeping. Much of this information, however, will be affected by the Privacy Act of 1972, HIPAA (reference (ak)), and

other legislation. The Documentation Unit should work closely with other Incident Command sections and units to ensure all relevant information is captured and with the Commander’s legal advisor to ensure records are maintained in accordance with all applicable laws and regulations. Finally, given the number of records maintained by several different agencies on radiation exposure, careful consideration should be given to the medium in which this data is maintained. Security and portability are two key concerns.

(b) Due to the potential long term effects of radiation, exposure information is maintained in several different locations. For example, radiation exposure history is recorded in the individual’s medical records. Additionally, however, each of the services and the Defense Threat Reduction Agency maintains radiation exposure records for their personnel. Finally, the National Personnel Records Center, a division of the National Archives and Records Agency (NARA) maintains copies of these records for 75 years.

Table 2. Sample Basic Operational Period IAP

Components	Normally Prepared By
Incident Objectives (Form: ICS 202)	Incident Commander
Organization List or Chart (Form: ICS 203)	Resources Unit
Assignment List (Form: ICS 204)	Resources Unit
Communications Plan (Form: ICS 205)	Communications Unit
Responder Medical Plan (Form: ICS 206)	Medical Unit
Incident Map	Situation Unit
General Safety Message	Safety Officer
Other Potential Components (Incident dependent)	
Air Operations Summary	Air Operations
Traffic Plan Ground	Support Unit
Decontamination Plan	Technical Specialist
Waste Management or Disposal Plan	Technical Specialist
Demobilization Plan	Demobilization Unit
Site Security Plan	Law Enforcement, Technical Specialist, or Security Manager
Investigative Plan	Law Enforcement
Evidence Recovery Plan	Law Enforcement
Evacuation/Sheltering Plan	As Required
Other	As Required

(4) Technical Specialists. These personnel have special skills and are activated only when needed. They may serve anywhere within the organization. They may form a separate unit within the Planning Section, or be assigned to one of the other sections as needed. Generally, if the expertise is needed for only a short period and normally involves only one individual, that

individual should be assigned to the Situation Unit. If the expertise is required on a long term basis or requires several personnel, it is advisable to establish a separate Technical Unit within the Planning Section. For a nuclear weapon accident, the many separate teams responsible for radiological monitoring may necessitate the need to establish a Radiological Monitoring Unit within the Planning Section or Operations Section as circumstances dictate.

(5) Demobilization Unit. The Demobilization Unit develops an Incident Demobilization Plan that includes specific instructions for all personnel and resources that will require demobilization. This unit should begin its work early in the operation, creating rosters of personnel and resources and obtaining any missing information as check-in proceeds.

e. Logistics Section (J-1, J-4 and J-6). The Logistics Section meets all support needs for the accident, including ordering resources through appropriate procurement authorities from off-incident locations. It also provides facilities, transportation, supplies, equipment maintenance and fueling, food service, communications, and medical services for accident management personnel. For large-scale nuclear weapon accidents, it may be necessary to divide these functions under two branches. Figures 5. and 6. illustrate both organizational structures. Regardless of the structure chosen, the functions of the individual units are the same.

Figure 5. Notional Logistics Section Organizational Structure

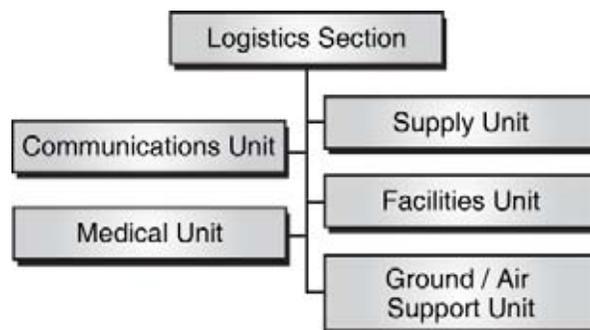
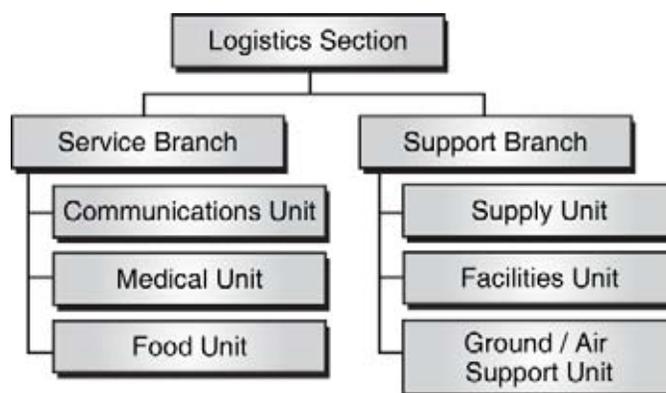


Figure 6. Notional Logistics Section: Two Branch Organizational Structure



(1) Supply Unit. The Supply Unit orders, receives, stores, and processes all accident-related resources, personnel, and supplies. This unit orders all off-incident tactical and support resources including personnel as well as expendable and nonexpendable supplies required for

accident support. The Supply Unit provides the support needed to receive, process, store, and distribute all supply orders. It also handles tool operations to include storing, disbursing, and servicing.

(2) Facilities Unit. The Facilities Unit sets up, maintains, and demobilizes all facilities used in support of accident operations. The unit also provides facility maintenance and security services (to include armory operations if required) to support accident operations. The Facilities Unit provides necessary support facilities to include food and water service, sleeping, sanitation and showers, and staging.

(3) Ground Support Unit. The Ground Support Unit maintains and repairs primary tactical equipment, vehicles, and mobile ground support equipment; records usage time for all ground equipment assigned to the accident; supplies fuel for all mobile equipment; provides transportation in support of incident operations (except aircraft); and develops and implements the Incident Traffic Plan.

(4) Communications Unit. The Communications Unit develops the Communications Plan to make the most effective use of the communications equipment and facilities assigned to the accident, installs and tests all communications equipment, supervises and operates the incident communications center, distributes and recovers communications equipment assigned to accident management personnel, and maintains and repairs communications equipment on site. The Unit's major responsibility is effective communications planning for the ICS, especially in the context of a multiagency incident. This planning is critical for determining radio nets, establishing interagency frequency assignments, and ensuring the interoperability and the optimal use of all assigned communications capabilities. Most nuclear weapon accidents involving a multiagency response will require a Communications Plan. A secondary, but equally important responsibility, is ensuring the Documentation Unit has the technical means to establish and maintain accurate records.

(5) Food Unit. The Food Unit determines food and hydration requirements; plans menus, orders food, provides cooking facilities, cooks and serves food, maintains food service areas, and manages food security and safety concerns. The Food Unit must interact closely with the following elements:

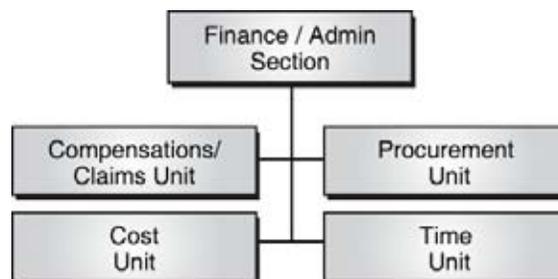
- (a) Planning Section (2.d.), to determine the number of personnel who must be fed.
- (b) Facilities Unit (2.e.(2)), to arrange food-service areas.
- (c) Supply Unit (2.e.(1)), to order food.
- (d) Ground Support Unit (2.e.(3)), to obtain ground transportation.
- (e) Air Operations Branch Director (2.c.), to obtain air transportation (if applicable).
- (f) Operations Section (2.c.), to determine an appropriate feeding schedule.

(6) Medical Unit. The primary responsibilities of the Medical Unit include development of the Incident Medical Plan for accident management personnel; developing procedures for handling any major medical emergency involving accident management personnel; providing

continuity of medical care, including vaccinations, vector control, occupational health, prophylaxis, and mental health services for accident management personnel; providing transportation for injured accident personnel; coordinate, establish, and staff the routine rest and rehabilitation of incident responders; ensuring that accident personnel patients are tracked as they move from origin, to care facility, to final disposition; assisting in the processing of all paperwork related to injuries, radiation exposure, or deaths of accident assigned personnel; and coordinating personnel and mortuary affairs for accident personnel fatalities.

f. Finance/Administration Section (J-1 and Comptroller). A Finance/Administration Section is established when there is a specific need for financial reimbursement (individual department or agency) and administrative services to support incident management activities. The primary purpose of this section is to monitor the myriad sources of funds, and track and report the rate and level of expenditures during the operation. This allows the IC to forecast the need for additional funds before operations are negatively impacted. The Section Chief will determine the need for specific subordinate units. Some possible required subordinate units are shown in Figure 7.

Figure 7. Notional Finance/Administration Section Organizational Structure



(1) Time Unit. The Time Unit is primarily responsible for ensuring proper daily recording of personnel time, in accordance with the policies of the relevant agencies. This unit also ensures the Logistics Unit records or captures equipment usage time, through the Ground Support Unit for ground equipment and through the Air Operations Support Group for aircraft. If applicable (depending on the agencies involved), personnel time records will be collected and processed for each operational period. Excess hours worked must also be determined, for which separate logs must be maintained. Finally, the amount of time personnel are exposed to radiation must be ascertained and maintained.

(2) Procurement Unit. The Procurement Unit administers all financial matters pertaining to vendor contracts. It coordinates with local jurisdictions to identify sources for equipment, prepares and signs equipment rental agreements, and processes all administrative requirements associated with equipment rental and supply contracts. This Unit will work closely with the Supply Unit in the Logistics Section (see 2.e. above).

(3) Compensation and Claims Unit. The Compensation and Claims Unit handles all injury and compensation claims. This includes investigating all civil tort claims involving property associated with or involved in the accident. This unit maintains logs on the claims, obtains witness statements, and documents investigations and agency follow-up requirements. Due to the nature of the unit's function, it will have to work closely with both the Medical Unit (see 2.e.(6) above) and the Legal Officer in the IC Personal (Special) Staff (see 2.b.(3) above).

(4) Cost Unit. The Cost Unit provides cost analysis data for the accident. It must ensure that equipment and personnel for which payment is required are properly identified, obtain and record all cost data, as well as analyze and prepare estimates of accident costs. The Cost Unit also provides input on cost estimates for resource use to the Planning Section (see 2.d. above) and maintains accurate information on the actual costs of all assigned resources.

3. JOINT FIELD OFFICE. The JFO is a DHS-led multiagency coordination center. The JFO organizational structure is based on the framework of the NIMS ICS, and many of the branches in the functional Sections parallel those of the ICS. However, the JFO does not manage on-scene operations. Instead, the JFO focuses on providing support to on-scene efforts and conducting broader support operations that may extend beyond the accident site, such as coordinating Federal support and providing area support when and where needed. As with the accident site ICS, the JFO is a flexible organization, and the branches and staffing in each of the functional sections are based on situational requirements. During accidents in which DHS does not establish a JFO, the DoD SO should operate within the Regional Response Coordination Center (RRCC) established by FEMA.

a. JFO Coordination Group. Utilizing the NIMS principle of Unified Command, JFO activities are directed by a JFO Coordination Group. If present, the PFO coordinates the overall Federal accident management and assistance activities. If a PFO is not assigned, the FCO or FRC provides overall coordination for the Federal components of the JFO. When DoD, as coordinating agency, is leading the Federal response, the DoD SO performs the duties of the PFO. A notional JFO Coordination Group for a nuclear weapon accident or incident is shown in Figure 8.

Figure 8. Notional JFO Coordination Group for a Nuclear Weapon Accident or Nuclear Weapon Incident

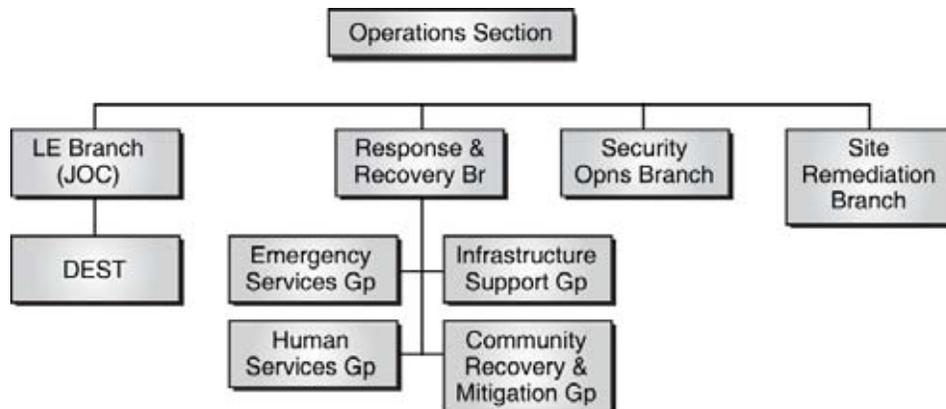


b. Operations Section.

(1) In a U.S. nuclear weapon accident or incident, the JFO Operations Section will have a Response and Recovery Branch comprised of four groups: Emergency Services, Human Services, Infrastructure Support, and Community Recovery and Mitigation. When the accident results in contamination, the Operations Section will also have a DoD-led Site Remediation Group under the Response and Recovery Branch or SR may be established as a Branch directly under the Operations Section.

(2) The Operations Section may also have a FBI-led Law Enforcement Investigative Operations (JOC) Branch until terrorism is ruled out as a cause of the accident. A Security Operations Branch may also be established to assist in site security of classified components and materials. If a Domestic Emergency Support Team (DEST) is deployed, it would normally be placed in support of the JOC; Figure 9. provides an example of a notional JFO Operations section structure.

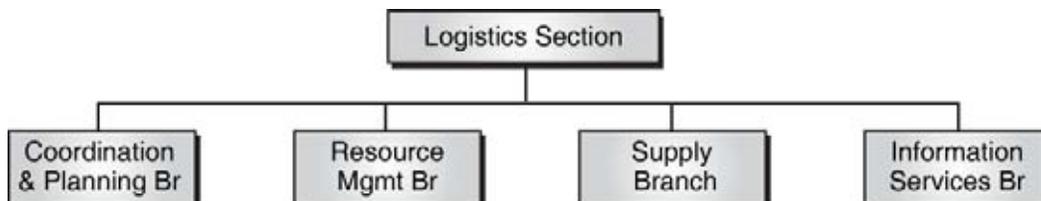
Figure 9. Notional JFO Operations Section Structure



(3) The subordinate structure of the JFO Planning Section and the Finance/Administration Section will likely have the same titles as those of the accident site ICS. As with the other JFO functional Sections, the focus is broader, at a higher level, and in support of the JFO Coordination Group.

(4) The JFO Logistics Section coordinates logistics support that includes control and accountability for Federal supplies and equipment; resource ordering; delivery of equipment, supplies, and services to the JFO and other field locations; facility location, setup, space management, building services, and general facility operations; transportation coordination and fleet management services; information and technology systems services; administrative services such as mail management and reproduction; and customer assistance. The Logistics Section may include the branches of Coordination and Planning, Resource Management, Supply, and Information Services Branches. Figure 10. shows a notional JFO Logistics Section structure that includes these organizations.

Figure 10. Notional JFO Logistics Section Organizational Structure



TAB A. JFO INCIDENT ACTION PLAN

SITREP #1				
Date/Time (EST)				
Incident Type:				
Location of Incident:				
Time of Incident (EST):				
Incident Site	<u>Location</u>	<u>Current</u>	<u>24 hours</u>	<u>48 hours</u>
Weather Conditions:				

Threat Levels	
COOP COGCON	
Homeland Security Advisory System (HSAS)	
Maritime Security Level (MARSEC)	
DoD Force Protection Condition (FPCON)	

Threat Assessment and Operational/Investigative Operations	
Intelligence Assessment/Update	
Technical Assessment/Update	
Counter-terror/Law Enforcement Operations Status/Update (non-ESF 13)	

Status of Federal Decisions and National-level Operational Elements	
Presidential Emergency/Disaster Declarations (Stafford Act)	
Principle Federal Official Status	
Joint Field Office Status	

Federal Radiological Monitoring and Assessment Center Status	
Catastrophic Incident Supplement Status	

Current Situation/Summary

Modeling

On-Scene Update	
<u>Official Casualties/Relief Effort</u>	
Fatalities	
Hospitalized	
Injured	
Sheltered	
<u>Extent of Damage</u>	
Destroyed	
Major Damage	
Minor Damage	
Power Outages	

Federal and National Guard Personnel Deployed	
Organization	
USCG	
FEMA Responders	
Federal Law Enforcement (ESF-13)	
National Guard	
US Active Military Duty	
Health and Human Services (ESF-8)	

Federal Assets Deployed	
Asset	
DoD Rotary Wing	
USCG Rotary Wing	
CBP	
Other	
Total Rotary Wing	
DoD Fixed Wing	
USCG Fixed Wing	
CBP Fixed Wing	
Total Fixed Wing	
DoD Ships	
USCG Ships	
Total Ships	

Requests For Assistance/Emergency, Disaster, and Presidential Declarations		
<u>Status of Declarations</u>		
Date	Declaration	Remarks

Law Enforcement Security Issues (non-ESF operations)	
Borders and Coastal Waters	

Transportation		
Law Enforcement	Federal	
	Regional	
	Local	

Critical Infrastructure Issues/Operational Activities	
Sector Impacts	
Agriculture & Food	
Banking & Finance	
Chemical	
Commercial Facilities	
Commercial Nuclear Reactors, Materials and Waste	
Dams	
Defense Industrial Base	
Drinking Water & Water Treatment	
Emergency Services	
Energy	
Government Facilities	
Information Technology (IT)	
National Monuments and Icons	
Postal & Shipping	
Public Health and Healthcare	
Telecommunications	
Transportation Systems	
Cross-Sector Impacts	

Emergency Response Issues			
<u>Emergency Support Functions (ESF) 1-15</u>			
<u>FEMA</u>			
ESF-1 Transportation	Activated: JFO	RRCC	NRCC
ESF-2 Communications	Activated: JFO	RRCC	NRCC
ESF-3 Public Works and Engineering	Activated: JFO	RRCC	NRCC
ESF-4 Firefighting	Activated: JFO	RRCC	NRCC
ESF-5 Emergency Management	Activated: JFO	RRCC	NRCC
ESF-6 Mass Care, Housing and Human Services	Activated: JFO	RRCC	NRCC
<u>Shelter Numbers</u>			
State	Number of Shelters	Remarks	
Total			
ESF-7 Resource Support	Activated: JFO	RRCC	NRCC
ESF-8 Public Health and Medical Services	Activated: JFO	RRCC	NRCC
ESF-9 Urban Search and Rescue	Activated: JFO	RRCC	NRCC
ESF-10 Oil and Hazardous Materials Response	Activated: JFO	RRCC	NRCC
ESF-11 Agriculture and Natural Resources	Activated: JFO	RRCC	NRCC
ESF-12 Energy	Activated: JFO X	RRCC X	NRCC X
ESF-13 Public Safety and Security	Activated: JFO X	RRCC X	NRCC X

FEMA Safety	Activated: JFO	RRCC	NRCC

ESF-14 Long-Term Community Recovery	Activated: JFO	RRCC	NRCC

Mitigation	Activated: JFO	RRCC	NRCC

ESF-15 External Affairs	Activated: JFO	RRCC	NRCC

Emergency Management Assistance Compact (EMAC)

Department of Defense (DoD)

Potential Additional Future Federal Responses Anticipated

Non-Governmental Assets Currently Not Addressed in ESF 6 (Type/Number)

International Issues

Joint Information Dissemination/Public Affairs Plan and/or Releases

Donations Activities

Additional Remarks

INTER-DOD FUNCTIONAL ANNEX

1. GENERAL. HSPD-5 and the NRF assign overall incident management responsibilities to DHS and the Nuclear/Radiological Incident Annex of the NRF identifies the Department of Defense as the Coordinating Agency for domestic accidents involving nuclear weapons in DoD custody. In accordance with the NRF Nuclear/Radiological Incident Annex, DHS may designate the Coordinating Agency to lead the Federal response in nuclear weapon accidents. This appendix summarizes the responsibilities of Federal agencies that provide support when the Department of Defense leads the Federal response, briefly describes the 15 Emergency Support Functions that provide the structure for coordinating Federal interagency support, and sketches the responsibilities of government entities below Federal level, as well as the responsibilities of NGOs and the private sector.

