

CHAPTER 10

SHIPBOARD ACCIDENT RESPONSE

10-1 GENERAL

A shipboard nuclear weapon accident differs from land-based scenarios in **several** aspects. A fire or explosion associated with the accident has the potential to cause loss of the ship. Results of shipboard fires are well known and documented in Repair Party Training and Procedures Manuals. Explosions, whether from a nuclear weapon or some other source (for example, petroleum fuels or conventional weapons) can cause severe damage effecting the safety and seaworthiness of the ship. Although the initial response by shipboard personnel will be the same **whether** an accident occurs at sea or in port, the frequent lack of immediate assistance at sea increases the importance of correct and adequate response by shipboard personnel. A significant difference is that the ship may, depending on the damage sustained, be directed to another location for weapon recovery operations and decontamination.

10-2 PURPOSE AND SCOPE

In a nuclear weapon accident, the Commanding Officer (CO) will focus attention on saving the ship and crew, protecting the public from health hazards, and keeping the chain-of-command informed of the situation. This chapter provides guidance concerning aspects of a nuclear weapon accident response unique to the shipboard environment.

10-3 RESPONSE ORGANIZATIONS

A ship's damage control organization will provide the initial response to a shipboard nuclear weapon accident and will be augmented by the following.

a. Explosive Ordnance Disposal (EOD) Detachment - Composed of one officer and four enlisted EOD specialists or detachments are embarked on CVs/ CVNS, AEs, and AOES during deployments. Also, detachments are permanently assigned to major U.S. port facilities throughout the world and are trained to respond to a nuclear weapon accident.

b. Weapon Safing Team - Composed of members of the ship's crew, this team performs emergency weapon safing procedures in the absence of an EOD team.

c. Radiation Monitoring Team - Comprised of members of the ship's crew, this response element is trained to operate RADIAC instruments and man the contamination control stations or decontamination stations.

d. The Navy Radiological Control (RADCON) Team - This team is located at NAVSEADET RASO, Yorktown, VA and can provide on-scene advice when radioactive contamination is released. The ability of the detachment to respond rapidly depends on the ship's location at the time of the accident. Again depending on the remoteness of the accident, the same response organizations described in Chapters 3 through 14 may be tasked to respond.

10-4 EQUIPMENT

The AN/ PDR-73 and IC/T2-PAB(M) are used to detect tritium. The AN/ PDR-56 alpha survey instrument is the ship's primary RADIAC instrument used in nuclear weapons accident response. The AN/ PDR-27 low range beta-gamma survey instrument is used primarily by initial entry teams to determine gamma dose rate and is carried by all ships. The AN/ PDR-43 high range beta-gamma survey instrument is also available and may be used to determine high beta-gamma dose rates, if required. The functions of these instruments are discussed in Appendix 10-B. The availability of air monitoring equipment to a ship depends on the ship's weapons maintenance capability for airborne radioactive material detection equipment. EOD teams have equipment for detection of gaseous radioactivity.

10-5 PRE-ACCIDENT PREPARATION

The key to responding to a nuclear weapon accident is planning, training, and adhering to precautionary measures during critical stages. In addition to possessing

a well exercised shipboard 'Nuclear Weapon Accident bill, ships should take the following preventive measures during weapons movements when the chance for a nuclear weapon accident is at its peak:

a. Have Damage Control parties alerted with protective equipment, calibrated **RADIAC**, and firefighting equipment.

b. Station security forces in the immediate area of the movement.

c. Ensure that the medical department and EOD detachment (when available) are on alert.

d. Establish a sound powered phone link between Damage Control Central, Damage Control parties and weapons handling personnel.

10-6 ACCIDENT

a. When an accident occurs in port, it **should** be handled similar to the one that occurs ashore. The initial response force will be derived from the activity in which the accident occurred (in this case the ship) and augmentation will be provided by a SRF. These procedures have been established in previous chapters. The major differences in port lay in the flexibility provided by the ship.

b. At sea, the possibility of augmentation by a Service Response Force will be diminished and the action by the ship's forces in effecting the response will be critical. Some additional assistance by specialized units may be provided by ships in the vicinity. Also, EOD detachments may be parachuted into the area.