Table 1. Organizations with Cooperating Agency Responsibilities

Department of Agriculture	Department of Commerce
Department of Energy	Department of Health & Human Services
Department of Homeland Security	Department of Housing & Urban Development
Department of the Interior	Department of Justice
Department of Labor	Department of Transportation
Department of Veterans Affairs	Environmental Protection Agency
Department of State	Nuclear Regulatory Commission
General Services Administration	American Red Cross

2. COOPERATING AGENCY RESPONSIBILITIES. The Cooperating Agencies listed in Table 1. provide support for the DoD lead, and their responsibilities are summarized below. A detailed listing of the responsibilities of the Coordinating and Cooperating Agencies can be found in the NRF Nuc/Rad Incident Annex.

a. Department of Agriculture.

(1) Inspects meat and meat products, poultry and poultry products, and egg products identified for interstate and foreign commerce to ensure that they are safe for human consumption.

(2) Assists, in conjunction with HHS, in monitoring the production, processing, storage, and distribution of food through the wholesale level to eliminate contaminated product or to reduce the contamination in the product to a safe level.

(3) Collects agricultural samples within the Ingestion Exposure Pathway Emergency Planning Zone (through the FRMAC). Assists in the evaluation and assessment of FRMAC data to determine the impact of the accident on agriculture.

(4) Assesses damage to crops, soil, livestock, poultry, and processing facilities; and incorporates findings in a damage assessment report.

(5) Provides emergency communications assistance to the agricultural community through the State Research, Education, and Extension Services electronic mail, or other USDA telecommunications systems.

(6) Supports/advises on decontamination and screening of pets and farm animals that may be exposed to radioactive material.

(7) Assists in animal carcass disposal.

b. Department of Commerce.

(1) Provides operational weather observations and prepares forecasts tailored to support emergency accident management activities.

(2) Provides plume dispersion assessment and forecasts to the IMAAC and/or Coordinating Agency, in accordance with established procedures.

(3) Archives, as a special collection, the meteorological data from national observing and numerical weather analysis and prediction systems applicable to the monitoring and assessment of the response.

(4) Ensures that marine fishery products available to the public are not contaminated.

(5) Provides assistance and reference material for calibrating radiological instruments.

(6) Provides radiation shielding materials.

(7) Serves as the agent for informing international hydro-meteorological services and associated agencies through the mechanisms afforded by the World Meteorological Organization (in the event of materials potentially crossing international boundaries).

(8) Provides radio-analytical measurement support and instrumentation.

c. Department of Energy.

(1) Coordinates Federal offsite radiological environmental monitoring and assessment activities as the lead technical organization in the FRMAC (emergency phase), regardless of who is designated the Coordinating Agency.

(2) Maintains technical liaison with State and local agencies with monitoring and assessment responsibilities.

(3) Maintains a common set of all offsite radiological monitoring data in an accountable, secure, and retrievable form and ensures the technical integrity of FRMAC data.

(4) Provides monitoring data and interpretations, including exposure rate contours, dose projections, and any other requested radiological assessments to the Coordinating Agency and to the States.

(5) Provides, in cooperation with other Federal agencies, the personnel and equipment to perform radiological monitoring and assessment activities and provides on-scene analytical capability supporting assessments.

(6) Requests supplemental assistance and technical support from other Federal agencies as needed.

(7) Arranges consultation and support services through appropriate Federal agencies to all other entities (e.g., private contractors) with radiological monitoring functions and capabilities and technical and medical expertise for handling radiological contamination and population monitoring.

(8) Works closely with the Senior EPA representative to facilitate a smooth transition of the Federal radiological monitoring and assessment coordination responsibility to EPA at a mutually agreeable time and after consultation with the State and Coordinating Agency.

(9) Provides, in cooperation with other Federal and State agencies, personnel and equipment, including portal monitors, to support initial external screening and provides advice and assistance to State and local personnel conducting screening/decontamination of persons leaving a contaminated zone.

(10) Provides plume trajectories and deposition projections for emergency response planning assessments, including source term estimates where limited or no information is available to the IMAAC and/or Coordinating Agency, in accordance with established procedures.

(11) Upgrades, maintains, coordinates, and publishes documentation needed for the administration, implementation, operation, and standardization of the FRMAC.

(12) Maintains and improves the ability to provide wide-area radiation monitoring now resident in the AMS.

(13) Maintains and improves the ability to provide medical assistance, advisory teams, and training related to nuclear/radiological accidents and incidents now resident in the REAC/TS.

(14) Maintains and improves the ability to provide near-real time assessments of the consequences of accidental or potential radiation releases by modeling the movement of hazardous plumes and to correct modeled results through integration of actual radiation measurements obtained from both airborne and ground sources, resident in the NARAC. The NARAC also maintains and improves their ability to model the direct results (blast, thermal, radiation, EMP) of a nuclear detonation.

(15) Maintains and improves the first-response ability to assess an emergency situation and to advise decision makers on what further steps can be taken to evaluate and minimize the hazards of a radiological emergency resident in the RAP.

(16) Maintains and improves the ability to respond to an emergency involving U.S. nuclear weapons through the ARG.

(17) Maintains and improves the ability of the Consequence Management Planning Team, CMHT, and CMRTs to provide initial planning, coordination, and data collection and assessment prior to or in lieu of establishment of a FRMAC.

(18) Assigns a SEO for any response involving the deployment of the DOE/NNSA emergency response assets. The SEO is responsible for the coordination and employment of these assets at the scene of a nuclear weapon accident, and the deployed assets will work in support of and under the direction of the SEO.

d. Department of Health and Human Services.

(1) In conjunction with USDA, inspects production, processing, storage, and distribution facilities for human food and animal feeds that may be used in interstate commerce to ensure protection of the public health.

(2) Collects samples of agricultural products to monitor and assess the extent of contamination as a basis for recommending or implementing protective actions (through the FRMAC).

(3) Provides advice on proper medical treatment of the general population and response workers exposed to or contaminated by radioactive materials.

(4) Provides available medical countermeasures through deployment of the Strategic National Stockpile.

(5) Provides assessment and treatment teams for those exposed to or contaminated by radiation.

(6) Provides advice and guidance in assessing the impact of the effects of nuclear weapon accidents on the health of persons in the affected area.

(7) Manages long-term public monitoring and supports follow-on personal data collection, collecting and processing of blood samples and bodily fluids/matter samples, and giving advice concerning medical assessment and triage of victims. Tracks victim treatment and long-term health effects.

e. Department of Homeland Security. The Homeland Security Act of 2002 establishes DHS to prevent terrorist attacks within the United States; reduce the vulnerability of the United States to terrorism, natural disasters, and other emergencies; and minimize the damage and assist in the recovery from terrorist attacks, natural disasters, and other emergencies. The act also designates DHS as “a focal point regarding natural and manmade crises and emergency planning.” The Secretary of Homeland Security determines the extent of DHS involvement for domestic nuclear weapon accidents.

(1) Emergency Preparedness and Response/Federal Emergency Management Agency.

(a) In consultation with the Coordinating Agency, coordinates the provision of Federal resources and assistance to affected SLT governments under the Stafford Act or Federal-to-Federal support provisions of the reference (c).

(b) Monitors the status of the Federal response to requests for assistance from the affected State(s) and provides this information to the State(s).

(c) Keeps the Coordinating Agency informed of requests for assistance from the State(s) and the status of the Federal response.

(d) Identifies and informs Federal agencies of actual or apparent omissions, redundancies, or conflicts in response activity.

(e) Establishes and maintains a source of integrated, coordinated information about the status of all non-radiological resource support activities.

(f) Provides other support to Federal agencies responding to the emergency.

(2) National Communications System. Acting through its operational element, the National Coordinating Center for Telecommunications (NCC), the NCS ensures the provision of adequate telecommunications support to nuclear weapon accident response operations.

(3) Science and Technology. Provides coordination of Federal science and technology resources as described in the Science and Technology Support Annex. This includes organization of Federal S&T support, as well as assessment and consultation in the form of Scientific and Technical Advisory and Response Teams (STARTs) and the IMAAC.

(4) U.S. Coast Guard (USCG). For incidents that have cross-boundary impacts, works with the other affected agency to determine how best to cooperatively respond consistent with the NCP model. Because of its unique maritime jurisdiction and capabilities, is prepared to provide appropriate security, command and control, transportation, and support to other agencies that need to operate in the maritime domain.

f. Department of Housing and Urban Development.

(1) Reviews and reports on available housing for disaster victims and displaced persons.

(2) Assists in planning for and placing homeless victims in available housing.

(3) Provides staff to support emergency housing within available resources.

(4) Provides housing assistance and advisory personnel.

g. Department of the Interior.

(1) Advises and assists in evaluating processes affecting radioisotopes in soils, including personnel, equipment, and laboratory support.

(2) Advises and assists in the development of geographic information systems databases to be used in the analysis and assessment of contaminated areas, including personnel and equipment.

(3) Advises and assists in assessing and dealing with impacts to natural resources, including fish and wildlife, subsistence uses, public lands, Indian tribal lands, land reclamation, mining, minerals, and water resources. Further guidance is provided in the Tribal Relations Support Annex and the ESF #11 – Agriculture and Natural Resources Annex of reference (c).

(4) Provides liaison between Federally recognized tribal governments and Federal, State, and local agencies for coordination of response activities. Additionally, the department advises and assists DHS on economic, social, and political matters in the U.S. insular areas should a radiological incident occur in these areas.

h. Department of Justice/Federal Bureau of Investigation. Coordinates all law enforcement and criminal investigative response to acts of terrorism to include: intelligence gathering, hostage negotiations, and tactical operations. Further details regarding the FBI response are outlined in the Terrorism Incident Law Enforcement and Investigation Annex of reference (c) as well as Enclosure 2, section 5 of DoD 3150.08-M.

i. Department of Labor/Occupational Safety and Health Administration. Provides advice and technical assistance to DHS, the Coordinating Agency, and State, local and tribal governments concerning the health and safety of response workers implementing the policies and concepts in this reference. Where this is a conflict between OSHA standards and those of other agencies, the Safety Officer (see section 2.b.(6) of the ICS Functional page) will dictate the appropriate standards to apply.

j. Department of State.

(1) Coordinates foreign information-gathering activities and all contacts with foreign governments, except in cases where existing bilateral agreements permit direct agency-to-agency cooperation.

(2) Conveys the U.S. Government response to foreign offers of assistance.

k. Department of Transportation. Provides technical advice and assistance on the transportation of radiological materials and the impact of the incident on the transportation infrastructure.

l. Department of Veterans Affairs.

(1) Provides medical assistance using the Medical Emergency Radiological Response Team.

(2) Provides temporary housing.

m. Environmental Protection Agency.

(1) Provides resources, including personnel, equipment, and laboratory support (including mobile laboratories) to assist DOE in monitoring radioactivity levels in the environment.

(2) Assumes coordination of Federal radiological monitoring and assessment responsibilities after the transition from the Department of Defense or DOE.

(3) Assists in the development and implementation of a long-term monitoring plan and long-term recovery plan.

(4) Provides nationwide environmental monitoring data from the Environmental Radiation Ambient Monitoring Systems for assessing the national impact of the accident.

(5) Develops Protective Action Guides in coordination with the Federal Radiological Preparedness Coordinating Committee (FRPCC).

(6) Recommends protective actions and other radiation protection measures for the public and emergency responders.

(7) Recommends acceptable emergency levels of radioactivity and radiation in the environment.

(8) Prepares health and safety advice and information for the public.

(9) Estimates effects of radioactive releases on human health and the environment.

(10) Provides response and recovery actions to prevent, minimize, or mitigate a threat to public health, safety, or the environment caused by actual or potential releases of radioactive substances, including actions to detect, identify, contain, clean up, and dispose of such substances.

(11) Assists and supports the NIRT, when activated.

(12) Provides, in cooperation with other Federal agencies, the law enforcement personnel and equipment to conduct law enforcement operations and investigations for nuclear weapon accident involving criminal activity that are not terrorism related.

n. General Services Administration. See ESF #7, reference (c).

o. National Aeronautics and Space Administration. Serves as a Coordinating Agency for incidents involving space craft.

p. Nuclear Regulatory Commission.

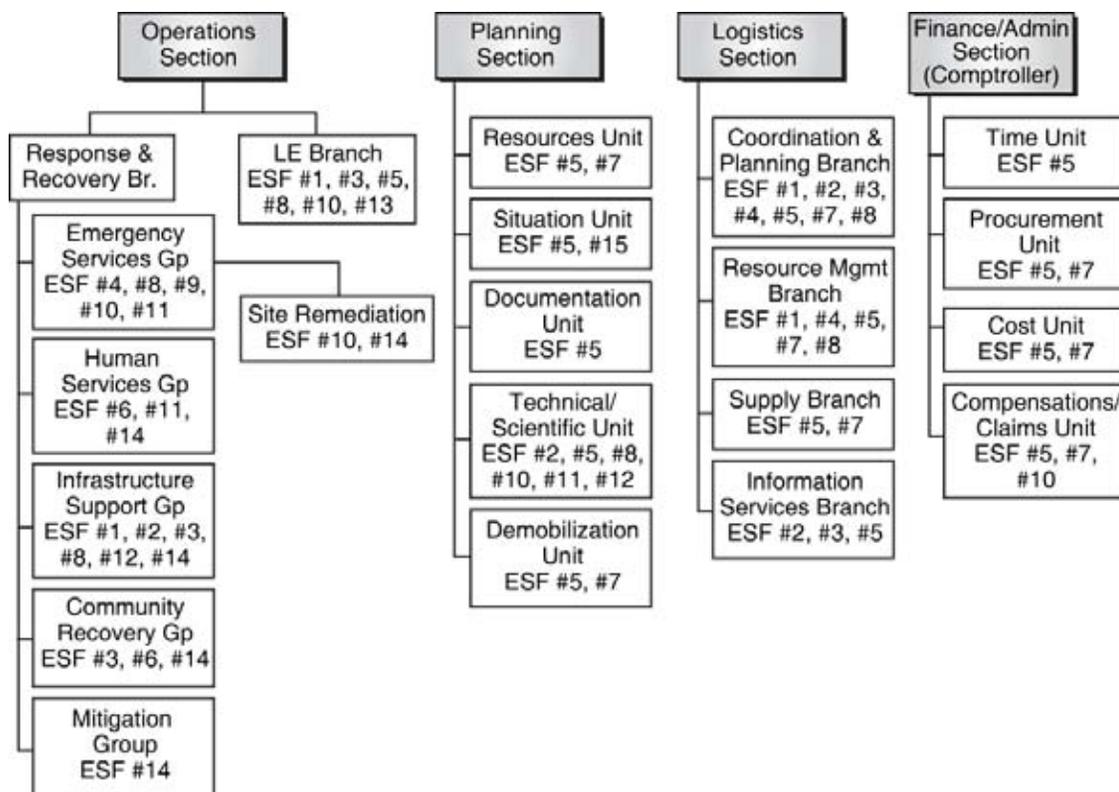
(1) Provides technical assistance to include source term estimation, plume dispersion, and dose assessment calculations.

(2) Provides assistance in Federal radiological monitoring and assessment activities.

q. American Red Cross. Assesses the mass care consequences of a nuclear weapon accident, and in conjunction with State, local, and tribal mass care organizations, develops and implements a sustainable short-term and long-term strategy for effectively addressing the consequences of the accident.

3. **EMERGENCY SUPPORT FUNCTIONS (ESFS).** The ESFs provide the structure for coordinating Federal interagency support for accidents requiring Federal coordination. The ESF structure includes mechanisms used to provide Federal support to States and Federal-to-Federal support, both for declared disasters and emergencies under the Stafford Act and for non-Stafford Act incidents. This structure also provides the mechanisms for interagency coordination during all phases of accident management. Some departments and agencies provide resources for response, support, and program implementation during the early stage of an accident, while others are more prominent in the recovery phase. The 15 ESFs are briefly described below. A sample placement of the ESFs within the JFO is at Figure 1. For a detailed discussion of each ESF, consult the NRF Emergency Support Function Annexes.

Figure 1. JFO Sections with Emergency Support Functions



- a. **ESF #1 – Transportation.** Provides transportation support to assist in domestic nuclear weapon accident management.
- b. **ESF #2 – Communications.** Provides Federal communications support to Federal, State, local, tribal, and private-sector response efforts.
- c. **ESF #3 – Public Works and Engineering.** Provides public works and engineering-related support for the changing requirements of domestic nuclear weapon accident management to include preparedness, prevention, response, recovery, and mitigation actions.

d. ESF #4 – Firefighting. Manages and coordinates firefighting activities, including the detection and suppression of fires on Federal lands, and provides personnel, equipment, and supplies in support of State, local, and tribal agencies involved in rural and urban firefighting operations.

e. ESF #5 – Emergency Management. Serves as the support ESF for all Federal departments and agencies across the spectrum of domestic incident management from prevention to response and recovery.

f. ESF #6 – Mass Care, Emergency Assistance, Housing, and Human Services. Promotes the delivery of services and the implementation of programs to assist individuals, households, and families impacted by a nuclear weapon accident requiring Federal coordination.

g. ESF #7 – Logistics Management and Resource Support. Consists of emergency relief supplies, facility space, office equipment, office supplies, telecommunications, contracting services, transportation services (in coordination with ESF #1—Transportation), security services, and personnel required to support immediate response activities for Federal, State, local, and tribal governments.

h. ESF #8 – Public Health and Medical Services. Provides the mechanism for coordinated Federal assistance to supplement SLT resources in response to public health and medical care needs (to include veterinary and/or animal health issues when appropriate).

i. ESF #9 – Search and Rescue. Rapidly deploys components of the National Urban Search and Rescue Response System to provide specialized life-saving assistance to SLT authorities.

j. ESF #10 – Oil and Hazardous Materials Response. Provides Federal support in response to an actual or potential discharge and/or uncontrolled release of oil or hazardous materials.

k. ESF #11 – Agriculture and Natural Resources. Supports SLT authorities and other Federal agency efforts to address: 1.) provision of nutrition assistance; 2.) control and eradication of an outbreak of a highly contagious or economically devastating animal/zoonotic disease, highly infective exotic plant disease, or economically devastating plant pest infestation; 3.) assurance of food safety and food security (under Department of Agriculture jurisdictions and authorities); and 4.) protection of natural and cultural resources and historic properties.

l. ESF #12 – Energy. Restores damaged energy systems and components.

m. ESF #13 – Public Safety and Security. Provides a mechanism for coordinating and providing Federal-to-Federal support or Federal support to State and local authorities to include non-investigative/non-criminal law enforcement, public safety, and security capabilities and resources.

n. ESF #14 – Long-Term Community Recovery. Provides a framework for Federal Government support to State, regional, local, and tribal governments, nongovernmental organizations (NGOs), and the private sector designed to enable community recovery from the long-term consequences of a nuclear weapon accident.

o. ESF #15 – External Affairs. Coordinates Federal actions to provide the required external affairs support to Federal, State, local, and tribal incident management elements.

4. STATE, LOCAL, AND TRIBAL (SLT) RESPONSIBILITIES.

a. State Responsibilities. The United States is a federation of sovereign entities or commonwealths with specific roles and responsibilities (see Enclosure 2, section 1. of DoD 3150.08-M)¹. This fact was first espoused in Article II of the Articles of Confederation, and later carried forth in the U.S. Constitution, namely with the Tenth Amendment. Although court decisions have shifted the original dual Federalism concept set forth in the Articles of Confederation to one of cooperative Federalism where the Federal government is a strong central authority, each of the States still retain certain inalienable powers. One of these powers is the State's responsibility to ensure the public safety and welfare of the people of the State. Oversight of this responsibility lays with the State's chief executive -- the Governor. To fulfill this responsibility, the Governor:

(1) Coordinates State resources to address the full spectrum of actions to prevent, prepare for, respond to, and recover from incidents in an all-hazards context to include terrorism, natural disasters, incidents, and other contingencies.

(2) Under certain emergency conditions, typically has police powers to make, amend, and rescind orders and regulations.

(3) Provides leadership and plays a key role in communicating to the public and in helping people, businesses, and organizations cope with the consequences of any type of declared emergency within State jurisdiction.

(4) Encourages participation in mutual aid and implements authorities for the State to enter into mutual aid agreements with other States, tribes, and territories to facilitate resource-sharing.

(5) Is the Commander-in-Chief of State military forces (National Guard when in State Status and the authorized State militias).

(6) Requests Federal assistance when it becomes clear that State or tribal capabilities will be insufficient or have been exceeded or exhausted.

b. Local Responsibilities. Individual States are composed of several local political units or jurisdictions (cities, towns, villages, and counties). Whereas a State is a sovereign entity, a local political unit is normally subordinated to the State in which it lies; the laws of individual States refine this status. However, much like a State, each jurisdiction is responsible for the public safety and welfare of the people of that jurisdiction. The Chief Executive Officer for the local level can be a mayor or city or county manager. In executing his responsibilities, the local Chief Executive Officer:

¹ This includes the District of Columbia.

(1) Is responsible for coordinating local resources to address the full spectrum of actions to prevent, prepare for, respond to, and recover from incidents involving all hazards including terrorism, natural disasters, incidents, and other contingencies.

(2) Dependent upon State and local law, has extraordinary powers to suspend local laws and ordinances, such as to establish a curfew, direct evacuations, and, in coordination with the local health authority, to order a quarantine.

(3) Provides leadership and plays a key role in communicating to the public and in helping people, businesses, and organizations cope with the consequences of any type of domestic incident within the jurisdiction.

(4) Negotiates and enters into mutual aid agreements with other jurisdictions to facilitate resource-sharing.

(5) Requests State and, if necessary, Federal assistance through the Governor of the State when the jurisdiction's capabilities have been exceeded or exhausted.

c. Tribal Responsibilities. From its earliest days, the United States has recognized the sovereign status of Native American or Indian tribes as domestic dependent nations. The U.S. Constitution recognizes Indian sovereignty by classing Indian treaties among the "supreme law of the land," and establishes Indian affairs as a unique area of Federal concern. In early Indian treaties, the United States pledged to "protect" Indian tribes, thereby establishing one of the bases for the Federal trust responsibility in our government-to-government relations with Indian tribes. These principles continue to guide our national policy towards Native American tribes.² These principles were reaffirmed on November 6, 2000, with Presidential Executive Order 13175 - Consultation and Coordination with Indian Tribal Governments. Much like State and local entities have Chief Executives, so do tribal governments. In this capacity, the Tribal Chief Executive Office is responsible for the public safety and welfare of the people of that tribe. To fulfill these responsibilities, the Tribal Chief Executive Officer, as authorized by the tribal government:

(1) Is responsible for coordinating tribal resources to address the full spectrum of actions to prevent, prepare for, respond to, and recover from incidents involving all hazards including terrorism, natural disasters, incidents, and other contingencies.

(2) Has extraordinary powers to suspend tribal laws and ordinances, such as to establish a curfew, direct evacuations, and order a quarantine.

(3) Provides leadership and plays a key role in communicating to the tribal nation and in helping people, businesses, and organizations cope with the consequences of any type of domestic incident within the jurisdiction.

(4) Negotiates and enters into mutual aid agreements with other tribes/jurisdictions to facilitate resource-sharing.

(5) Can request State and Federal assistance through the Governor of the State when the tribe's capabilities have been exceeded or exhausted.

² <http://www.usdoj.gov/ag/readingroom/sovereignty.htm>

(6) Can elect to deal directly with the Federal Government. (Although a State Governor must request a Presidential disaster declaration on behalf of a tribe under the Stafford Act, Federal agencies can work directly with the tribe within existing authorities and resources.)

5. NON-GOVERNMENTAL ORGANIZATIONS. NGOs are non-profit entities that are based upon the interests of its members, individuals, or institutions. They are not created by a government, but do serve a public purpose, not a private benefit. NGOs collaborate with first responders, governments at all levels, and other agencies and organizations providing relief services to sustain life, reduce physical and emotional distress, and promote recovery of disaster victims when assistance is not available from other sources.

a. American Red Cross. The ARC is an NGO that provides relief at the local level and also coordinates the Mass Care element of ESF #6. For a nuclear weapon accident, the ARC assesses the mass care consequences of a radiological incident, and in conjunction with State, local, and tribal (including private-sector) mass care organizations, develops and implements a sustainable short-term and long-term strategy for effectively addressing the consequences of the incident.

b. Community-based organizations (CBOs). CBOs receive government funding to provide essential public health services. The National Voluntary Organizations Active in Disaster (NVOAD) is a consortium of more than 30 recognized national organizations of volunteers active in disaster relief. Such entities provide significant capabilities to incident management and response efforts at all levels. For example, the wildlife rescue and rehabilitation activities conducted during a pollution emergency, such as a nuclear weapon accident, may be carried out by private, nonprofit organizations working with natural resource trustee agencies.

6. PRIVATE SECTOR. The private sector is more involved in planning and prevention than in the actual response to an accident. However, the relationships established between the Federal government and the private sector is invaluable during an actual accident. DHS uses a private sector advisory group to provide advice on incident management and emergency response issues. This advice assists the private sector if a nuclear weapon accident occurs. The roles, responsibilities, and participation of private sector organizations vary depending upon the nature of the private sector organization.

a. Impacted Organization or Infrastructure. Private-sector organizations may be affected by direct or indirect consequences of a nuclear weapon accident, including privately owned critical infrastructure, key resources, and those main private-sector organizations that are significant to local, regional, and national economic recovery from the accident. Examples of privately owned infrastructure include transportation, telecommunications, private utilities, financial institutions, and hospitals.

b. Response Resource. Private-sector organizations provide response resources (donated or compensated) during an incident—including specialized teams, equipment, and advanced technologies—through local public-private emergency plans, mutual aid agreements, or incident specific requests from government and private-sector-volunteered initiatives.

c. State/Local Emergency Organization Member. Private-sector organizations may serve as an active partner in local and State emergency preparedness and response organizations and activities.

NOTIONAL ACCIDENT SITE

1. GENERAL

a. Effective nuclear weapon accident response will rely heavily upon the response force footprint at and around the accident site. While responding forces clearly will not have the luxury of dictating where the accident occurs, leadership may have some flexibility in determining the location of key facilities they will use in managing response activities. The paragraphs that follow are designed as considerations for leadership to use in determining facility and activity locations. **These considerations are intended as a guide – not requirements; the differences and dynamics of each nuclear weapon accident may render them moot. The actual accident site set up is situational and will be determined by the Incident Commander or Unified Command.**

2. JURISDICTION. In determining the appropriateness of establishing a National Defense Area (NDA), the DoD IC must consider the jurisdiction where the nuclear weapon accident occurs and where any classified residue may be located. The jurisdiction will determine the authority the DoD Incident Commander (IC) has in conducting and commanding tactical accident management activities. If the jurisdiction does not provide the DoD IC the authority to manage the accident response operation, an NDA should be established. At the onset of all response operations, the DoD IC should work closely with legal advisors to determine relevant jurisdiction and authorities. Further, the status of local mutual aid agreements should also be evaluated. Jurisdiction is the power, right, or authority to interpret and apply (enforce) the law. Jurisdiction typically falls into one of three categories: exclusive, concurrent, or proprietary. In a nuclear weapon accident, the type of jurisdiction at the accident site will determine the relationship between DoD and other officials (Federal, State, local, and tribal) who may also have jurisdictional equities. Since a domestic accident site, either on or off a DoD installation, may potentially fall under any of the three types of jurisdiction, it is imperative that the DoD IC know the type of jurisdiction in effect. Similarly, the DOE will have exclusive jurisdiction within the boundaries of a declared National Security Area (NSA).

a. Exclusive Jurisdiction. In designated areas under exclusive jurisdiction, a single government (Federal, State, local, or tribal) has sole jurisdiction over the area. Many DoD installations have exclusive Federal jurisdiction. On those installations, the Federal government exercises executive, legislative, and judicial authority. To facilitate exclusive jurisdiction and to avoid the difficult task of enacting and maintaining a code of criminal laws appropriate for areas under its jurisdiction, Congress passed Title 18, Assimilated Crimes Act, *United States Code*, Section 13. This statute provides that all acts or omissions occurring in an area under Federal jurisdiction, which would constitute crimes if the area were under the State jurisdiction, shall constitute similar crimes, similarly punishable, under Federal law¹. On exclusive jurisdiction DoD installations, the DoD IC shall have sole authority over the accident site. Outside the boundaries of a DoD installation, DoD will have exclusive jurisdiction within the boundaries of a declared NDA but will rarely have exclusive jurisdiction outside the NDA.

¹ http://www.tpub.com/content/USMC/mcwp3341/css/mcwp3341_29.htm

b. Concurrent Jurisdiction. In areas under concurrent jurisdiction, multiple governments (e.g., Federal and State or local governments) exercise simultaneous authority over the area. Essentially, this is dual jurisdiction. Under concurrent jurisdiction, State criminal laws are applicable in the area and can be enforced by the State as well as the Federal Government under the Assimilated Crimes Act (reference (ah)).² In nuclear weapon accident situations, both on and off DoD installations, where concurrent jurisdiction applies, the DoD IC must work with State, local, and tribal civil authorities and conduct collective accident management activities. An NDA will normally be established in an accident outside the boundaries of a DoD installation. It may also be necessary to establish an NDA if the accident is inside the boundaries of a DoD installation to ensure proper safeguarding of classified components and materials. In an accident that is within the boundaries of a DoD installation, the DoD IC should consult with local military legal professionals to determine the advisability of establishing and declaring an NDA.

c. Proprietary Jurisdiction. Proprietary jurisdiction applies in situations where a government entity has ownership of an area but has not retained jurisdiction. Under these circumstances, the owning government entity has the same rights as any other landowner. The State, local, or tribal government retains jurisdiction over the area and has the authority to enforce laws in the area. The Assimilated Crimes Act does not apply to areas of Federal proprietary jurisdiction. In such areas, military police exercise authority in compliance with the instructions of the appropriate commander.³ In a nuclear weapon accident on Federal land under proprietary jurisdiction, the DoD IC can be held liable for issues involving law enforcement activities. Although very few installations fall into this category, if a nuclear weapon accident occurs in an area where the DoD has proprietary jurisdiction, the DoD IC should establish an NDA and a Unified Command relationship with designated officials from the agencies with jurisdictional authority (see Enclosure 2, paragraph 2.c.(1)(b) of DoD 3150.08-M).

3. SPECIFIC REQUIREMENTS. Figure 1. diagrams a notional accident site and assumes the NDA perimeter is synonymous with the inner perimeter of the accident site; in an actual situation, this may or may not be the case. The main point to consider when determining the location of each activity is to reduce, to the maximum extent possible, the number of people in close proximity to the accident site. This action will minimize the exposure to hazards of those involved in the accident response and aid in maintaining the integrity of the accident site for any subsequent investigation.

a. The initial size of the accident site will be driven in large part by the fragmentation distance(s) associated with the involved weapon(s). The fragmentation distance is a calculated distance within which 95% of the debris from a detonation of the conventional high explosive charge is expected to be contained. A nominal distance of 770 meters has been selected on which to base initial accident site considerations. Fragmentation distance impacts initial site setup in two ways. First, if there are essentially intact weapon(s) which are not yet rendered safe, it is the distance over which debris (including classified parts) could be thrown in the event of a subsequent detonation of the conventional high explosive. Second, if there has already been a detonation of the conventional explosives in an involved weapon, it is the distance within which hazardous debris and classified parts from that detonation are expected to be found. Therefore, the fragmentation distance serves both as a safety buffer for the exclusion of all non-essential

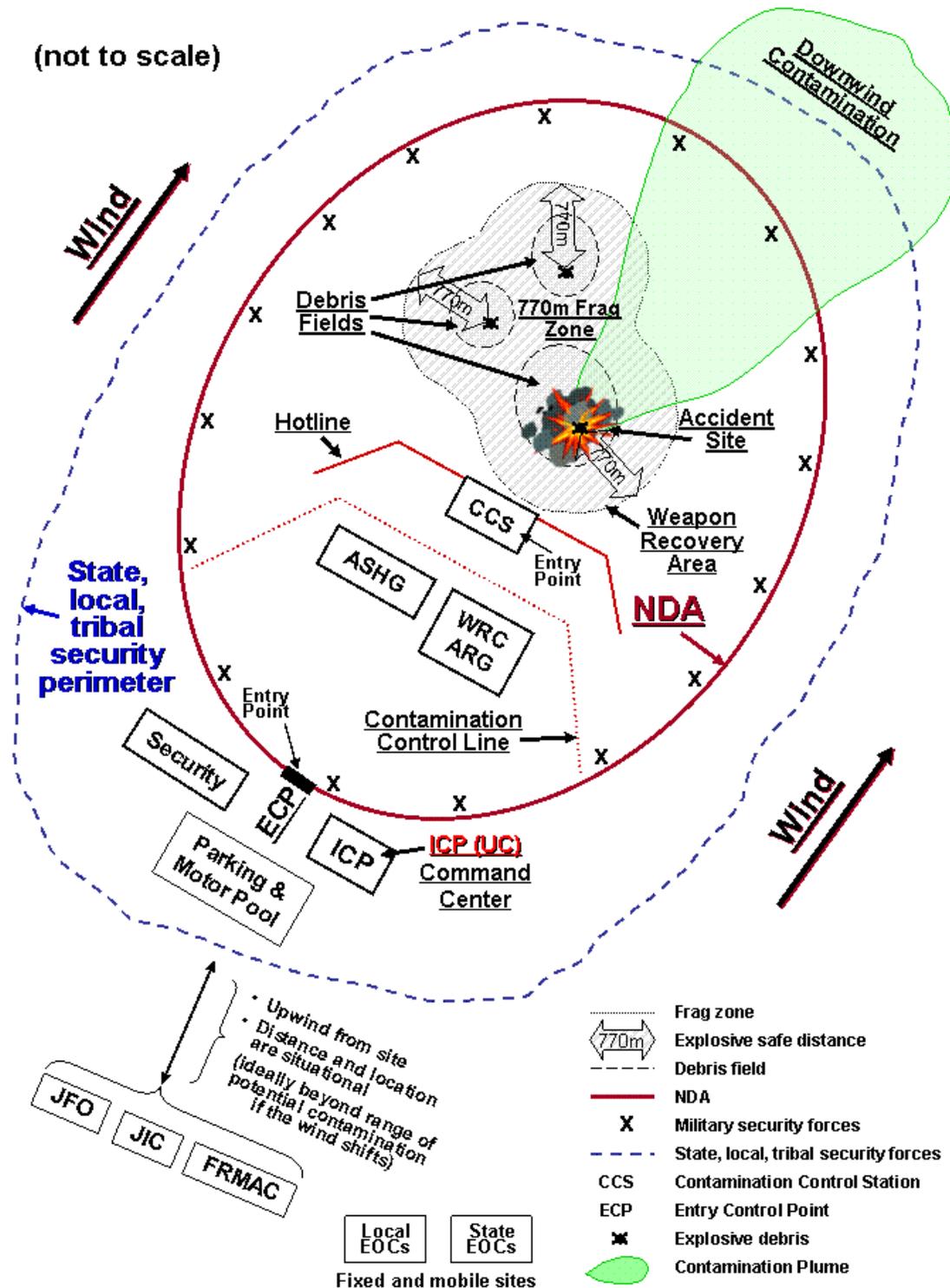
² http://www.tpub.com/content/USMC/mcwp3341/css/mcwp3341_29.htm

³ http://www.tpub.com/content/USMC/mcwp3341/css/mcwp3341_29.htm

personnel until the risk of further explosive hazard is mitigated and as the basis for establishing an NDA until all associated classified components that could have been thrown over this distance have been accounted for. In the case of a multiple-weapon scenario, a 770-meter fragmentation zone should be determined from the center of each intact weapon and from each site of detonation (as applicable) and a composite perimeter established which encompasses all of the individual zones. Within this perimeter, EOD escort should be required until hazards are identified and flagged and safe routes for working within the perimeter are identified. The complete fragmentation zone will be within the confines of the NDA. As hazards are made safe over the course of the nuclear weapon accident response operation, this zone is expected to shrink dramatically. As classified materials and government property are identified and retrieved, it is expected that the NDA would also shrink accordingly. No permanent facilities for the accident response operation should be established within a fragmentation zone. The outermost perimeter of the fragmentation zone is considered the initial hot line. It is clearly possible for contamination to extend beyond the boundary of either the fragmentation zone or the NDA in the downwind direction. It is also likely that, as the extent of contamination is assessed, some areas within the fragmentation zone or NDA may be determined to be uncontaminated and released from radiological controls.

b. On the upwind side of the fragmentation zone, a CCS will be created; it will be located on the hot line. The CCS must be portable in nature to facilitate rapid relocation should an unexpected shift in wind direction occur. All personnel moving into the accident site will pass through the CCS.

Figure 1. Notional Nuclear Weapon Accident Site



c. It is possible that contamination could spread outside the NDA/NSA. In this case, ensure sentries minimize their exposure time; further, these personnel should have the appropriate protective gear. Minimize the number of people needed within the contaminated area; for those required in the contaminated area, minimize their exposure time.

d. Located 100 meters upwind beyond the extent/spread of the known or suspected radiological contamination, a CCL is established. Immediately outside (side away from the accident site) of the CCL, the ASHG, the ARG, and the Weapons Recovery Center (WRC) will be established. These activities will be directly involved with monitoring radiation and contamination levels, as well as the actual recovery of the weapon. Thus, they must be located in a position as close to, but as safe as possible, with respect to the accident site. While there is no prohibition against conducting these functions in a permanent facility, the ability to rapidly relocate should the wind shift must be maintained.

e. All of the above functions are located within the NDA (in a DoD custody accident) or the NSA (in a DOE custody accident). Located on the perimeter of the NDA/NSA is the Entry Control Point (ECP). All personnel en route to the accident site will transit the area through the ECP. To aid in personnel accountability, the use of an exchange badge system is ideal; if not possible, sign in/out logs should be used. As the military guard controlling entry through the ECP will be posted there for long periods of time, it is recommended the ECP have some type of phone communication (to include a cell phone with the “call waiting” function). As the ECP will receive many visitors, it is paramount an adequate parking plan be developed. Immediately adjacent to the ECP should be two activities – a security activity and the Incident Command Site.

(1) Security. The Security Activity is responsible for overseeing the security and integrity of the accident site. For accidents occurring outside of DoD exclusive jurisdiction areas, DoD security forces will rely on SLT officials to aid in securing the NDA. For this reason, representatives from each law enforcement and security agency should be present. While a large facility is not required, space for a security control desk with telephone and radio communication is a consideration. Other capabilities required for a security area are an evidence holding facility, a personnel holding area, and latrine facilities. Ideally, the facility will have room for small arms storage. In the case of a DOE custody accident, DOE security forces will be integrated into the Security Area.

(2) Incident Command Post. The ICP is the command center at the accident site. This facility must be large enough to handle all command activities at the accident site.

f. Away and upwind from the accident site, a location must be selected to house the JFO, the JIC, and the FRMAC. The facility should be located far enough away from the accident site to preclude relocating should the wind shift. As all of these functions are extremely large, all will require a large physical space. The facility should have good communications capability, adequate latrine facilities, and ample parking. Further, the facility should have close proximity to restaurants and other conveniences. The facility should have space for conferences, private office space, and several larger rooms for each of the JFO coordination activities outside the accident site.

4. AUTHORITY. The authority the DoD IC enjoys at and around the exercise site depends largely on the jurisdiction and the relationship enjoyed between the DoD IC and representatives from SLT organizations.

a. Inside the NDA. Within the confines of the legally established NDA, the DoD IC has absolute authority to enforce entry into the NDA, as well as the establishment and enforcement of regulations dealing with the safe and secure conduct of activities within the NDA. DoD ICs are cautioned to remember, however, that while the NDA is a Federal exclusive jurisdiction area, the NDA is likely surrounded by other jurisdictions. Prudence dictates the establishment and maintenance of harmonious relations.

b. Outside the NDA. Outside the perimeter of the NDA, the DoD IC has no authority over any civilian from a Federal, State, local, or tribal organization. Additionally, the DoD IC may have to rely on civilians to enforce the sanctity of the NDA. For this reason, the importance of a UC in the area of the accident site is crucial for the success of nuclear weapon accident response operations.

MANAGEMENT OF CONTAMINATED REMAINS

1. **GENERAL**. Contaminated remains require special handling. This page provides an outline of actions that must be addressed in managing the deceased.