(1) Initial Response Procedures. These procedures are the most crucial in gaining control of a nuclear accident or incident. Accordingly, all ships **force** personnel who, by the nature of their official duties, may become directly or indirectly involved in a nuclear accident or incident are trained to perform the following procedures:

(a) When a nuclear accident or incident occurs, the senior person present **shall** take charge at the scene and direct available personnel to:

1. Attempt to save the lives of personnel involved.

2. Attempt, when required, to extinguish a fire involving weapons or radioactive material using the

firefighting guidance provided in S WOP 20-11 and Appendix 10-A.

3. Establish a security perimeter surrounding the accident scene, limiting access to authorized personnel only. The security perimeter aboard ship may be defined by securing hatches to a compartment, passageway, or hangar deck. In all cases, once the hatches have been secured, only personnel authorized by the senior person present shall be allowed **at** the accident scene.

4. Direct **all** personnel at the scene to take emergency breathing precautions. As a minimum, personnel shall cover their noses and mouths with a handkerchief or similar item to minimize inhalation of hazardous materials and smoke.

5. Notify Damage Control Central, via most expedient means, that an accident has occurred in compartment/ passageway/ hangar deck (by compartment and frame number).

(b) Upon notification of an accident or incident, Damage Control Central shall:

1. Notify the bridge of the accident location and recommend to the commanding officer the state of readiness and heading to which the ship should be brought.

2. Initiate routine announcements over the 1 MC as follows:

“NO EATING, DRINKING OR SMOKING IS ALLOWED UNTIL FURTHER NOTICE.”

3. Initiate standard shipboard damage control procedures including initiating a radiation plot, identifying route(s) to DECON station, recommend changes to ships heading to vent smoke, toxic gases, and contaminated **firefighting** water. Near shore releases should be done as a last resort action.

4. Prepare to initiate battle dressing and decontamination station procedures.

(c) The bridge/strike operations center, upon notification of an accident or incident shall:

1. Initiate initial OPREP-3 report.

2. Make preparation if in an in-port status for assisting the OSC designated by the Fleet Commander.

3. Bring the ship to appropriate condition of readiness.

4. Act, as appropriate, on Damage Control Central recommendation.

5. Continue **OPREP-3** situation reports, as required.

6. Request if required, helicopter/parachute insertion of nearest EOD Detachment.

(2) Follow-on Response Procedures. These procedures are an extension of the initial response procedures. However, they include more detailed procedures for providing positive control of an accident *scene*. The responsibility of executing these procedures rests with the senior person at the scene until relieved by appropriately qualified damage control personnel or, in the case of an in-port accident, the shore establishments designated OSC.

(a) As soon as practicable after notification of an accident or incident, damage control **RADCON** should conduct beta/gamma detection operations. **RADCON AN/ PDR-27** monitors should then proceed to the extremities of the accident scene, maintaining constant surveillance of the instrument to detect increases in gamma radiation. Any radiation reading above normal background shall be reported immediately to Damage Control Central.

(b) In the absence of EOD personnel, the ship's Weapon Safety Team may perform emergency procedures outlined in applicable SWOPS or technical publication, as directed by the CO, providing the weapons are not too severely damaged.

1. Enter the compartment where the accident occurred and render the weapons/ materials safe using approved procedures and equipment.

2. Identify the types of containers/materials accredited for packaging explosives and radioactive materials.

3. Report via sound powered telephone completion of EOD procedures to Damage Control Central and be available to assist and advise repair parties in the decontamination of affected areas.

(c) Public Affairs. At sea, Public Affairs will be the responsibility of the Fleet Commander. The Commanding Officer is responsible for informing the ship's crew regarding public affairs releases and prior to their debarking or using MARS, on procedures for responding to requests for information from the press or from families. When the ship is in port, public affairs will be coordinated by Fleet Commander or his designated area' coordinator.