2. **PRONOUNCEMENT OF DEATH**. The authority, such as the local coroner, the RTF physician, etc., for pronouncing death needs to be identified. A procedure to bring the authority into the contaminated area or to extract the remains to a hot line for pronouncement must be accomplished as soon as practical. If a non-CNWDI cleared authority is used within the NDA, the authority will need to be debriefed by security officials.

3. **ACTIONS FOR REMAINS WITHIN THE NDA**.

a. **Mark and Cover**. EOD personnel should mark a safe path to the remains and cover the remains as soon as practical.

b. **Extraction**. A plan to extract the remains should be developed and implemented. ASHG shall approve the plan. RAMT, MRAT, the death pronouncement authority and the RTF Mortuary Affairs Officer are all appropriate parties for advice and coordination.

c. **Decontamination and Transport**. A plan to decontaminate the remains (if necessary), package the remains and store or ship the remains should be developed and implemented. Decontamination with soap and water, if necessary, is likely adequate. For alpha contamination, containment of contamination can be accomplished with a body bag, whereby, decontamination might not be necessary. Decontamination on site may be driven by requirements at the receiving facility. The RTF Mortuary Affairs Officer is the key official for this coordination effort. A sample BROKEN ARROW Human Remains Special Instructions Form is attached as Figure 1 at the end of the appendix. Refrigerated vans will likely be needed for storage and transport.

d. **Goals for Disposition of Remains**. Human remains should be managed with respect, dignity and timeliness. In many environments (e.g., hot and humid), removal of remains before decomposition should be a HIGH PRIORITY. Attempting decontamination after the body begins to decompose will be futile.

4. **EVIDENCE PRESERVATION**. For some accidents, the National Transportation Safety Board (NTSB) may have evidence preservation and documentation requirements. Likewise for potential terrorist events, the FBI may have special evidence preservation requirements. If this is the case, early coordination in planning or submittal of waivers should be pursued. The RTF operations and security staff should expedite and resolve any such issues.

5. **TECHNICAL RESOURCES**. The Armed Forces Medical Examiner, the Armed Forces Institute of Pathology and the Army's 262nd Quartermaster Battalion (with WMD DECON Mortuary Affairs Unit, Fort Lee, VA) are all potential consultants for managing contaminated remains.

Figure 1. SAMPLE BROKEN ARROW HUMAN REMAINS TRANSPORT, AUTOPSY AND MORTUARY AFFAIRS SPECIAL INSTRUCTIONS FORM

Special Instructions for the Remains of _____.
(Name, last 4)

These instructions are to accompany the remains and are intended for autopsy and/or mortuary service staff processing and preparing the body for burial.

The remains of _____ are slightly contaminated with radioactive material that emits alpha particles and low energy gamma rays. When following these special instructions, the levels of radiation associated with preparing the remains for burial are safe and will not result in a dose to staff members in excess of 5 mrem (1/1000th of the allowed occupational dose limit).

1. Use normal pathogenic protective clothing (e.g., universal precautions) when handling the remains. Additionally, double glove and wear a surgical mask.
2. Use care to remove the deceased clothing so that any dust is not agitated and resuspended into the air. Place the clothing in a plastic bag and seal it. Then double bag the clothing. During embalming and other processing of the remains, be sure to collect all liquid wastes and any solid wastes in autoclave containers and run them through the autoclave process. Likewise, do the same for all runoff associated with washing autopsy tools or related equipment. Mark all bags and containers with a contamination sticker or tag and save them for retrieval by the US Army Rock Island radioactive waste disposal staff/contractors.
3. Take care not to cross contaminate items or surfaces in the laboratory. For example, do not make entries on a computer keyboard without first removing the outer layer of gloves.
4. Double bag the body bags used for transporting the remains to the mortuary facility and mark with a contamination sticker or tag. Likewise, do the same for any gowns, gloves, or other protective clothing used while executing these special instructions.
5. Ensure that no single staff member is in close proximity of the body or collected waste containers for more than a total of 10 hours. Within one meter would be indicative close proximity.
6. Incineration of the remains is not recommended. If incineration is desired, approval from the state health department may be necessary.

While the remains are in DoD custody, radiological specialists from the US Army Radiological Advisory Team at Walter Reed Army Medical Center are available for on site assistance in implementing these instructions. As well, radiological specialists from the Armed Forces Radiobiology Research Institute are also available for assistance.

These special instructions were prepared by COL John Mercier, Ph.D., PE, DABR, Senior Health Physicist, Armed Forces Radiobiology Research Institute, ph. 301-295-1210.

DoD 3150.08-M
“Nuclear Weapon Accident Response Procedures”
(NARP)

INTERNET SUPPLEMENT



REFERENCE DOCUMENTS



REFERENCES

- (a) DoD Instruction 3150.8, "Nuclear Weapon Accident Response Procedures," June 13, 1996
- (b) DoD 3150.8-M, "Nuclear Weapon Accident Response Procedures (NARP)," February 2005
- (c) National Response Framework, January 2008
- (d) National Incident Management System, FEMA 501, March 1, 2004¹
- (e) Section 2(6) of Public Law 107-296, "Homeland Security Act of 2002," January 1, 2003
- (f) DoD 6055.9-STD, "DoD Ammunition and Explosives Safety Standards," October 2004
- (g) Section 2162 of title 42, United States Code
- (h) Title 49, Code of Federal Regulations, Part 171.8, "General Information, Regulations, and Definitions," current edition
- (i) Section 1321 of title 33, United States Code
- (j) Section 102 of Public Law 96-510, "Comprehensive Environmental Response, Compensation, and Liability Act," December 11, 1980
- (k) Section 6903 of title 42, United States Code
- (l) Sections 6901-6992 of title 42, United States Code
- (m) Section 1317 of title 33, United States Code
- (n) Section 7412 of title 42, United States Code
- (o) Section 7 of Public Law 94-469, "Toxic Substances Control Act," January 1, 1977
- (p) Section 470(w)(5) of title 16, United States Code
- (q) DoD Directive 5101.1, "DoD Executive Agent," September 2002
- (r) Section 2(10) of Public Law 107-296, "Homeland Security Act of 2002," January 1, 2003
- (s) Section 5122 of title 42, United States Code
- (t) Title 40, Code of Federal Regulations, Part 300.21, "National Oil and Hazardous Substances Pollution Contingency Plan," current edition
- (u) Section 64501 of title 16, United States Code
- (v) Section 2071 of title 42, United States Code
- (w) Section 2(14) of Public Law 107-296, "Homeland Security Act of 2002," January 1, 2003
- (x) Section 2(15) of Public Law 107-296, "Homeland Security Act of 2002," January 1, 2003
- (y) Sections 1601-1629h of title 43, United States Code
- (z) Section 2(16) of Public Law 107-296, "Homeland Security Act of 2002," January 1, 2003
- (aa) Section 742(f)(c) of title 16, United States Code; Title 29, Code of Federal Regulations, Part 553.101, "Application of the Fair Labor Standards Act to Employees of State and Local Governments," current edition
- (ab) Section 2332a of title 18, United States Code
- (ac) National Security Presidential Directive 28, "Nuclear Weapons Command, Control, Safety, and Security," June 20, 2003
- (ad) Homeland Security Presidential Directive 5, "Management of Domestic Incidents," February 28, 2003
- (ae) DoD Directive 3025.1, "Military Support to Civil Authorities (MSCA)," January 15, 1993
- (af) DoD Directive 3025.15, "Military Assistance to Civil Authorities," February 18, 1997

¹ <http://www.fema.gov/emergency/nims/index.shtm>

- (ag) Chairman of the Joint Chiefs of Staff CONPLAN 0-0500-98, "Military Assistance to Domestic Consequence Management Operations in Response to a Chemical, Biological, Radiological, Nuclear, or High-Yield Explosive Situation," February 11, 2002
- (ah) Section 13 of title 18, United States Code
- (ai) Presidential Directive/National Security Council-27, "Procedures for Dealing with Non-Military Incidents," January 19, 1978
- (aj) Chairman of the Joint Chiefs of Staff 3150.03B, "Joint Reporting Structure Event and Incident Reports," July 23, 2003
- (ak) Section 1-521 of Public Law 104-191, "Health Insurance Portability and Accountability Act (HIPAA),"² August 21, 1996
- (al) DoD Directive 5200.8, "Security of DoD Installations and Resources," April 25, 1991
- (am) DoD Directive 5230.16, "Nuclear Accident and Incident Public Affairs (PA) Guidance," December 20, 1993
- (an) AR 75-14/OPNAVIST 8027.1G/MCO 8027.1D/AFR 136-8, "Interservice Responsibilities for Explosive Ordnance Disposal," February 14, 1992
- (ao) Joint Nuclear Weapons Publication System 60-0 Manual, "Principles of Nuclear EOD," December 20, 2004³
- (ap) Joint Nuclear Weapons Publication System 60-1 Manual, "Explosives Ordnance Disposal Procedures, General Information Applicable to Nuclear Weapon," July 24, 2006, with Change 1 dated October 30, 2006⁴
- (aq) Joint Nuclear Weapons Publication System 60-6 Manual, "Explosive Ordnance Disposal Procedures, RSP For Nuclear Weapons," March 10, 2004⁵
- (ar) Joint Nuclear Weapons Publications System 20-7 Manual, "Nuclear Safety Criteria," May 31, 2005, with Change 1 dated 8 September 2006⁶
- (as) Joint Nuclear Weapons Publication System 20-11 Manual, "General Guidance and Material Hazard Information For Nuclear Weapons, Components and Nonnuclear Designations," February 28, 2006, with IC 1-1 dated 7 September 2006⁷
- (at) USAF Crested Ice Report Volume 65, No. 1 "USAF Nuclear Safety," 1970
- (au) NUREG-1575, EPA 402-R-97-016, DOE/EH-0624, Multiagency Radiation Survey and Site Investigation Manual, August 2000⁸
- (av) Section 9601-9675 of title 42, United States Code
- (aw) DoD 4000.25-1-M, "Military Standard Requisitioning and Issue Procedures," November 2000
- (ax) DoD Instruction 7000.14, "Department of Defense Financial Management Policy and Procedures," March 3, 2006
- (ay) Title 41, Code of Federal Regulations, Part 101-102, "Federal Management Regulations," current edition
- (az) Presidential Decision Directive/National Security Council-27, "Nonproliferation Science and Technology Strategy," August 1994

² <http://biotech.law.lsu.edu/cases/medrec/publ191-104.pdf#search=%22Public%20Law%20104-191%22>

³ Available through DTRA/Combat Support Nuclear Logistics Branch, 1680 Texas Street SE, Kirtland AFB, NM 87117-5669.

⁴ *Ibid.*

⁵ *Ibid.*

⁶ *Ibid.*

⁷ *Ibid.*

⁸

<http://www.irpa11.com/new/pdfs/6e6.pdf#search=%22Multiagency%20Radiation%20Survey%20and%20Site%20Investigation%20Manual%22>

- (ba) Section 2011-2259 of title 42, United States Code
- (bb) Chairman of the Joint Chiefs of Staff Instruction 6110.01A, "Chairman, Joint Chiefs of Staff-Controlled Communications Assets," July 1, 2002
- (bc) Army FM 24-2, "Spectrum Management," August 21, 1991
- (bd) AFI 33-118, "Radio Frequency Spectrum Management," April 3, 2002
- (be) DoD 5210.63, "Security of Nuclear Reactors and Special Nuclear Material," April 6, 1990
- (bf) Section 797 of title 50, United States Code
- (bg) AR 40-13, "Medical Support-Nuclear/Chemical Accidents and Incidents," February 1, 1985
- (bh) AR 600-8-1, "Army Casualty Operations/Assistance/Insurance," October 20, 1994
- (bi) AFI 36-3002, "Casualty Services," August 26, 1994
- (bj) Naval Military Personnel Manual, Article 1770-010, April 2002
- (bk) National Council on Radiation Protection and Measurements Report, No. 65, "Management of Persons Accidentally Contaminated with Radionuclides," 1980⁹
- (bl) Joint Pub 4-06, "Joint Tactics, Techniques, and Procedures for Mortuary Affairs in Joint Operations," August 28, 1996
- (bm) U.S. Department of Homeland Security, "Working Group on Radiological Dispersal Device (RDD) Preparedness, Medical Preparedness and Response Sub-Group," December 2003
- (bn) E.T. Lessard, et al., "Interpretation of Bioassay Measurements," U.S Nuclear Regulatory Commission, NUREG/CR-4884, <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/occupational-health/active/8-09/-book8#book8> July 1987
- (bo) Title 29, Code of Federal Regulations, Parts 900-1899, "Privacy Act Regulations," current edition
- (bp) AR 11-9, "The Army Radiation Safety Program," June 1999
- (bq) Navy Bureau of Medicine and Surgery P-5055, "Radiation Health Manual," August 2001
- (br) AFI 48-125, "The U.S. Air Force Personnel Dosimetry Program," March 1, 1999
- (bs) Armed Forces Radiobiology Research Institute, "Medical Management of Radiological Casualties," April 2003
- (bt) Army FM 4-02.283, Navy NTRP 4-02.21, Air Force Manual (AFMAN) 44-161(I), Marine Corps MCRP 4-11.1B, "Treatment of Nuclear and Radiological Casualties," December 20, 2001
- (bu) Sections 552-552a of title 5, United States Code
- (bv) Department of Transportation Emergency Response Guidebook, 2004
- (bw) Technical Order 00-105E-9, "Aerospace Emergency Rescue and Mishap Response Information," September 2, 2005
- (bx) Federal Guide Report, No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion, EPA," September 1988
- (by) Joint Pub 3-61, "Doctrine for Public Affairs in Joint Operations," May 9, 2005
- (bz) Department of Energy Order 151.1A, "Comprehensive Emergency Management System," November 1, 2000
- (ca) National Weather Service Instruction 10-518, "Non-Weather Related Emergency Products Specification," September 8, 2004
- (cb) U.S. Nuclear Regulatory Commission Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," February 1996

⁹ <http://pubmedcentral.com/articlerender.fcgi?artid=1439056>

- (cc) DoD Directive 5210.56, "Use of Deadly Force and the Carrying of Firearms by DoD Personnel Engaged in Law Enforcement and Security Duties", November 1, 2001
- (cd) DoD C-5210.41-M, "Nuclear Weapon System Security Manual (U)," April 1994
- (ce) Sections 831 and 1385 of title 18, United States Code
- (cf) Section 831 of title 50, United States Code
- (cg) DoD Directive O-5210.41, "Security Policy for Protecting Nuclear Weapons," November 1, 2004
- (ch) Department of Energy Order 470.1, "Safeguards and Security Program," September 28, 1995 and Department of Energy Order 470.4, "Safeguards and Security Program," August 26, 2005
- (ci) Department of Energy Order 474.1A, "Control and Accountability of Nuclear Materials," November 20, 2000
- (cj) Department of Energy Manual 474.1-1A, "Control and Accountability of Nuclear Materials," November 20, 2000
- (ck) DoD 5200.1-R, "Information Security Program," January 1997
- (cl) Department of Energy Order 471.2A, "Information Security Program," March 27, 1997
- (cm) DoD Directive 5210.2, "Access to and Dissemination of Restricted Data," January 12, 1978
- (cn) DoD Directive 5210.42, "Nuclear Weapon Personnel Reliability Program (PRP)," January 8, 2001
- (co) Title 10, Code of Federal Regulations, Chapter 3, Part 711, "Personal Assurance Program (PAP)," current edition
- (cp) Joint Pub 5-00.2, "Joint Task Force Planning Guidance and Procedures," January 13, 1999
- (cq) Technical Publication 20-11, "General Firefighting Guidance," February 6, 2002
- (cr) Naval Ships Technical Manual 079, Volume II, "Damage Control-Practical Damage Control," February 25, 1999
- (cs) Navy Bureau of Medicine and Surgery (BUMED) Instruction 6470.10B, "Initial Management of Irradiated or Radioactively Contaminated Personnel," December 7, 1998
- (ct) Title 33, Code of Federal Regulations, Part 165.20, "Safety Zones in Regulated Navigation Areas and Limited Access Areas," current edition
- (cu) Federal Guidance Report, No.13, "Cancer Risk Coefficients for Environmental Exposure to Radionuclides," September 1999
- (cv) DoD Directive 3025.12, "Military Assistance for Civil Disturbances (MACDIS)," February 4, 1994
- (cw) DoD Directive 3020.40, "Defense Critical Infrastructure Program (DCIP)," August 19, 2005.
- (cx) DoD Directive 5525.5, "DoD Cooperation with Civilian Law Enforcement Officials," January 15, 1986, with Change 1 dated December 20, 1989

DEFINITIONS

Access

Close physical or electrical proximity to a nuclear weapon in such a manner as to allow the opportunity to tamper with or damage a nuclear weapon. For example, a person would not be considered to have access if an escort or a guard was provided for either the person or the weapon when the person is in close proximity to the weapon.

Access to Classified Material

The ability and opportunity to get knowledge of classified information. For access to classified information the following general restrictions apply:

- Favorable determination of eligibility for access has been made by the Head of an Agency or his or her designee.
- The person has signed an approved nondisclosure agreement; and
- The person has a need to know the information.

Accident Response Group (ARG)

A DOE/NNSA asset comprised of technical and scientific experts with specialized equipment. The ARG includes a cadre of senior scientific advisors, weapons engineers and technicians, experts in nuclear safety and high-explosive safety, health physicists, radiation control technicians, industrial hygienists, physical scientists, packaging and transportation specialists, and other specialists from the DOE/NNSA weapons complex. The ARG maintains readiness to provide DOE technical assistance to peacetime accidents involving U.S. nuclear weapons and components anywhere in the world.

Accident Scene

The area surrounding an Accident Site from which all non-essential personnel are evacuated or excluded.

Accident Site

An area within the NDA, NSA, WRA, Weapon Storage Area, Restricted Area (RA), or Safety and Security Zone (SSZ) containing the affected weapon(s), warhead(s), special nuclear material (SNM), and any potential damaged buildings, vehicles, and personal property affected by the accident. Additionally, the accident site will include response personnel, equipment, and resources necessary to control entry and access to the affected area, and to plan and organize health and safety matters, weapons recovery, and other operations essential to recovery from the emergency.

Accident Site Consolidation

The third phase of the response to a nuclear weapon accident. It is marked by the arrival of a robust cadre of DoD and DOE/NNSA response assets to the accident site. It grows out of the initial response phase and begins once immediate life-saving and firefighting activities are completed.

Accident Site Health Group (ASHG)

A group of health and safety experts, staffed by representatives from the Department of Defense and the DOE/NNSA. The ASHG will ensure the health and safety of all on-site personnel during

recovery from a nuclear weapon accident and all associated hazards, not just radiological hazards. The ASHG was formerly known as the Joint Hazard Evaluation Center.

Activity

The intensity of a radioactive source or the quantity of radioactive material that is transformed into a more stable element over a period of time. Unit of activity is a curie (Ci) or a Becquerel (Bq).

Aerial Measuring System (AMS)

A DOE/NNSA asset consisting of fixed and rotary wing aircraft used to perform aerial radiation surveys and radioactive source searches which are able to confirm the release of radioactive materials into the atmosphere, track the radiation plume, map the radioactive ground deposition, and provide aerial photography.

Agency

A division of government with a specific function, offering a particular kind of assistance. In ICS, agencies are defined either as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or other assistance).

Agency Representative

A person assigned by a primary, assisting, or cooperating Federal, State, local, or tribal government agency or private entity that has been delegated authority to make decisions affecting that agency's or organization's participation in incident management activities, following appropriate consultation with the leadership of that agency.

Air Force Institute for Operational Health (AFIOH)

A U.S. Air Force (USAF) unit that provides consultant, engineering, and analytical support in radiological, occupational, and environmental health programs.

Air Force Radiation Assessment Team (AFRAT)

A field-qualified 37-person team of worldwide deployable health physicists, industrial hygienists, and laboratory technicians stationed at the Air Force Institute for Operational Health. Assets include a forward deployed field laboratory, supplemented by reach-back radioanalytical capability at Brooks City Base, TX.

Air Sampler

A device used to collect samples of and measure the amounts of various pollutants or other substances in the air. As related to radiation, this device is used to collect radioactive particulates suspended in the air.

Airborne Radioactivity

Any radioactive material suspended in the atmosphere.

Airhead

A designated location in an area of operations used as a base for supply and evacuation by air.

Alpha Particle Radiation

A positively charged particle made up of two neutrons and two protons, emitted by certain radioactive nuclei. Alpha particles may be stopped by thin layers of light materials such as a sheet

of paper or the outer layer of the exposed person's skin and therefore pose no direct or external radiation threat. However, if internalized, they may pose a health risk.

Area Command (Unified Area Command)

An organization established 1.) to oversee the management of multiple incidents that are each being handled by an ICS organization or 2.) to oversee the management of large or multiple incidents to which several Incident Management Teams have been assigned. Area Command has the responsibility to set overall strategy and priorities, allocate critical resources according to priorities, ensure that incidents are properly managed, and ensure that objectives are met and strategies followed. Area Command becomes Unified Area Command when incidents are multijurisdictional. Area Command may be established at an emergency operations center facility or at some location other than an incident command post.

Armed

The configuration of a nuclear weapon in which a single signal initiates the action for a nuclear detonation.

Armed Forces Radiobiology Research Institute (AFRRI)

A tri-Service facility in Bethesda, MD, that conducts research in the field of radiobiology and related matters essential to the operational and medical support of the U.S. Department of Defense and the Military Services. The AFRRI provides the Medical Radiobiology Advisory Team (MRAT), and also provides educational courses such as, "The Medical Effects of Ionizing Radiation." (See <http://www.afri.usuhs.mil>)

Assessment

The evaluation and interpretation of measurements and other information to provide a basis for decision-making.

Assignments

Tasks given to resources to perform within a given operational period that are based on operational objectives defined in the Incident Action Plan (IAP).

Assistant

Title for subordinates of principal Command Staff positions. The title indicates a level of technical capability, qualifications, and responsibility subordinate to the primary positions. Assistants may also be assigned to unit leaders.

Atmospheric Release Advisory Capability (ARAC)

A DOE/NNSA asset for providing real-time computer modeling to assess events involving the release of radiological materials and other hazardous chemicals into the atmosphere.

Available Resources

Resources assigned to an incident, checked in, and available for use, normally located in a Staging Area.

Background Count

In connection with health protection, the contribution of background radiation to a measurement of radioactivity.

Background Radiation

The radioactivity and radiation in the environment, including both natural and a very small amount of manmade radioactive material. Nuclear (or ionizing) radiation arising from within the body and from the surroundings to which individuals are always exposed. It approximates 360 millirem (mrem) a year.

Becquerel (Bq)

The International System unit of activity of a radionuclide, equal to the activity of a quantity of a radionuclide having one spontaneous nuclear transformation a second. The traditional unit of activity is the Curie.

BENT SPEAR

See **Nuclear Weapon Incident**.

Beta Particle Radiation

An electron or positron emitted by an atomic nucleus during radioactive decay. Beta radiation may be harmful depending on the dose and time of exposure and is easily shielded by aluminum.

Bioassay

The determination of type, quantity, concentration, and/or location of radioactive material in the body using either direct measurements of the body or analysis of biological material removed (blood, saliva) or excreted (feces, urine) from the body.

Biodosimetry

A laboratory method for determining a person's dose of ionizing radiation by analyzing certain components of the blood.

Branch

The organizational level having functional or geographical responsibility for major aspects of incident and accident operations. A branch is organizationally situated between the section and the division or group in the Operations Section, and between the section and units in the Logistics Section. Branches are identified by the use of Roman numerals or by functional area.

BROKEN ARROW

See **Nuclear Weapon Accident**.

Casualty

Any person who is declared dead or is missing, ill, or injured.

Catastrophic Incident

Any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national morale, and/or government functions. A catastrophic event could result in sustained national impacts over a prolonged period of time; almost immediately exceeds resources normally available to State, local, tribal, and private-sector authorities in the impacted area; and significantly interrupts governmental operations and emergency services to such an extent that national security could be threatened. All catastrophic events are Incidents of National Significance.

Chain of Command

A series of command, control, executive, or management positions in hierarchical order of authority.

Check-In

The process through which resources first report to an incident or accident. Check-in locations include the incident command post, Resources Unit, incident base, camps, staging areas, or directly on the site.

Chief

The ICS title for individuals responsible for management of functional sections: Operations, Planning, Logistics, Finance/Administration, and Intelligence (if established as a separate section).

Close Proximity

Within two-arms' reach or 6 to 7 ft of a weapon or SNM.

Coastal Zone

As defined by the National Contingency Plan (NCP), means all U.S. waters subject to tide, U.S. waters of the Great Lakes, specified ports and harbors on inland rivers, waters of the contiguous zone, other water of the high seas subject to the NCP, the land surface or land substrata, ground waters, and ambient air proximal to those waters. The term "coastal zone" delineates an area of Federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in Regional Contingency Plans (RCPs).

Command

The act of directing, ordering, or controlling by virtue of explicit statutory, regulatory, or delegated authority.

Command Staff

In an incident or accident management organization, the Command Staff consists of the Incident Command and the special staff positions of Public Information Officer, Safety Officer, Liaison Officer, and other positions as required, e.g., legal and medical advisor who report directly to the Incident Commander. They may have an assistant or assistants, as needed.

Community Recovery

In the context of the National Response Plan (NRP) and its annexes, the process of assessing the effects of an Incident of National Significance, defining resources, and developing and implementing a course of action to restore and revitalize the socioeconomic and physical structure of a community.

Communications Unit

An organizational unit in the Logistics Section responsible for providing communication services at an incident or an Emergency Operations Center (EOC). A Communications Unit may also be a facility (e.g., a trailer or mobile van) used to support an Incident Communications Center.

Consequence Management (CM)

Actions taken to maintain or restore essential services and manage and mitigate problems resulting from disasters and catastrophes, including natural, manmade, or terrorist incidents.

Contamination

The deposition and/or absorption of radioactive or other hazardous or toxic material on or by structures, areas, personnel, or objects where it is not desired.

Contamination Control

Procedures to avoid, reduce, remove, or render harmless, temporarily or permanently, nuclear or other hazardous or toxic materials contamination to maintain or enhance the efficient conduct of operations.

Contamination Control Line (CCL)

A line that initially extends 100 m beyond the known and/or suspected radiological contamination to provide a measure of safety. Once the Contamination Control Station (CCS) is operational, the CCL becomes the outer boundary that separates the reduced hazard area from the clean area.

Contamination Control Station (CCS)

An area specifically designated for allowing ingress and egress of personnel and equipment to and/or from the Hazards Area/Radiological Control Area (RCA, also called the Exclusion Zone). The outer boundary of the CCS is the CCL, and the inner boundary is the line segment labeled the hot line.

Contiguous Zone

The zone of the high seas, established by the United States under Article 24 of the Convention on the Territorial Sea and Contiguous Zone that is contiguous to the territorial sea and that extends 9 miles seaward from the outer limit of the territorial sea.

Continental United States (CONUS)

U.S. territory, including the adjacent territorial waters, located in North America between Canada and Mexico.

Cooperating Agency

An agency supplying assistance other than direct operational or support functions or resources to the incident or accident management effort.

Coordinate

To advance systematically an analysis and exchange of information among principals who have or may have a need to know certain information to carry out specific incident or accident management responsibilities.

Coordinating Agency

The Coordinating Agency is the Federal agency that owns, has custody of, authorizes, regulates, or is otherwise designated responsibility for the nuclear/radioactive material or nuclear weapon. Coordinating Agencies are responsible for the implementation of processes detailed in the Nuclear/Radiological Incident Annex of the NRP and have primary responsibilities for Federal activities related to the nuclear/radiological aspects of the incident or accident. DHS may assume overall responsibility for Federal coordination of the response, while the Coordinating Agency would be responsible for supporting DHS in this mission. The Coordinating Agency was formerly known as the Lead Federal Agency (LFA).

Credible Threat

A threat which one party finds sufficiently believable based upon a variety of variables, including intelligence, past experience, etc., that the party will undertake actions based upon the assumption that the threat will be executed. In principle, a threat is credible if it is in the best interest of the party making the threat to carry it out.

Critical Infrastructures

Systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters.

Critical Nuclear Weapons Design Information (CNWDI)

Top-secret restricted data (RD) or secret restricted data revealing the theory of operation or design of the components of a thermonuclear or implosion-type fission bomb, warhead, demolition munition, or test device. Specifically excluded is information concerning arming, fusing, and firing systems; limited life components; and totally contained quantities of fissionable, fusionable, and high-explosive materials by type.

Cultural Resources

Cultural resources include historic and prehistoric structures, archeological sites, cultural landscapes, and museum collections.

Cumulative Dose (Radiation)

The total dose resulting from repeated exposure to radiation in the same region or of the whole body, including multiple exposures or internal doses delivered over time.

Curie (Ci)

The traditional unit of activity; the activity of a quantity of any radioactive nuclide undergoing 37 billion disintegrations per second; the amount of activity in 1 gram of radium. The International System unit of activity is the Becquerel (Bq). One Curie = 3.7×10^{10} Bq.

Custody

The responsibility for the control of, transfer and movement of, and access to weapons and components. Custody also includes the maintenance of and accountability for weapons, components, and radioactive materials.

Decay (Radioactive)

The spontaneous decrease in the radiation intensity or mass of any radioactive material with respect to time.

Decontamination

The process of making any person, object, or area safe within acceptable limits by absorbing, making harmless, or removing contaminated material clinging to or around it.

Decontamination Station

A building or location suitably equipped and organized where personnel and material are cleansed of radiological and other hazardous or toxic contaminants.

Defense Senior Official (DSO)

The Official who supports the IC by managing DoD emergency response assets during a nuclear weapon accident or incident when the Department of Defense is the Coordinating Agency. When the Department of Defense is not the Coordinating Agency, the DoD SO is responsible for C2 and coordination of DoD emergency response assets to support the IC. The DoD SO serves as the DoD senior spokesperson when the Department of Defense is not the Coordinating Agency.

Defense Support of Civil Authorities (DSCA)

Refers to DoD support provided by Federal military forces, DoD civilians and contract personnel, and DoD agencies and components, in response to requests for assistance during domestic incidents to include terrorist threats or attacks, major disasters, and other emergencies.

Deploy

The ordered movement of a resource or resources to an assigned operational mission or an administrative move from one location to another.

Deputy

A fully qualified individual who, in the absence of a superior, could be delegated the authority to manage a functional operation or perform a specific task. In some cases, a deputy could act as relief for a superior and therefore must be fully qualified in the position. Deputies can be assigned to the Incident Commander, General Staff, Section Chiefs, and Branch Directors.

Disaster

See **Major Disaster**.

Division

The partition of an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the manageable span of control of the Operations Chief. A division is located within the ICS organization between the branch and resources in the Operations Section.

Dose

The amount of energy absorbed per unit mass of material, or the time integrated dose rate. The International System unit of dose is the gray (Gy). The traditional unit of dose is radiation absorbed dose (rad).

Dosimetry

The measurement of radiation dose. It applies to both the devices used (dosimeters) and to the techniques.

Emergency Management Team (EMT)

The DOE Headquarters' (HQ) senior management team that coordinates and supports the departmental response to radiological emergencies.

Emergency Operations Center (EOC)

The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. EOCs may be organized by major functional disciplines (e.g.,

fire, law enforcement, and medical services), by jurisdiction (e.g., Federal, State, regional, county, city, tribal), or by some combination thereof.

Emergency Response Provider

Includes Federal, State, local, and tribal emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities. (See reference (e)). Also known as “emergency responder” or “first responder.”

Emergency Support Function (ESF)

A grouping of government and certain private-sector capabilities into an organizational structure to provide the support, resources, program implementation, and services that are most likely to be needed to save lives, protect property and the environment, restore essential services and critical infrastructure, and help victims and communities return to normal, when feasible, following domestic incidents. The ESFs serve as the primary operational-level mechanism to provide assistance to State, local, and tribal governments or to Federal departments and agencies conducting missions of primary Federal responsibility.

Emergency

Under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, an emergency is any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States. Absent a Presidentially-declared emergency, any incident(s), human-caused or natural, that requires responsive action to protect life or property.

Entry Control Point (ECP). The place where entry into and exit from the CCL, Security Station, NDA/NSA, or classified material working space is controlled. It is located on the disaster cordon near the on-scene control point.

Environment

Natural and cultural resources and historic properties as those terms are defined in this glossary and in relevant laws.

Environmental Response Team

Established by the EPA, the Environmental Response Team includes expertise in biology, chemistry, hydrology, geology, and engineering. The Environmental Response Team provides technical advice and assistance to the IC for both planning and response to discharges and releases of oil and hazardous substances into the environment.

Explosive Ordnance

All munitions containing explosives, nuclear fission or fusion materials, and biological and chemical agents. This ordnance includes bombs and warheads; guided and ballistic missiles; and artillery, mortar, rocket, and small arms ammunition. It also includes all mines, torpedoes, and depth charges; pyrotechnics; clusters and dispensers; cartridges and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive device (IED); and all similar or related items or components that are explosive in nature.

Explosive Ordnance Disposal (EOD)

The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance. It may also include explosive ordnance which has become hazardous by damage or deterioration.

Explosive Ordnance Disposal (EOD) Procedures. Those particular courses or modes of action taken by EOD personnel for access to, diagnosis, rendering safe, recovery, and final disposal of explosive ordnance or any Hazardous Material (HAZMAT) associated with an EOD incident.

- **Access Procedures.** Those actions to locate exactly and gain access to unexploded ordnance.
- **Diagnostic Procedures.** Those actions taken to identify and evaluate unexploded explosive ordnance.
- **Render Safe Procedures (RSPs).** The part of the EOD procedures involving the application of special EOD methods and tools to interrupt functions or separate essential components of unexploded explosive ordnance to prevent an unacceptable detonation.
- **Recovery Procedures.** Those actions taken to recover unexploded explosive ordnance.
- **Final Disposal Procedures.** The final disposal of explosive ordnance which may include demolition or burning in place, removal to a disposal area, or other appropriate means.

Evacuation

Organized, phased, and supervised withdrawal, dispersal, or removal of persons from dangerous or potentially dangerous areas, and their reception and care in safe areas.

Event

A planned, non-emergency activity. ICS can be used as the management system for a wide range of events, e.g., parades, concerts, or sporting events.

Exclusion Zone

An area within the incident or accident site where contamination is present and the highest possibility for worker exposure to hazardous waste occurs.

Explosive Safety Quantity Distance (ESQD) Standards

Standards for the amounts and kinds of explosives that may be stored and the proximity of such storage to buildings, highways, railways, magazines, and other installations. These standards may be found in DoD 6055.9-STD, reference (f).

Exposure

The level of radiation flux to which a material or living tissue is exposed. The actual dose of radiation from the exposure depends on many factors including length of exposure time, the distance from the radiation source, and the amount of shielding between the radiation source and the exposed object.

Facility Management

Facility selection and acquisition, building services, information systems, communications, safety and health, and physical security.

Federal

Of or pertaining to the Federal Government of the United States of America.

Federal Coordinating Officer (FCO)

The Federal officer who is appointed to manage Federal resource support activities related to Stafford Act disasters and emergencies. The FCO is responsible for coordinating the timely delivery of Federal disaster assistance resources and programs to the affected State and local governments, individual victims, and the private sector.

Federal Emergency Communications Coordinator (FECC)

That person, assigned by General Services Administration (GSA), who functions as the principal Federal manager for emergency telecommunications requirements in major disasters, emergencies, and extraordinary situations, when requested by the FCO or Federal Resource Coordinator (FRC).

Federal Emergency Management Agency (FEMA)

The Federal Agency within the Department of Homeland Security (DHS) which establishes policy and coordinates all civil defense and civil emergency planning, management, mitigation, and assistance functions of executive agencies in response to emergencies which require Federal response assistance. The FEMA assists State and local agencies in their emergency planning. Its primary role in a radiological accident is one of coordinating Federal, State, local, and volunteer response actions.

- **National Interagency Emergency Operations Center (NIEOC).** The NIEOC is the location in the FEMA HQ in Washington, DC, from which the Emergency Support Team (EST) provides coordination support for Federal and State emergency response activities to a radiological accident or emergency.
- **Emergency Response Team (ERT).** An interagency team, headed by the FEMA, deployed to a radiological emergency scene by the FEMA Director to make an initial assessment of the situation and then provide the FEMA's primary response capability.
- **Emergency Support Team (EST).** The FEMA HQ team that carries out notification activation and coordination procedures from the FEMA NIEOC. The EST obtains HQ coordination for Federal Agencies and supports staff of the FEMA Director and the Federal Coordinating Officer (FCO).

Federal On-Scene Coordinator (FOSC)

The Federal official predesignated by the EPA or the USCG to coordinate responses under subpart D of the National Contingency Plan (NCP), or the government official designated to coordinate and direct removal actions under subpart E of the NCP.

Federal Radiological Monitoring and Assessment Center (FRMAC)

A coalition of all Federal resources that coordinates and manages the Federal off-site radiological monitoring and assessment activities during major radiological emergencies within the United States. The FRMAC works in support of State, local, and tribal governments through the Coordinating Agency/LFA.

Federal Resource Coordinator (FRC)

The Federal official appointed to manage Federal resource support activities related to non-Stafford Act incidents. The FRC is responsible for coordinating support from other Federal departments and agencies using interagency agreements and MOUs.

Field Instrument for the Detection of Low-Energy Radiation (FIDLER)

A field survey instrument specifically designed to measure low-energy X rays and gamma rays from weapons-grade plutonium (Pu).

Film Badge

A photographic film packet or badge sometimes carried by non-U.S. personnel for measuring and recording gamma ray dosage permanently. Regularly replaced by Thermoluminescent Dosimetry.

Final Disposal Procedures

See **Explosive Ordnance Disposal (EOD) Procedures**.

First Responders

Local and nongovernmental police, fire, and emergency personnel who in the early stages of an incident are responsible for the protection and preservation of life, property, evidence, and the environment, including emergency response providers as defined in section 2 of the Homeland Security Act of 2002 (reference (e)), as well as emergency management, public health, clinical care, public works, and other skilled support personnel (such as equipment operators) who provide immediate support services during prevention, response, and recovery operations. First responders may include personnel from Federal, State, local, tribal, or nongovernmental organizations. The IRF is considered a first responder.

Formerly Restricted Data (FRD)

Information removed from the restricted data category when the DOE (or antecedent Agencies) and the DoD jointly determine that such information relates primarily to the military use of atomic weapons and that such information may be adequately safeguarded as classified defense information. (Section 142d of the Atomic Energy Act (AEA) of 1954, as amended (reference (g)).

Fragmentation Zone

A computed distance which fragments created by an explosion may be projected.

Gamma-Ray Radiation

High-energy electromagnetic radiation emitted from atomic nuclei during a nuclear reaction or radioactive decay. Gamma radiation requires thick layers of dense materials, such as lead, for shielding. Potentially lethal to humans, depending on the intensity of the field.

Geiger-Müller (GM) Counter

A GM counter is a gas ionization-type detector for gamma detection. They are most often used to detect beta and gamma rays. These counters are unable to distinguish gamma-ray energies and therefore may not be used to identify specific radionuclides.

General Staff

A group of incident management personnel organized according to function and reporting to the Incident Commander. The General Staff normally consists of the Operations Section Chief, Planning Section Chief, Logistics Section Chief, and Finance/Administration Section Chief.

Gray (Gy). A unit of absorbed dose of radiation in the International System. The traditional system unit is radiation absorbed dose (rad). One centigray (cGy) equals one rad.

Ground Radioactivity

An undesirable radioactive substance dispersed on the ground.

Group

Established to divide the incident management structure into functional areas of operation. Groups are composed of resources assembled to perform a special function not necessarily within a single geographic division. Groups, when activated, are located between branches and resources in the Operations Section. (See Division.)

Half-Life

The time required for the activity of a given radioactive element to decrease to half of its initial value due to radioactive decay. The physical half-life is a characteristic property of each radioactive element and is independent of its amount or physical form. The effective or biological half-life of a given isotope in the body is the time in which the quantity in the body decreases to half because of both radioactive decay and biological elimination.

Hazard

Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.

Hazard Mitigation

Any cost-effective measure which will reduce the potential for damage to a facility or harm to individuals from a disaster event.

Hazard Prediction and Assessment Capability (HPAC)

The HPAC is a forward deployable modeling capability available for government, government-related, or academic use. This software tool assists in emergency response to hazardous agent releases. Its fast running, physics-based algorithms enable users to model and predict hazard areas and human collateral effects in minutes. The HPAC is able to predict the effects of HAZMAT releases into the atmosphere and their impact on civilian and military populations.