(d) Security. Unless accident damage to the ship and/ or weapon(s) has destroyed the normal security provisions for the weapon(s), additional security will not be needed. Additional security is provided if required,..

to ensure continued weapon protection and to prevent unauthorized access.

(e) Debriefings. All ship's crew members with information as to the cause of the accident, and particularly those personnel who observed the extent of damage to the weapon(s), should be identified to assist in the accident investigation and debriefed to assess potential internal damage to the weapon.

(f) Follow-on Response at Sea. Weather and sea conditions, the extent of damage to the ship, remaining hazards to the ship and crew, and the time required to get either expert assistance onboard or move the ship to suitable facilities, will all effect the specific follow-on response actions which the Commanding Officer might direct while at sea. Also, guidance will be provided by the Fleet Commander and the higher authority must have estimates of damage to the ship and weapon(s). *Moreover*, the ship must be provided information on the estimated time of arrival, the nature of any technical assistance being sent, and be directed to an appropriate port. Much of the technical assistance discussed in Chapters 5 and 17 may be airlifted to the accident ship, or a suitable ship in the vicinity for direct assistance at sea, when dictated, due to damage, contamination, or other conditions.

1. Logistics. Resources will be limited to those onboard. Priority should be given to performing operations *to* minimize any hazards to ship's personnel and damage to critical equipment, including **RADIACs**.

2. Ship Decontamination. The amount of decontamination ship's personnel will be able to perform will be limited by the number of **RADIACs** available to monitor and **remonitor** surfaces being decontaminated and to operate the Contamination Control Station. Simple cleaning techniques are frequently effective in reducing, if not removing, contamination from many of the surfaces on a ship. Decontamination techniques are described in Chapter 19.

(g) Follow-on Response in Port. The follow-on response in port will be the responsibility of the shore establishment, and will follow procedures described in Chapters 4 through 19.

(3) Claims. Any contaminated personal property belonging to ship's personnel should be collected and marked with the owner's identification. The property must be replaced if it cannot be decontaminated. In general, decontamination of high value items, or items which the owner cannot easily replace, must not be attempted by ships personnel.

APPENDIX 10-A

SHIPBOARD FIREFIGHTING

10-A-I

a. Normal shipboard firefighting and damage control procedures will apply to fires involving nuclear weapons with the following provisions:

(1) Extinguishing the fire has priority.

(2) Cooling of any weapons involved in the fire or in close proximity should be performed to the maximum extent that fire hoses permit.

(3) Cooling should be continued after the fire is extinguished until the weapon is at ambient temperature.

b. The primary suppressant for a fire involving a nuclear weapon is high velocity water fog (low velocity fog for submarines). The propellants used in any weapon, conventional or nuclear, produce oxygen once ignited. They cannot be extinguished with smothering agents, and some may cause the retention of heat within the weapon. This factor does not preclude the use of foam, CO₂, Purple-K, Aqueous Film Forming Foam (AFFF) or other suppressants on aircraft fuel, Navy Standard Fuel Oil (NSFO), or other petroleum fuel fires which involve a nuclear weapon.

c. High velocity water fog, or a firefighting agent **should** be sprayed over the complete length of the weapon(s) and/ or both sides in a sweeping motion to cool the weapon and its high explosive contents until the weapon is at ambient temperature. When using foam to fight a fire surrounding an intact **weapon**, water should not be used to cool the weapon because water will float the foam away which could allow **reignition** of the fire.

d. For weather-deck fires, the **nozzleman** and number one **hoseman** will wear OBA'S. Other hosemen and response personnel will be equipped with OBA'S or gas masks. For below deck fires, **all** response personnel going below decks will wear a self-contained breathing apparatus (for example, OBA and Scott Air Pack); top side personnel will wear gas masks. Any firefighters responding initially without respiratory protection should be relieved as soon as possible. Repair party personnel will wear protective clothing as specified in NSTM 079-39.137, reference (p). Involvement of a nuclear weapon does not require additional protective **clothing** for firefighting personnel. A backup firefighting

team, with appropriate respiratory protection, will be prepared to relieve, or rescue, teams at the scene.