Hazardous Material (HAZMAT)

Any material that is flammable, corrosive, an oxidizing, explosive, toxic, poisonous, radioactive, nuclear, unduly magnetic, or chemical agent, biological research material, compressed gas, or any other material that, because of its quantity, properties, or packaging, may endanger life or property. For the purposes of ESF #1, hazardous material is a substance or material, including a hazardous substance, that has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated (See reference (h)). For the purposes of ESF #10 and the Oil and Hazardous Materials Incident Annex, the term is intended to mean hazardous substances, pollutants, and contaminants as defined by the NCP.

Hazardous Substance

As defined by the NCP, any substance designated pursuant to section 1321 of the Clean Water Act (reference (i)); any element, compound, mixture, solution, or substance designated pursuant to section 102 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, reference (j)); any hazardous waste having the characteristics identified under or listed pursuant to the Solid Waste Disposal Act (reference (k)) (but not including any waste the regulation of which under the Solid Waste Disposal Act [reference (l)] has been suspended by act of Congress); any toxic pollutant listed under section 1317 of the Clean Water Act (reference

(m)); any hazardous air pollutant listed under section 7412 of the Clean Air Act (reference (n)); and any imminently hazardous chemical substance or mixture with respect to which the EPA Administrator has taken action pursuant to the Toxic Substances Control Act (reference (o)).

High Explosive (HE).

An energetic material that detonates (instead of deflagrating or burning); the rate that the reaction zone advances into the unreacted material exceeds the velocity of sound in the unreacted material.

Historic Property

Any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places, including artifacts, records, and remains which are related to such district, site, building, structure, or object (reference (p)).

Hot Line

The inner boundary of the CCS, marked with tape or line. The station personnel consider the area on the inner side of the line as being contaminated and the side away from the incident or accident as an area of reduced contamination.

Hot Spot

The region in a contaminated area in which the level of radioactive contamination is considerably greater than in neighboring regions in the area (about 10 times the surrounding area).

Hot Spot Health Physics Code

A fast, field-portable set of software modeling programs used for evaluating events involving radioactive material. The software is also used for safety-analysis of facilities handling nuclear material.

Hotspot Mobile Laboratory

The Hotspot Mobile Laboratory is a DOE/NNSA emergency response capability that analyzes radiation samples for incidents or accidents involving nuclear weapons and radioactive materials.

Human Reliability Program (HRP)

A program implemented for specifically tasked DOE personnel who handle, have access to, or control access to nuclear weapon systems and components. The program covers selection, screening, and evaluation of the personnel assigned to various nuclear duties. The program seeks to ensure that personnel coming under its purview are mentally and emotionally stable and reliable.

Incident

An unexpected event that presents the potential for negative consequences that may be caused by accidental or intentional acts, acts of God, unfavorable environmental conditions, or other factors.

Incident Action Plan (IAP)

An oral or written plan containing general objectives reflecting the overall strategy for managing an incident. It may include the identification of operational resources and assignments. It may also include attachments that provide direction and important information for management of the incident during one or more operational periods.

Incident Command Post (ICP)

The field location at which the primary tactical-level, on-scene incident command functions are performed. The ICP may be collocated with the incident base or other incident facilities and is normally identified by a green rotating or flashing light.

Incident Command System (ICS)

A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating with a common organizational structure, designed to aid in the management of resources during incidents. ICS is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, or organized field-level incident management operations.

Incident Commander (IC)

The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.

Incident Management Team (IMT)

The Incident Commander and appropriate Command and General Staff personnel assigned to an incident.

Incident Mitigation

Actions taken during an incident designed to minimize impacts or contain the damages to property or the environment.

Incident Objectives

Statements of guidance and direction necessary for selecting appropriate strategy(s) and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow strategic and tactical alternatives.

Information Officer

See **Public Information Officer**.

Infrastructure

The manmade physical systems, assets, projects, and structures, publicly and/or privately owned, that are used by or provide benefit to the public. Examples of infrastructure include utilities, bridges, levees, drinking water systems, electrical systems, communications systems, dams, sewage systems, and roads.

Ingestion Pathway

The means by which a person is exposed to radiation through ingestion (i.e., hand-to-mouth).

Inhalation Pathway

The means by which a person at, or downwind from, the incident or accident area is subjected to respiratory radiation exposure.

Initial Actions

The actions taken by those responders first to arrive at an incident or accident site.

Initial Response

Resources initially committed to an incident.

Initial Response Force (IRF)

A tailored force dispatched from the closest military installation by the NMCC immediately upon notification of a nuclear weapon accident or nuclear or radiological incident. The IRF will assume military command of the accident site, provide security forces, set up a National Defense Area if appropriate, and establish a working relationship with the civilian incident commander IAW the National Incident Management System (NIMS).

- If an IRF is deployed by specific request of the Department of Energy or the National Aeronautics and Space Administration (NASA) as custodial agencies for radiological materials, the IRF will coordinate with the DOE or NASA incident commander upon arrival at the accident site.
- The IRF may include command and control, security, public affairs, hazardous material, EOD, communications, and logistics elements depending upon the request.

Initial Response Resources (IRR)

Disaster support commodities that may be pre-staged, in anticipation of a catastrophic event, at a Federal facility close to a disaster area for immediate application through an NRP ESF operation. The initial response resources are provided to victims and responders immediately after a disaster occurs. They are designed to augment State and local capabilities. DHS/EPR/FEMA Logistics Division stores and maintains critically needed initial response commodities for victims and responders and pre-positions supplies and equipment when required. The initial response resources include supplies (baby food, baby formula, blankets, cots, diapers, meals ready-to-eat, non-slip plastic sheeting, tents, and water) and equipment (emergency generators, industrial ice-makers, mobile kitchen kits, portable potties with service, portable showers, and refrigerated vans).

Inland Zone

As defined in the NCP, the environment inland of the coastal zone, excluding the Great Lakes and specified ports and harbors on the inland rivers. The term "coastal zone" delineates an area of Federal responsibility for response action. Precise boundaries are determined by EPA/USCG agreements and identified in RCPs.

Insensitive High Explosive (IHE)

HE that requires a shock of unusual strength to cause detonation. This relative insensitivity contributes to weapon safety.

Insular Areas

Non-State possessions of the United States. The insular areas include Guam, the Commonwealth of the Northern Mariana Islands (CNMI), American Samoa, the U.S. Virgin Islands, and the

former World War II Trust Territories now known as the Federated States of Micronesia and the Republic of the Marshall Islands. These last two entities, known as Freely Associated States (FAS), are still connected with the United States through the Compact of Free Association.

Intelligence Officer

The intelligence officer is responsible for managing internal information, intelligence, and operational security requirements supporting incident or accident management activities. These may include information security and operational security activities, as well as the complex task of ensuring that sensitive information of all types (e.g., classified information, law enforcement sensitive information, proprietary information, or export-controlled information) is handled in a way that not only safeguards the information, but also ensures that it gets to those who need access to it to perform their missions effectively and safely.

Interagency Modeling and Atmospheric Assessment Center (IMAAC)

An interagency center responsible for production, coordination, and dissemination of consequence predictions for an airborne hazardous material release. The IMAAC generates the single Federal prediction of atmospheric dispersions and their consequences utilizing the best available resources from the Federal Government.

Joint Director of Military Support (JDOMS)

Plans for and commits DoD resources in response to requests from civil authorities, under DoD Directive 5101.1 (reference (q)). The JDOMS serves as the action agent for planning and executing the Department of Defense's support mission to civilian authorities within the United States.

Joint Field Office (JFO)

A temporary Federal facility established locally to provide a central point for Federal, State, local, and tribal executives with responsibility for incident or accident oversight, direction, and/or assistance to effectively coordinate protection, prevention, preparedness, response, and recovery actions. The senior officials from each federal agency form what is known as the JFO Coordination Group within the JFO. The JFO will combine the traditional functions of the JOC, the FEMA DFO, and the JIC within a single Federal facility.

Joint Information Center (JIC)

A facility established to coordinate all incident- or accident-related public information activities. It is the central point of contact for all news media at the scene of the incident or accident. Public information officials from all participating agencies should collocate at the JIC.

Joint Operations Center (JOC)

The JOC is the focal point for all Federal investigative law enforcement activities during a terrorist or potential terrorist incident or any other significant criminal incident, and is managed by the SFLEO. The JOC becomes a component of the JFO if the SFO is activated.

Jurisdiction

A range or sphere of authority. Public agencies have jurisdiction at an incident or accident related to their legal responsibilities and authorities. Jurisdictional authority at an incident or accident can be political or geographical (e.g., city, county, tribal, State, or Federal boundary lines) or functional (e.g., law enforcement, public health). There are three types of jurisdiction with which the DoD IC needs to be concerned:

- **Exclusive Jurisdiction.** In designated areas under exclusive jurisdiction, a single government (Federal, State, local, or tribal) has sole jurisdiction over the area. Many DoD installations have exclusive Federal jurisdiction. On those installations, the Federal government exercises executive, legislative, and judicial authority. On exclusive jurisdiction DoD installations, the DoD IC shall have sole authority over the incident or accident site. Outside the boundaries of a DoD installation, the Department of Defense will have exclusive jurisdiction within the boundaries of a declared National Defense Area (NDA – see the Security page), but will rarely have exclusive jurisdiction outside the NDA.
- **Concurrent Jurisdiction.** In areas under concurrent jurisdiction, multiple governments (e.g., Federal and State or local governments) exercise simultaneous authority over the area. Essentially, this is dual jurisdiction. In nuclear weapon accidents or incidents, both on and off DoD installations, where concurrent jurisdiction applies, the DoD IC must work with State, local, and tribal civil authorities to conduct collective accident management activities. An NDA will normally be established around an accident occurring outside the boundaries of a DoD installation. It may also be necessary to establish an NDA if the accident is inside the boundaries of a DoD installation to ensure proper safeguarding of classified components and materials. In an accident that is within the boundaries of a DoD installation, the DoD IC should consult with local military legal professionals to determine the advisability of establishing and declaring an NDA.
- **Proprietary Jurisdiction.** Proprietary jurisdiction applies in situations where a government entity has ownership of an area but has not retained jurisdiction. Under these circumstances, the owning government entity has the same rights as any other landowner. The State, local, or tribal government retains jurisdiction over the area and has the authority to enforce laws in the area. In a nuclear weapon accident or incident on Federal land under proprietary jurisdiction, the DoD IC can be held liable for issues involving law enforcement activities. Although very few installations fall into this category, if a nuclear weapon accident occurs in an area where the Department of Defense has proprietary jurisdiction, the DoD IC should establish an NDA and a Unified Command relationship with designated officials from the agencies with jurisdictional authority (see Unified Command).

Lead Federal Agency (LFA)

See Coordinating Agency. This term is still used for incidents and accidents that occur outside the United States.

Liaison

A form of communication for establishing and maintaining mutual understanding and cooperation.

Liaison Officer

A member of the Command Staff responsible for coordinating with representatives from cooperating and assisting agencies.

Local Government

A county, municipality, city, town, township, local public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under State law), regional or interstate

government entity, or agency or instrumentality of a local government; an Indian tribe or authorized tribal organization or, in Alaska, a Native Village or Alaska Regional Native Corporation; or a rural community, unincorporated town or village, or other public entity (As defined in reference (r)).

Logistics

Providing resources and other services to support incident or accident management. Logistics Section: The section responsible for providing facilities, services, and material support for the incident or accident.

Major Disaster

As defined under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (reference (s)), a major disaster is any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which, in the determination of the President, causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of States, tribes, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.

Management by Objective

A management approach that involves a four-step process for achieving the response goal. The Management by Objectives approach includes the following: establishing overarching objectives; developing and issuing assignments, plans, procedures, and protocols; establishing specific, measurable objectives for various incident or accident management functional activities and directing efforts to fulfill them, in support of defined strategic objectives; and documenting results to measure performance and facilitate corrective action.

Materiel Management

Requisitioning and sourcing (requirements processing); acquisition, asset visibility (resource tracking), receipt, storage, and handling; security and accountability; inventory, deployment, issue, and distribution; and recovery, reuse, and disposition.

Maximum Permissible Dose

The radiation dose that a military commander or other appropriate authority may prescribe as the limiting cumulative radiation dose to be received over a specific period of time by members of the command, consistent with operational military considerations.

Medical Radiobiology Advisory Team (MRAT)

A team from the AFRRRI of highly qualified radiation medicine physicians, health physicists, and related scientists who provide state-of-the-art advice and assistance to the U.S. Combatant Commanders, allied forces, Federal Agencies, State and local governments, and others on radiological matters including accidents and incidents involving nuclear weapons, nuclear reactors, radiological dispersal devices, and industrial and/or medical sources. The MRAT also provides expertise for managing and treating radiation casualties. The MRAT deploys as augmentees to the DTRA Consequence Management Advisory Team (CMAT).

Mission Assignment

The vehicle used by DHS/EPR/FEMA to support Federal operations in a Stafford Act major disaster or emergency declaration. It orders immediate, short-term emergency response assistance when an applicable State or local government is overwhelmed by the event and lacks the capability to perform, or contract for, the necessary work.

Mitigation

Activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident or accident. Mitigation measures may be implemented prior to, during, or after an incident or accident. Mitigation measures are often developed in accordance with lessons learned from prior incidents or accidents. Mitigation involves ongoing actions to reduce exposure to, probability of, or potential loss from hazards. Measures may include zoning and building codes, floodplain buyouts, and analysis of hazard-related data to determine where it is safe to build or locate temporary facilities. Mitigation can include efforts to educate governments, businesses, and the public on measures they can take to reduce loss and injury.

Mobilization

The process and procedures used by all organizations—Federal, State, local, and tribal—for activating, assembling, and transporting all resources that have been requested to respond to or support an incident or accident.

Mobilization Center

An off-site, temporary facility at which response personnel and equipment are received from the Point of Arrival and are pre-positioned for deployment to an incident or accident logistics base, to a local Staging Area, or directly to an incident or accident site, as required. A mobilization center also provides temporary support services, such as food and billeting, for response personnel prior to their assignment, release, or reassignment and serves as a place to out-process following demobilization while awaiting transportation.

Monitoring

The act of detecting the presence of radiation and the measurement thereof with radiation measuring instruments; the act of detecting the presence of other hazardous materials and the measurement thereof with suitable measuring instruments.

Multiagency Coordination System

Provides the architecture to support coordination for incident and accident prioritization, critical resource allocation, communications systems integration, and information coordination. The components of multiagency coordination systems include facilities, equipment, EOCs, specific multiagency coordination groups, personnel, procedures, and communications. The systems assist agencies and organizations to fully integrate the subsystems of NIMS.

Mutual Aid Agreement

Written agreement between agencies, organizations, and/or jurisdictions that they will assist one another on request by furnishing personnel, equipment, and/or expertise in a specified manner.

National

Of a nationwide character, including the Federal, State, local, and tribal aspects of governance and policy.

National Atmospheric Release Advisory Center (NARAC)

A centralized computer-based system that estimates the transport, diffusion, and deposition of radioactive or other HAZMAT released to the atmosphere and projects doses to people and the environment.

National Communications System (NCS)

The telecommunications system resulting from the technical and operational integration of the separate telecommunications systems of the several Executive Branch departments and Agencies having significant telecommunications capability.

National Coordinating Center for Telecommunications

A joint telecommunications industry–Federal Government operation established to assist in the initiation, coordination, restoration, and reconstitution of NS/EP telecommunications services and facilities.

National Defense Area (NDA)

An area established on non-Federal or Federal lands located within the United States, its possessions, or its territories for safeguarding classified defense information or protecting DoD equipment and/or material. Establishment of an NDA temporarily places such lands under the effective control of the Department of Defense and results only from an emergency event. The senior DoD representative at the scene shall define the boundary, mark the boundary with a physical barrier, and post warning signs. The landowner's consent and cooperation shall be obtained when possible; however, military necessity shall dictate the final decision on location, shape, and size of the NDA.

National Incident Management System (NIMS)

A system mandated by HSPD-5 that provides a consistent nationwide approach for Federal, State, local, and tribal governments, the private-sector, and nongovernmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among Federal, State, local, and tribal capabilities, the NIMS includes a core set of concepts, principles, and terminology. HSPD-5 identifies these as the ICS; multiagency coordination systems; training; identification and management of resources (including systems for classifying types of resources); qualification and certification; and the collection, tracking, and reporting of incident information and incident resources.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP)

Maintained by the EPA in coordination with the National Response Team (NRT), the NCP provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants. To achieve this objective, the NCP establishes the NRT, Regional Response Teams (RRTs), and local Area Committees to coordinate planning and preparedness efforts. Federal On-Scene Coordinators coordinate response activities at the incident site. The NCP applies to oil discharges into or on the navigable waters of the United States (including adjoining shorelines and into the exclusive economic zone) and to releases into the environment of hazardous substances, pollutants, or contaminants that may present an imminent and substantial danger to public health or welfare.

National Response Center

A national communications center for activities related to oil and hazardous substance response actions. The National Response Center, located at DHS/USCG Headquarters in Washington, DC, receives and relays notices of oil and hazardous substances releases to the appropriate Federal On-Scene Coordinator (OSC).

National Response Framework (NRF)

The document that establishes a comprehensive, national, all-hazards approach to domestic incident response. It replaces the National Response Plan (NRP).

National Response System

Pursuant to the NCP, the mechanism for coordinating response actions by all levels of government (reference (t)) for oil and hazardous substances spills and releases.

National Response Team (NRT)

The NRT, comprised of the 16 Federal agencies with major environmental and public health responsibilities, is the primary vehicle for coordinating Federal agency activities under the NCP. The NRT carries out national planning and response coordination and is the head of a highly organized Federal oil and hazardous substance emergency response network. EPA serves as the NRT Chair, and DHS/USCG serves as Vice Chair.

National Security and Emergency Preparedness (NS/EP) Telecommunications

NS/EP telecommunications services are those used to maintain a state of readiness or to respond to and manage any event or crisis (local, national, or international) that causes or could cause injury or harm to the population, damage to or loss of property, or could degrade or threaten the NS/EP posture of the United States.

National Security Area (NSA)

An area established on non-Federal or Federal lands located in the United States, its possessions, or its territories, for safeguarding classified information, restricted data, or equipment and material belonging to the DOE/NNSA or the National Aeronautics and Space Administration (NASA). Establishment of an NSA temporarily places such lands under the effective control of the DOE/NNSA or NASA and results only from an emergency event. The senior DOE/NNSA or NASA representative having custody of the material at the scene shall define the boundary, mark the boundary with a physical barrier, and post warning signs. The landowner's consent and cooperation shall be obtained when possible; however, operational necessity shall dictate the final location, shape, and size of the NSA.

Natural Resources

Natural resources include land, fish, wildlife, domesticated animals, plants, biota, and water. Water means salt and fresh water, surface and ground water, including water used for drinking, irrigation, aquaculture, and recreational purposes, as well as in its capacity as fish and wildlife habitat, including coral reef ecosystems as defined in reference (u). Land means soil, surface and subsurface minerals, and other terrestrial features.

Nongovernmental Organization (NGO)

A nonprofit entity that is based on the interests of its members, individuals, or institutions and that is not created by a government, but may work cooperatively with government. Such

organizations serve a public purpose, not a private benefit. Examples of NGOs include faith-based charity organizations and the American Red Cross.

Nuclear Component

The part of a nuclear weapon composed of fissionable or fusionable materials that contribute substantially to nuclear energy released during detonation. Nuclear components include radioactive boosting materials.

Nuclear Contribution

Explosive energy released by nuclear fission or fusion reactions as part of the total energy released by a radiological incident or accident.

Nuclear Detonation

A nuclear explosion resulting from fission or fusion reactions in nuclear materials, such as from a nuclear weapon.

Nuclear Incident Response Team (NIRT)

Created by the Homeland Security Act to provide DHS with a nuclear/radiological response capability. When activated, the NIRT consists of specialized Federal response teams drawn from DOE and/or EPA. These teams may become DHS operational assets providing technical expertise and equipment when activated during a crisis or in response to a nuclear/radiological incident as part of the DHS Federal response.

Nuclear Radiation

Particulate and electromagnetic radiation emitted from atomic nuclei in various nuclear processes. The important nuclear radiations, from the weapons effects standpoint, are alpha and beta particles, gamma rays, and neutrons.

Nuclear Weapon

A complete assembly (i.e., implosion type, gun type, or thermonuclear type), in its intended ultimate configuration which, on completion of the prescribed arming, fusing, and firing sequence, is able to produce the intended nuclear reaction and release of energy.

Nuclear Weapon Accident (flagword BROKEN ARROW)

An unexpected event involving nuclear weapons or radiological nuclear weapon components that results in any of the following:

- Accidental or unauthorized launching, firing, or use by U.S. forces or U.S. supported allied forces of a nuclear-capable weapon system which could create the risk of an outbreak of war.
- Loss or destruction of a nuclear weapon or radiological nuclear weapon component, including jettisoning.
- An increase in the possibility of, or actual occurrence of, an explosion, a nuclear detonation, or radioactive contamination.
- Non-nuclear detonation or burning of a nuclear weapon or radiological nuclear weapon component.
- Public hazard, actual or implied.
- Any act of God, unfavorable environment, or condition resulting in damage to the weapon, facility, or component.

Nuclear Weapon Incident (flagword BENT SPEAR)

An unexpected event, including intentional, willful acts, involving a nuclear weapon, facility, or component, resulting in any of the following, but not constituting a nuclear weapon(s) accident:

- An increase in the possibility of, or actual occurrence of, an explosion, a nuclear detonation, or radioactive contamination.
- Errors committed in the assembling, testing, loading, or transportation of equipment and materiel which might lead to an unintentional operation of all or part of the weapon arming or firing sequence or which could lead to a substantial change in yield or increased dud probability.
- Loss or destruction of a nuclear weapon or radiological nuclear weapon component due to terrorist or enemy action (flagword EMPTY QUIVER, see Nuclear Weapon Theft).
- Non-nuclear detonation or burning of a nuclear weapon or radiological nuclear weapon component.
- Loss or destruction of a nuclear weapon or radiological nuclear weapon component, including jettisoning.
- Public hazard, actual or implied.

Nuclear Weapon Theft (flagword EMPTY QUIVER)

The seizure, theft, or loss of a nuclear weapon. To include:

- The loss (explained or unexplained) of a nuclear weapon or nuclear component.
- The forcible, unauthorized seizure or theft of a nuclear weapon or nuclear component.

Nuclear Yield

The energy released in the detonation of a nuclear weapon, usually expressed in terms of the kilotons or megatons of TNT, required to produce an equivalent energy release.

Off-Site

The area beyond the boundaries of a DoD installation or DOE facility, including the area beyond the boundary of an NDA or NSA, that has been or may become affected by a nuclear weapon accident or incident.

On-Scene Coordinator (OSC)

See **Federal On-Scene Coordinator**.

Operational Period

The time scheduled for executing a given set of operation actions, as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not over 24 hours.

Operational Report (OPREP)-3 BEELINE / PINNACLE EMPTY QUIVER

Report will be used to report the seizure, theft, or loss of a nuclear weapon. Includes:

- The loss (explained or unexplained) of a nuclear weapon or nuclear component.
- The forcible, unauthorized seizure or theft of a nuclear weapon or nuclear component.

Operational Report (OPREP)-3 BENT SPEAR

Report will be used to report an unexpected event involving a nuclear weapon, or component resulting in any of the following, but not constituting a nuclear weapon accident.

- An increase in the possibility of explosion or radioactive contamination.
- Errors committed in assembling, testing, loading, or transporting equipment or the malfunctioning of equipment and material which might lead to an unintentional operation of all or part of the weapon arming or firing sequence which, in turn, might lead to a substantial change in yield, or increased dud probability.
- Any act of God, unfavorable environment, or condition resulting in damage to the weapon, facility, or component.

Operational Report (OPREP) -3 PINNACLE BROKEN ARROW

Report used to report a U.S. nuclear weapon accident that does not create risk of nuclear war. Included are the following:

- Nuclear detonation of a U.S. nuclear weapon.
- Non-nuclear detonation or burning of a nuclear weapon.
- Radioactive contamination from a U.S. nuclear weapon or component.
- Seizure, theft, loss, or destruction of a nuclear weapon or radiological nuclear weapon component, including jettisoning.
- Public hazard, actual or implied, from a U.S. nuclear weapon or component.

Operations Section

The section responsible for all tactical incident and accident response operations. In ICS, it normally includes subordinate branches, divisions, and/or groups.

Oralloy

Oak Ridge alloy. Uranium enriched in the 235 isotope. Oy-xx is the notation used to designate the level of enrichment, where “xx” is the weight percent of U-235. Also known as enriched uranium.

Personal Protective Equipment (PPE)

Clothing and other protective equipment worn by response and recovery personnel that provides protection from radiological contamination and protection from other hazards. Clothing may consist of coveralls, shoe covers, cotton or latex gloves, and hood or hair cap. While personal protective clothing protects the user from alpha-beta radiation, it is primarily a contamination control device to prevent the spread of contamination. A respirator may also be worn as a part of personal protective equipment, which protects against the inhalation of contaminants.

Personnel Accountability

The ability to account for the location and welfare of incident and accident response personnel. It is accomplished when supervisors ensure that ICS principles and processes are functional and that personnel are working within established incident and accident management guidelines.

Personnel Reliability Program (PRP)

A program implemented for all DoD personnel who control, handle, have access to, or control access to nuclear weapon systems and components, SNM, and Nuclear Command and Control (NC2) materials. The program covers selection, screening, and continuous evaluation of the

personnel assigned to various nuclear duties. The program seeks to ensure that personnel coming under its purview are mentally and emotionally stable and reliable.

Physical Security

Elements of security concerned with physical measures designed to safeguard personnel and classified information; to prevent unauthorized access to nuclear weapons, SNM, and NC2 materials, equipment, facilities, and documents; and to safeguard them against espionage, sabotage, damage, and theft.

Planning Meeting

A meeting held as needed prior to and throughout the duration of incident and accident response operations to select specific strategies and tactics for incident and accident control operations and for service and support planning. For larger incidents and accidents, the planning meeting is a major element in the development of the Incident Action Plan.

Planning Section

Responsible for the collection, evaluation, and dissemination of operational information related to the incident or accident, and for the preparation and documentation of the IAP. This section also maintains information on the current and forecasted situation and on the status of resources assigned to the incident or accident response operation.

Plutonium (Pu)

An artificially produced fissile material. The Pu-239 isotope is the isotope of Plutonium primarily used in nuclear weapons.

Pollutant or Contaminant

As defined in the NCP, includes, but is not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions, or physical deformations in such organisms or their offspring.

Preparedness

The range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process. Preparedness involves efforts at all levels of government and between government and private-sector and nongovernmental organizations to identify threats, determine vulnerabilities, and identify required resources. Within the NIMS, preparedness is operationally focused on establishing guidelines, protocols, and standards for planning, training and exercises, personnel qualification and certification, equipment certification, and publication management.

Prevention

Actions taken to avoid an incident or accident or to intervene to stop an incident or accident from occurring. Prevention involves actions taken to protect lives and property. It involves applying intelligence and other information to a range of activities that may include such countermeasures as: deterrence operations; heightened inspections; improved surveillance and security operations; investigations to determine the full nature and source of the threat; public health and agricultural

surveillance and testing processes; immunizations, isolation, or quarantine; and, as appropriate, specific law enforcement operations aimed at deterring, preempting, interdicting, or disrupting illegal activity and apprehending potential perpetrators and bringing them to justice.

Principal Federal Official (PFO)

The Federal official designated by the Secretary of Homeland Security to act as his/her representative locally to oversee, coordinate, and execute the Secretary's incident and accident management responsibilities under HSPD-5 for nuclear weapon accidents or incidents.

Private Sector

Organizations and entities that are not part of any governmental structure. It includes for-profit and not-for-profit organizations, formal and informal structures, commerce and industry, and private voluntary organizations (PVO).

Processes

Systems of operations that incorporate standardized procedures, methodologies, and functions necessary to provide resources effectively and efficiently. These include resource typing, resource ordering and tracking, and coordination.

Protection Factors (PFs)

The assigned level of protection that a properly functioning respirator provides to a population of properly trained and fitted workers.

Protective Action Guide (PAG)

A radiation exposure level or range (or level of other hazard) established by appropriate Federal or State agencies beyond which protective action should be considered.

Protective Action Recommendation (PAR)

Advice to State, local, and tribal authorities on emergency measures it should consider in deciding action for the public to take to avoid or reduce exposure to radiation or other hazard.

Public Health

Protection, safety, improvement, and interconnections of health and disease prevention among people, domestic animals, and wildlife.

Public Information Officer (PIO)

A member of the Command Staff responsible for interfacing with the public and media or with other agencies with incident- or accident-related information requirements.

Public Works

Work, construction, physical facilities, and services provided by governments for the benefit and use of the public.

Qualification and Certification

This subsystem provides recommended qualification and certification standards for emergency responders and incident and accident management personnel. It also allows the development of minimum standards for resources expected to have an interstate application. Standards typically include training, currency, experience, and physical and medical fitness.

Radiation Absorbed Dose (rad)

Traditional unit of absorbed dose of radiation in any material. The International System unit of absorbed dose is the Gray. One centiGray = 1 rad.

Radiation Emergency Assistance Center/Training Site (REAC/TS)

A DOE/NNSA asset that provides 24-hour direct or consulting assistance to medical and health physics practitioners dealing with radiation-related health problems or injuries from local, national, or international radiation incidents.

Radioactivity Detection, Indication, and Computation (RADIAC)

A term designating various types of radiological measuring instruments or equipment.

Radioactivity

The spontaneous emission of radiation, most commonly alpha or beta particles or gamma ray photons, from the nuclei of atoms of an unstable isotope.

Radiological Accident

A loss of control over radiation or radioactive material that presents a hazard or potential hazard to life, health, property, or the environment, or that may result in any member of the general population exceeding limits for exposure to ionizing radiation.

Radiological Advisory Medical Team (RAMT)

A U.S. Army national asset DoD rapid response team specifically designed to provide timely expert guidance and services to the Combatant Commander, the IC, and/or local medical authorities and to provide limited medical support to response teams in controlled areas. In peacetime or war, the RAMT is capable of responding to a wide variety of events involving limited or mass nuclear casualties, radiologically contaminated patients, or exposed populations from events such as BROKEN ARROWS, reactor accidents, radiological terrorism, or nuclear war. The RAMT may deploy within 4 hours of notification and may operate in a NSA, NDA, and CNWDI access areas.

Radiological Assistance Program (RAP) Team

A regionally based DOE/NNSA emergency asset that provides, on request, radiological assistance to: DOE program elements; other Federal Agencies; State, local, and tribal governments; private groups; and individuals. RAP teams provide personnel and equipment to evaluate, assess, advise, and help lessen actual or perceived radiation hazards and risks to workers, the public, and the environment.

Radiological Assistance

That assistance provided after an incident or accident involving radioactive materials to:

- Evaluate the radiological hazard.
- Accomplish emergency rescue and first aid.
- Reduce safety hazards to the public.
- Reduce exposure of personnel to radiation or radioactive materials.
- Reduce the spread of radioactive contamination.
- Reduce damaging effects on property.
- Issue technical information and medical advice to appropriate authorities.

Radiological Control Area (RCA)

The control area including all known, or suspected, radiological contamination at the site of a radiological incident or accident. Also called the Exclusion Zone.

Radiological Survey

The directed effort to determine the distribution of radiological material and exposure rates in an area.

Reception Area

This refers to a location separate from staging areas, where resources report for in-processing and out-processing. Reception Areas provide accountability, security, situational awareness briefings, safety awareness, distribution of IAPs, supplies and equipment, feeding, and bed down.

Recovery

Involves myriad technical disciplines and supporting infrastructure to effectively reduce hazards to the public and the environment. Weapon recovery begins once any existing fires have been extinguished, weapons have been cooled, exposed personnel have been removed or stabilized, and initial reconnaissance of the area has been conducted by EOD personnel to locate weapon(s) and debris, as well as to prioritize future actions. The basic steps of weapon recovery operations are 1.) Initial Entry, 2.) Locating Weapons and Weapon Components, 3.) Development and Approval of the Recovery Plan, 4.) Performing Render Safe Procedures, and 5.) Temporary Storage, Packaging, Transport, and Disposal of the Weapon and Components. .

Re-entry Recommendations (RERs)

Advice provided to the State on guidance that may be issued to members of the public on returning to an area affected by a radiological emergency, either permanently or for short-term emergency actions.

Regional Response Coordination Center (RRCC)

Location established by the FEMA Regional Administrator to coordinate initial regional and field activities amongst State, local, and tribal agencies. The RRCC also will be the site of Federal coordination until a JFO is established by DHS.

Regional Response Teams (RRTs)

As regional counterparts to the National Response Team, the RRTs comprise regional representatives of the Federal agencies on the NRT and representatives of each State within the region. The RRTs serve as planning and preparedness bodies before a response, and provide coordination and advice to the Federal OSC during response actions.

Render Safe Procedures (RSPs)

See **EOD Procedures**.

Resources

Personnel and major items of equipment, supplies, and facilities available or potentially available for assignment to accident operations and for which status is maintained. Resources are described by kind and type and may be used in operational support or supervisory capacities at an accident or at an EOC.

Resource Management

Efficient accident management requires a system for identifying available resources at all jurisdictional levels to enable timely and unimpeded access to resources needed to prepare for, respond to, or recover from an incident or accident. Resource management under the NIMS includes mutual-aid agreements; the use of special Federal, State, local, and tribal teams; and resource mobilization protocols.

Resources Unit

Functional unit within the Planning Section responsible for recording the status of resources committed to the incident or accident. This unit also evaluates resources currently committed to the incident or accident, the effects additional responding resources will have on the incident or accident, and anticipated resource needs.

Response

Activities that address the short-term, direct effects of an incident or accident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes. As indicated by the situation, response activities include the following: applying intelligence and other information to lessen the effects or consequences of an incident or accident; increased security operations; continuing investigations into the nature and source of the threat; ongoing public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and specific law enforcement operations aimed at preempting, interdicting, or disrupting illegal activity, and apprehending actual perpetrators and bringing them to justice.

Response Task Force (RTF)

A DoD response force appropriately staffed, trained, and equipped to coordinate all actions necessary to control and recover from a nuclear weapon accident. The specific purpose of the RTF is to recover weapons and provide radiological accident assistance. Combatant Commanders will be given operational control of RTFs by the Chairman of the Joint Chiefs of Staff, via the NMCC, at an appropriate time in the response.

Restricted Data (RD)

All data (information) concerning the following:

- The design, manufacture, or use of atomic weapons;
- The production of Special Nuclear Material (SNM); or
- The use of SNM in the production of energy, but not including data declassified or removed from the restricted data category under Section 142 of the AEA.

Roentgen (R)

A unit of exposure of gamma (or X-ray) radiation.

Roentgen Equivalent Man/Mammal (rem)

The traditional unit of dose equivalent. A derived unit equal to the absorbed dose in humans, multiplied by a quality factor, which accounts for the average effectiveness of a particular type of radiation in producing biological effects in humans. The International System unit of dose equivalent is the Sievert. One rem = 0.01 Sievert.

Safety Officer

A member of the Command Staff responsible for monitoring and assessing safety hazards or unsafe situations and for developing measures for ensuring personnel safety.

Safing

As applied to weapons and ammunition, the changing from a state of readiness for initiation to a condition where initiation is not likely.

Second-Order Closure Integrated Puff (SCIPUFF)

SCIPUFF is the transport model used within the HPAC model to predict the expected dispersion on nuclear, biological, and chemical (NBC) materials and associated uncertainties. SCIPUFF takes the release scenarios (what, where, when, and the boundaries of the specific environmental data), predicts where the NBC material may move through the atmosphere, and computes the deposition of the HAZMAT at geographic locations.

Section

The organizational level having responsibility for a major functional area of incident or accident management, e.g., Operations, Planning, Logistics, Finance/Administration, and Intelligence (if established). The section is organizationally situated between the branch and the Incident Command.

Security Area

The area surrounding the incident or accident site in a foreign country where a two-person security policy is established to prevent unauthorized access to classified defense information, equipment, or material. The cooperation by local authorities and host nation consent should be obtained through prior host nation agreements. In some countries, this area may be designated as the "Weapon Restricted Area," or RA, in accordance with bilateral or Combatant Commander plans.

Senior Energy Official (SEO)

The Official who provides C2 and coordination of all DOE/NNSA emergency response assets that may be called to lessen the consequences of the nuclear weapon accident. The SEO is the focal point for interfacing with the Department of Defense and other agencies and represents the DOE/NNSA at the accident site for all Departmental response operations, including serving as the senior spokesperson for the DOE/NNSA.

Senior Official (SO)

An individual representing a Federal department or agency with primary statutory responsibility for incident or accident management. SOs utilize existing authorities, expertise, and capabilities to aid in management of the incident or accident working in coordination with other members of the JFO Coordination Group. The SO for the DoD is the DSO, and the SO for the DOE is the SEO.

Shared Resources (SHARES) High Frequency Radio Program

SHARES provides a single, interagency emergency message handling system by bringing together existing HF radio resources of Federal, State, and industry organizations when normal communications are destroyed or unavailable for the transmission of NS/EP information.

Sievert (Sv)

International System unit of any of the quantities expressed as dose equivalent. The dose equivalent in Sv is equal to the absorbed dose in Gys multiplied by the quality factor (1 Sv = 100 rem).

Site Remediation (SR)

The process of removing contaminants from a site that were the result of an incident or accident and restoring the site to conditions agreed on by the stakeholders.

Site Remediation Working Group (SRWG)

An organization formed at the accident scene whose sole purpose is to focus on SR issues. The SRWG draws on the expertise of the various elements who respond to the incident or accident to form a coordinated SR team.

Situation Assessment

The evaluation and interpretation of information gathered from a variety of sources (including weather information and forecasts, computerized models, GIS data mapping, remote sensing sources, ground surveys, etc.) that, when communicated to emergency managers and decision makers, can provide a basis for incident or accident management decision-making.

Span of Control

The number of individuals a supervisor is responsible for, usually expressed as the ratio of supervisors to individuals. Under the NIMS, an appropriate span of control is between 1:3 and 1:7.

Spill of National Significance (SONS)

The National Oil and Hazardous Substances Pollution Contingency Plan defines a Spill of National Significance (SONS) as: “a spill that, due to its severity, size, location, actual or potential impact on the public health and welfare or the environment, or the necessary response effort, is so complex that it requires extraordinary coordination of Federal, State, local, and responsible party resources to contain and clean up the discharge.”

Special Nuclear Material (SNM)

Plutonium and uranium enriched in the 239 or 235 isotope, respectively, and any other material that the DOE, under the provisions the AEA (reference (v)), determines to be SNM. Does not include source material.

Staging Area

Location established where resources can be placed while awaiting a tactical assignment. The Operations Section manages Staging Areas.

State

Any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and any possession of the United States (As defined in reference (w)).

State Status

Used to denote National Guard forces working under the command of the Governor in either Title 32 or State Active Duty status. National Guard personnel can be placed in Title 10 Status,

placing them under the command of the Commander-in-Chief, can be placed in Title 32 status where they are funded by the Federal government but command authority remains with the state Governor, or they can be in State Active Duty status where they are funded and commanded by the state.

Strategic

Strategic elements of incident and accident management which are characterized by continuous, long-term, high-level planning by organizations headed by elected or other senior officials. These elements involve the adoption of long-range goals and objectives, the setting of priorities, the establishment of budgets and other fiscal decisions, policy development, and the application of measures of performance or effectiveness.

Strategic Plan

A plan that addresses long-term issues such as impact of weather forecasts, time-phased resource requirements, and problems such as permanent housing for displaced disaster victims, environmental pollution, and infrastructure restoration.

Strategy

The general direction selected to accomplish incident objectives set by the IC.

Strike Team

A set number of resources of the same kind and type that have an established minimum number of personnel.

Subject-Matter Expert (SME)

An individual who is a technical expert in a specific area or in performing a specialized job, task, or skill.

Task Force

Any combination of resources assembled to support a specific mission or operational need. All resource elements within a Task Force must have common communications and a designated leader.

Technical Assistance

Support provided to State, local, and tribal jurisdictions when they have the resources but lack the complete knowledge and skills needed to perform a required activity (such as mobile-home park design and hazardous material assessments).