e. Ordnance magazine sprinkling systems in or near the affected area shall be manned and made ready to be activated;" however, the magazine sprinkling system must not be activated without specific orders from the Commanding Officer.

f. During firefighting actions, the flow of potentially contaminated water should be noted and the wetted surfaces considered contaminated until monitoring can be performed. The flow of potentially contaminated water should be controlled to the extent possible, and dewatering operations should not be performed in port until testing determines if the water is contaminated. The best method of controlling the potentially contaminated water will be ship and situation unique.

g. Fires involving nuclear weapons in enclosed shipboard spaces should be vented to the atmosphere as soon as practical to deplete toxic, caustic, and the presence of radioactive gases. When venting shipboard spaces, care should be taken to minimize the possible contamination of the exterior of the ship. In the event of a magazine accident, the normal exhaust system shall be secured and emergency ventilation procedures used. Portable blowers (for example, Red Devil Blowers) should be used if there is no installed blowout system. Recommend use of "snorkel hosing" with high capacity filters in conjunction with portable blowers to reduce possible contamination to portable blowers and ensure contamination in smoke exhausted is directed outside the skin of the ship. In **all** cases, the exhaust vent should be on the leeward side of the ship. After the fire is extinguished and when in port, unfiltered venting should not be done if it results in contamination being spread to nearby shore establishments or communities.

h. Upon extinguishing a fire involving a nuclear weapon, a **reflash** watch will be set to provide an immediate response to any reoccurrence of the fire.

i. Potentially contaminated equipment used to fight the fire should be placed in a designated area until monitoring and necessary decontamination can be performed.

APPENDIX 10-B

SHIPBOARD RADIOLOGICAL MONITORING AND CONTROL

10-B-1

Monitoring for radioactivity is performed initially to identify radioactive material. If radioactivity is found, monitoring continues to determine the extent of the contaminated area. Personnel monitors are to identify contaminated personnel who require decontamination, and to prevent the spread of "radioactive material to uncontaminated parts of the ship.

a. Control of Contamination. Standard damage control procedures should be used to limit damage and the spread of contamination. Fire boundaries shall be set and maintained to prevent the spread of fire, and material conditions ZEBRA and Circle WILLIAM set to prevent the spread of contamination and minimize the effects of structural damage. Additionally, at the outset of an accident, the ship should be maneuvered, if possible, so the wind is on the beam and carrying any contamination away from the ship.

(1) Ship Monitoring. If contamination was released during the accident, it should be confirmed that portions of the ship thought to be uncontaminated are in fact "clean." Monitors should be directed initially to check passageways at hatches, doors, ladders, and other locations where most personnel would place their hands or feet. If contamination is found, its location should be marked for decontamination and remonitoring. Contamination tracked, or carried, onto hard surfaces can be usually removed with soap and water, or by wiping with a clean, damp cloth. Then monitors should be directed toward the expected contaminated area. The boundaries of the contaminated area should be defined. Then personnel should be advised of these boundaries and the procedures for crossing them if required for essential ship operations.

(2) Air Monitoring. Airborne radiological monitoring shall be conducted to the extent instrumentation will allow. However, many ships are not equipped with air samplers. Monitoring surfaces for loose surface contamination will be the most reliable indicator of airborne contamination. If Table 6-2, Protective Devices for Emergency Workers as a Function of Surface Contamination, is used, table values should be divided

by 100 to correct for the higher resuspension factors (0.001 vice the 0.00005 used to develop the table) which can be expected from shipboard surfaces.

b. Contamination Control Station (CCS). The contamination control station will be normally located at a compartment entrance for topside accidents and at a fire boundary for below deck accidents. Most ships will have insufficient **RADIAC** instruments to support more than one CCS. If potentially contaminated personnel are both above and below decks, routes to minimize their movement through clean areas should be established. Access to the CCS must be possible from both contaminated and uncontaminated areas. A shower and wash basin should be designated for use in decontamination procedures. The wash facilities need not be in the immediate vicinity of the CCS although such a location is preferable.

(1) Until the absence of gamma radiation is confirmed by monitoring at the accident site, personnel should be monitored at the CCS with the AN/ PDR-27 and the AN/ PDR-56. Once the absence of gamma radiation is **confirmed**, use of the **AN/ PDR-27** is no longer necessary. The use of earphones with **RADIACs** is required. This practice results in easier, more accurate monitoring. The user's attention is not focused on the **RADIAC'S** meter movement, lessening the possibility of damage or inadvertent probe contamination during the monitoring process.

(2) Personnel monitoring should include: the front and backs of hands, forearms, torso, and legs; a thorough check of the forehead, cheeks, nose and mouth **area**; and finally the ankles and feet. The preliminary readings in the areas most likely to be contaminated (for example, the hands and feet) should be made with the probe 1/8-1 / 16th inch from the monitored surface. If the person is not obviously contaminated, contact readings may be used for the remainder of the monitoring. If clothing is damp, inaccurate alpha contamination evaluation and detection is probable. Damp clothing should be removed, assumed contaminated, and the person's skin dried prior to evaluation for the presence of alpha contamination.

(3) To conserve the expenditure of protective **clothing**, initial personnel monitoring must be performed prior to the removal of the clothing. If no contamination,

or contamination below the acceptable emergency remaining levels of contamination identified in OPNAVINST 3440.15, reference (u), are found on the protective clothing, it should be removed and placed in containers for clothing to be reused. Booties and gloves should be kept separate. If contamination levels greater than those levels shown in reference (u) are found, the protective clothing should be removed and placed in a container marked for contaminated clothing.

(4) Personnel who had contamination on their protective clothing should be remonitored after removing the protective clothing. If contamination is also on their personal clothing, the clothing should be removed, placed in a plastic bag labeled as contaminated clothing, and the fact noted in the CCS log. If contamination is on the skin, it can normally be removed by washing with nonabrasive soap and water. When washing, be sure not to puncture or abrade the skin through excess scrubbing. Following each washing, the skin should be thoroughly dried before monitoring to determine if the procedure removed the alpha contamination. Shampoo contaminated hair several times. Final monitoring should be made with the probe in contact with the skin. If two washings do not reduce contamination levels on the skin or hair, individuals should be referred to the Medical Department for further decontamination under medical supervision. BUMEDINST 6470.10, reference (r), provides detailed guidance on personnel decontamination procedures and **should** be available to the Medical Department. When all contamination cannot be removed, the residual level should be recorded in medical records, the CCS log, and the Commanding Officer should be advised. Disposition of the contaminated individual(s) will **be** determined by the Medical Department cooperating with BUMED.

c. Protective Clothing. Any close knit clothing should prevent contamination of the skin and provide protection from alpha contamination. If anti-contamination clothing is unavailable, coveralls are recommended for personnel entering the contaminated area to repair damage **or** perform decontamination operations. Openings in the clothing should be taped. When working in a wet environment, waterproof clothing should be **used** for anti-contamination clothing if possible. Much of the protection provided by coveralls will be lost if the material becomes soaked. Liquids soaking the clothing can carry contamination from the outer surface of the clothing. When removing contaminated clothing, care should be taken to prevent the outside of the clothing from contacting the skin.

d. Clothing Decontamination. The limited stock of protective clothing on board a ship may be exhausted rapidly during decontamination operations at sea. At sea, protective clothing and other launderable equipment can be laundered, if necessary, without damage to the equipment or the washing machine. Automatic washing machines should be clean and free of soap scum to prevent deposition of contamination. If decontaminating agents are used, they will aid in keeping washers free of contamination. After laundered items have completely dried, they must be checked for any remaining contamination. Items contaminated above acceptable emergency levels given in reference (u) and that do not show any appreciable contamination reduction after three successive launderings should be packaged for disposal as radioactive waste. Machines used to **launder** contaminated clothing should not be used for normal laundry until after they have been fully cycled empty, allowed to dry, and monitored to ensure they are free from contamination.