Telecommunications

The transmission, emission, or reception of voice and/or data through any medium by wire, radio, other electrical electromagnetic, or optical means. Telecommunications includes all aspects of transmitting information.

Telecommunications Service Priority (TSP) Program

The NS/EP TSP Program is the regulatory, administrative, and operational program authorizing and providing for priority treatment (i.e., provisioning and restoration) of NS/EP telecommunications services. As such, it establishes the framework for NS/EP telecommunications service vendors to provide, restore, or otherwise act on a priority basis to ensure effective NS/EP telecommunications services.

Terrorism

Under the Homeland Security Act of 2002, terrorism is defined as any activity that (A) involves an act that (i) is dangerous to human life or potentially destructive of critical infrastructure or key resources; and (ii) is a violation of the criminal laws of the United States or of any State or other subdivision of the United States; and (B) appears to be intended (i) to intimidate or coerce the civilian population; (ii) to influence the policy of a government by intimidation or coercion; or (iii) to affect the conduct of a government by mass destruction, assassination, or kidnapping (see reference (x)).

Threat

An indication of possible violence, harm, or danger.

Tools

Those instruments and capabilities that allow for the professional performance of tasks, such as information systems, agreements, doctrine, capabilities, and legislative authorities.

Transportation Management

Transportation prioritizing, ordering, sourcing, and acquisition; timephasing plans; fleet management; and movement coordination and tracking.

Triage

The process for sorting injured people into groups based on their need for, or likely benefit from, immediate medical treatment. More generally, a process in which things are ranked in terms of importance or priority.

Tribal

Any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native Village as defined in or established pursuant to the Alaskan Native Claims Settlement Act (reference (y)), that is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

Tritiated Water (HTO)

A water molecule in which a tritium (T or H-3) atom replaces a hydrogen atom.

Tritium (T or H-3)

Tritium is a radioactive isotope of hydrogen having one proton and two neutrons in the nucleus. Tritium is a low-energy beta emitter that, when in water vapor form (HTO), poses a radiation hazard from inhalation and absorption through the skin because of its physical and biological similarities to water.

Tuballoy

A term of British origin for uranium metal containing no more than natural (0.7%) isotopic content of U-235. This term is sometimes used to indicate either natural or depleted uranium.

Two-Person Concept

A system designed to prohibit access by one individual to nuclear weapons and certain designated components by requiring the presence at all times of at least two authorized persons capable of detecting incorrect or unauthorized procedures with respect to the task to be performed. Also referred to as the two-person rule or policy. Replaced the two-man rule.

Two-Person Control

The close surveillance and control of materials at all times by at least two authorized persons, each capable of detecting incorrect or unauthorized procedures with respect to the task to be performed and each familiar with established security requirements.

Type

A classification of resources in ICS that refers to capability. Type 1 is generally considered to be more capable than Types 2, 3, or 4, respectively, because of size; power; capacity; or, in the case of incident management teams, experience and qualifications.

Unified Area Command

A Unified Area Command is established when incidents or accidents under an Area Command are multijurisdictional (see Area Command).

Unified Command (UC)

In ICS, the Unified Command is a unified team effort which allows all agencies with responsibility for the incident or accident, either geographic or functional, to manage an accident working together, by establishing a common set of incident or accident objectives and strategies. This is accomplished without losing agency authority, responsibility, or accountability.

Unit

The organizational element having functional responsibility for a specific accident planning, logistics, or finance/administration activity.

United States (U.S.)

The term "United States," when used in a geographic sense, means any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, any possession of the United States, and any waters within the jurisdiction of the United States (as defined in reference (z)).

Unity of Command (UC)

The concept by which each person within an organization reports to one and only one designated person. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.

Uranium (U)

Uranium is a heavy, silvery white, radioactive metal. In air, the metal becomes coated with a layer of oxide that makes it appear from a golden-yellow color to almost black. Uranium is an alpha emitter. Decay (progeny) products emit an array of other radiations. Uranium presents chemical and radiation hazards and exposure may occur during mining, ore processing, or uranium metal production. Uranium and its compounds have both toxic chemical and radiation effects, depending on dose and exposure time, as well as type of exposure, such as inhalation or skin contact.

Urban Search and Rescue (US&R)

Operational activities that include locating, extricating, and providing on-site medical treatment to victims trapped in collapsed structures.

Volunteer

Any individual accepted to perform services by an agency that has authority to accept volunteer services when the individual performs services without promise, expectation, or receipt of compensation for services performed (see reference (aa)).

Warhead

That part of a missile, projectile, torpedo, rocket, or other munitions that contains the nuclear or thermonuclear system, HE system, chemical or biological agents, or inert materials intended to inflict damage.

Weapon Debris (Nuclear)

The residue of a nuclear weapon after it has undergone a conventional explosion, burned, or been severely damaged; that is, the materials used for the casing and other components of the weapon, plus unexpended plutonium, uranium, and other components, together with fission products, if any.

Weapon of Mass Destruction (WMD)

As defined in reference (ab), weapon of mass destruction means 1.) any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than 4 ounces, missile having an explosive or incendiary charge of more than one-quarter ounce, mine, or similar device; 2.) any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals or their precursors; 3.) any weapon involving a biological agent, toxin, or vector; or 4.) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

Weapons Recovery

See **Recovery**.

Wireless Priority Service (WPS)

WPS allows authorized NS/EP personnel to gain priority access to the next available wireless radio channel to initiate calls during an emergency when carrier channels may be congested.

ABBREVIATIONS

AAC	Ambient Air Concentration
ACC	Army Combatant Command
AEA	Atomic Energy Act
AFB	Air Force Base
AFI	Air Force Instruction
AFIOH	Air Force Institute for Operational Health
AFMAN	Air Force Manual
AFRAT	Air Force Radiation Assessment Team
AFRRI	Armed Forces Radiobiology Research Institute
AIB	Accident Investigation Board
Am	Atomic Symbol for the element Americium
AMAD	Activity Median Aerodynamic Diameter
AMS	Aerial Measuring System
AMSC	American Mobile Satellite Corporation
AN/PDQ	Army, Navy/Portable, RADIAC, Special or Combination
AN/PDR	Army, Navy/Portable Detector Radiation
AN/VDR	Army, Navy/Vehicular (Ground), RADIAC, Passive Detecting
AOR	Area of Responsibility
APF	Assigned Protection Factor
APR	Air-Purifying Respirator
ARAC	Atmospheric Release Advisory Capability
ARG	Accident Response Group
ASD(HD&ASA)	Assistant Secretary of Defense for Homeland Defense and Americas Security Affairs
ASD(NII)	Assistant Secretary of Defense (Networks and Information Integration)
ASD(PA)	Assistant Secretary of Defense (Public Affairs)
ASD(SO/LIC)	Assistant Secretary of Defense (Special Operations and Low Intensity Conflicts)
ASHG	Accident Site Health Group
ATSD(NCB)	Assistant to the Secretary of Defense For Nuclear, Chemical and Biological Defense Programs

BEAR	Basic Expeditionary Airfield Resources
BEEF	Base Engineer Emergency Forces
BGP	Beta Gamma Probe
Bq	Becquerel
BUMED	Navy Bureau of Medicine and Surgery

C2	Command and Control
CASNAR	Commander and Staff Nuclear Accident Response
CAT	Crisis Action Team
CATS	Consequence Assessment Tool Set
CBO	Community-Based Organization
CBRNE	Chemical, Biological, Radiological, Nuclear, or High-Yield Explosive

CbtWMD	Combating Weapons of Mass Destruction
CCA	Contamination Control Area
CCDR	Combatant Commander
CCG	Crisis Coordination Group
CCL	Contamination Control Line
CCS	Contamination Control Station
CDC	Center for Disease Control and Prevention
CDO	Command Duty Officer
CEDE	Committed Effective Dose Equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	Composite Fiber
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
cGy	CentiGray
Ci	Curie
CIB	Combined Information Bureau
CKHV	High Volume Calibration Kit
CM	Consequence Management
CMAT	Consequence Management Advisory Team
CME	Crisis Management Element
CMHT	Consequence Management Home Team
CMPT	Consequence Management Planning Team
CMRT	Consequence Management Response Team
CMST	Consequence Management Support Team
CNMI	Commonwealth of the Northern Mariana Islands
CNWDI	Critical Nuclear Weapon Design Information
CO	Commanding Officer
COM	Chief of Mission
COMSEC	Communications Security
CONUS	Continental United States
COTP	Captain of the Port
CPM	Counts per Minute
CPX	Command Post Exercise
CRSP	Continuation of Render Safe Procedures
CSG	Counterterrorism Security Group
CST-RTC	Civil Support Team Radiological Training Course

DAC	Derived Air Concentration
DCE	Defense Coordinating Element
DCFs	Dose Conversion Factors
DCO	Defense Coordinating Officer
DEPSECDEF	Deputy Secretary of Defense
DEST	Domestic Emergency Support Team
DHS	Department of Homeland Security
DII	Defense Information Infrastructure
DMAT	Disaster Medical Assistance Team
DMORT	Disaster Mortuary Operational Response Team
DNWS	Defense Nuclear Weapons School

DOC	Department of Commerce
DoD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOJ	Department of Justice
DOL	Department of Labor
DOS	Department of State
DOT	Department of Transportation
DPM	Disintegrations per minute
DSCA	Defense Support of Civil Authorities
DSN	Defense Switched Network
DT	Detecting Head
DTPA	Diethylenetriamine Pentaacetic Acid
DTRA	Defense Threat Reduction Agency
DTRU	Defense Threat Reduction University
DU	Depleted Uranium

EAS	Emergency Alert System
EAO	External Affairs Officer
ECN	Emergency Communications Network
ECP	Entry Control Point
EEFI	Essential Elements of Friendly Information
EMS	Emergency Medical Services
EMT	Emergency Management Team
EOC	Emergency Operations Center
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPR	Emergency Preparedness and Response
ERO	Emergency Response Officer
ERT	Emergency Response Team
ERT-A	Emergency Response Team—Advance Element
ERT-N	National Emergency Response Team
ESF	Emergency Support Function
ESQD	Explosive Safety Quantity Distance
EST	Emergency Support Team
EUCOM	European Command

FAS	Freely Associated States
FBI	Federal Bureau of Investigation
FCO	Federal Coordinating Officer
FDA	Food and Drug Administration
FDPMU	U.S. Navy Forward Deployable Preventive Medicine Unit
FECC	Federal Emergency Communications Coordinator
FEMA	Federal Emergency Management Agency
FF	Fit Factor
FIDLER	Field Instrument for the Detection of Low-energy Radiation
FIRST	Federal Incident Response Support Team

FM	Frequency Modulation
FNS	Food and Nutrition Service
FOG	Field Operations Guide
FOIA	Freedom of Information Act
FOSC	Federal On Scene Coordinator
FRC	Federal Resource Coordinator
FRD	Formerly Restricted Data
FRMAC	Federal Radiological Monitoring and Assessment Center
FRPCC	Federal Radiological Preparedness Coordinating Committee
FSE	Full Scale Exercise

GC	General Counsel
GETS	Government Emergency Telecommunications Service
GIS	Geographical Information System
GM	Geiger-Mueller
GPS	Global Positioning System
GSA	General Services Administration
Gy	Gray

H-3 (T)	Symbols for the Hydrogen isotope Tritium
HAZMAT	Hazardous Material
HE	High Explosive
HEPA	High Efficiency Particulate Air
HEU	Highly Enriched Uranium
HF	High Frequency
HIPAA	Health Insurance Portability and Accountability Act
HHS	Department of Health and Human Services
HMRU	Hazardous Materials Response Unit
HPAC	Hazard Prediction and Assessment Capability
HQ	Headquarters
HQ/EOC	DOE HQ Emergency Operations Center
HRP	Human Reliability Program
HSAS	Homeland Security Advisory System
HSC	Homeland Security Council
HSIN	Homeland Security Information Network
HSPD	Homeland Security Presidential Directive
HTO	Tritiated Water

IAC	Incident Advisory Council
IAIP	Information Analysis and Infrastructure Protection
IAP	Incident Action Plan
IC	Incident Command(er) (see context)
IC	Inhaled Concentration (see context)
ICP	Incident Command Post (see context)
ICP	Incident Communications Plan (see context)
ICRP	International Commission on Radiological Protection

ICS	Incident Command System
IED	Improvised Explosive Device
IHE	Insensitive High Explosive
IJOPS	Implementing Joint Operating Plans
IM	Intensity Measuring (device)
IMAAC	Interagency Modeling & Atmospheric Assessment Center
IMT	Incident Management Team
INMARSAT	International Marine Satellite
INS	Incident of National Significance
IRF	Initial Response Force
IRR	Initial Response Resources
IS	Independent Study
IV	Intravenous; intravenously

J-3	Joint Staff, Directorate of Operations
JDOMS	Joint Director of Military Support
JFCOM	Joint Forces Command
JFO	Joint Field Office
JIC	Joint Information Center
JNAIRT	Joint Nuclear Accident/Incident Response Team
JNEODC	Joint Nuclear Explosives Ordnance Disposal Course
JNSEC	Joint DoD-DOE/NNSA Nuclear Surety Executive Course
JNTC	Joint National Training Capability
JOC	Joint Operations Center
JOPEs	Joint Planning and Execution System
JPC	Joint Planners Course
JSCC	Joint Security Control Center
JTF	Joint Task Force
JTF-CS	Joint Task Force Civil Support
JTS	Joint Training System
JTTF	Joint Terrorism Task Force

keV	Thousand Electron Volts
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LAM	Local Area Monitoring
LFA	Lead Federal Agency
LLNL	Lawrence Livermore National Laboratory
LNO	Liaison Officer

MACS	Multiagency Coordination System
MATTS	Mobile Air Transportable Telecommunications System
MBq	Megabequerel
mCi	Millicurie
MDS	Meteorological Data Servers

MERS	Mobile Emergency Response Support
MeV	Million Electron Volts
μCi	Microcurie
μCi/m ²	Microcuries per square meter
μCi/m ³	Microcuries per cubic meter
μg/m ²	Micrograms per square meter
μR	Microroentgen
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPE	Maximum Permissible Exposure
mph	Miles per hour
mR	Milliroentgen
MRAT	Medical Radiobiological Advisory Team (AFRRI)
mRem	Millirem
MSCA	Military Support to Civil Authorities
NaI	Sodium Iodide
NARA	National Archives and Records Agency
NARAC	National Atmospheric Release Advisory Center
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NAVSCOLEOD	Naval School Explosive Ordnance Disposal
NBC	Nuclear, Biological, and Chemical
NC2	Nuclear Command and Control
NCCS	Nuclear Command and Control System
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (aka National Contingency Plan)
NCS	National Communications System
NDA	National Defense Area
NEP	National Exercise Program
NGO	Nongovernmental Organization
NICCL	National Incident Communications Conference Line
NIEOC	National Interagency Emergency Operations Center
NIMS	National Incident Management System
NIPP	National Infrastructure Protection Plan
NIRT	Nuclear Incident Response Team
NL	No Limit
NMCC	National Military Command Center
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NORTHCOM	U.S. Northern Command
NOC	National Operations Center
NRC	Nuclear Regulatory Commission
NRCC	National Response Coordination Center
NRF	National Response Framework
NRF-ICEPP	National Response Framework Incident Communications Emergency Policy and Procedures
NRF-ICES	National Response Framework Incident Communications Emergency Support Supplement

NRIM	Nuclear and Radiological Incident Management
NRP	National Response Plan
NRT	National Response Team
NSA	National Security Area
NSC	National Security Council
NS/EP	National Security and Emergency Preparedness
NSN	National Stock Number
NSSE	National Special Security Event
NVOAD	National Voluntary Organizations Active in Disaster
NWAIRS	Nuclear Weapon Accident-Incident Response Subcommittee

OCONUS	Outside Continental United States
OOD	Officer of the Deck
OPR	Office of Primary Responsibility
OPREP	Operations Report
OPSEC	Operation Security
OSC	On-Scene Coordinator
OSD	Office of the Secretary of Defense
OSHA	Occupational Safety and Health Administration
OT	Operations Team

PA	Preliminary Assessment (see context)
PA	Public Affairs (see context)
PACAF	Pacific Command Air Force
PACOM	Pacific Command
PAG	Protective Action Guide
PAO	Public Affairs Officer
PAR	Protective Action Recommendation
pCi	Picocurie
PDA	Preliminary Damage Assessment
P/ENAF	Primary/Emergency Nuclear Airlift Force
PF	Protection Factor
PFO	Principal Federal Official
PIO	Public Information Officer
PLA	Principal Legal Advisor
POC	Point of Contact
POL	Petroleum, Oil, and Lubricants
PPE	Personal Protective Equipment
PRP	Personnel Reliability Program
PVO	Private Voluntary Organizations
Pu	Atomic Symbol for the element Plutonium

QC	Quality Control
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R	Roentgen
RA	Restricted Area
rad	Radiation Absorbed Dose
RADCON	Radiological Control
RADIAC	Radioactivity Detection, Indication, and Computation
RAMT	Radiological Advisory Medical Team (U.S. Army)
RAP	Radiological Assistance Program
RCA	Radiological Control Area
RCP	Regional Contingency Plan
REAC/TS	Radiation Emergency Assistance Center/Training Site
RD	Restricted Data
RDD	Radiological Dispersal Device
rem	Roentgen Equivalent Man/Mammal
RER	Re-entry Recommendations
RETOPS	Radiological Emergency Team Operations
RETOR	Radiological Emergency Team Orientation
RF	Resuspension Factor
RFA	Request for Assistance
RFF	Request for Forces
RFI	Request for Information
ROE	Rules of Engagement
RRCC	Regional Response Coordination Center
RRT	Regional Response Team
RSP	Render Safe Procedure
RTF	Response Task Force
RUF	Rules for Use of Force

SAC	Special Agent-in-Charge
SAR	Search and Rescue
SCBA	Self-Contained Breathing Apparatus
SCIPUFF	Second-Order Closure Integrated Puff
SCO	State Coordinating Officer
SDO	Senior Defense Official
SECDEF	Secretary of Defense
SEO	Senior Energy Official
SFLEO	Senior Federal Law Enforcement Official
SI	Site Inspection (see context)
SI	Système Internationale d'Unités (International System of Units) (see context)
SICCL	State Incident Communications Coordination Line
SINCGARS	Single Channel Ground and Airborne Radio System
SIPRNET	SECRET Internet Protocol Router Network
SHARES	Shared Resources High Frequency Radio Program
SIOC	Strategic Information and Operations Center
SLT	State, local, and tribal
SME	Subject Matter Expert
SNL	Sandia National Laboratories
SNM	Special Nuclear Material

SO	Senior Official
SOI	Signal Operating Instruction
SONS	Spill of National Significance
SOP	Standard Operating Procedure
SR	Site Remediation
SRWG	Site Remediation Working Group
SSZ	Safety and Security Zone
START	Scientific & Technical Advisory & Response Team
STE	Secure Terminal Equipment
STU III	Secure Telephone Unit III
Sv	Sievert

T (or H-3)	Atomic Symbols for the Hydrogen isotope Tritium
Th	Atomic Symbol for the element Thorium
TLD	Thermo-Luminescent Dosimeter
TNT	Trinitrotoluene
TRI-TAC	Tri-Service Tactical
TSP	Telecommunications Service Priority
TTX	Table Top Exercise

U	Atomic Symbol for the element Uranium
UC	Unified Command
UCNI	Unclassified Controlled Nuclear Information
UCT	Universal Coordinated Time
UHF	Ultra High Frequency
U.S.	United States
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventative Medicine
USAF	United States Air Force
U.S.C.	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USD(I)	Under Secretary of Defense For Intelligence
USD(P)	Under Secretary of Defense For Policy
USEUCOM	U.S. European Command
USG	United States Government
USNORTHCOM	U.S. Northern Command
USSTRATCOM	U.S. Strategic Command
USTRANSCOM	U.S. Transportation Command
US&R	Urban Search and Rescue

VHF	Very High Frequency
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WATS	Wide Area Telephone Service
WBGT	Wet Bulb Globe Temperature
WMD	Weapon(s) of Mass Destruction
WMDC3	Weapons of Mass Destruction Command, Control, and Coordination
WMDS3	Weapons of Mass Destruction Staff Support Seminar
WPS	Wireless Priority Service
WRA	Weapon Restricted Area
WRSET	Weapon Recovery Safety Evaluation Team
ZnS	Zinc Sulfide