RECOVERY OPERATIONS IN A CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR (CBRN) ENVIRONMENT NTTP 3-02.1.1/MCWP 3-37.6

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS AND
HEADQUARTERS, U. S. MARINE CORPS

Command Letterhead

Month and Year

LETTER OF APPROVAL

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2. NTTP 3-02.1.1/MCWP 3-37.6 is effective upon receipt.

3. NTTP 3-02.1.1/MCWP 3-37.6 provides essential information for the conduct of recovery operations in which military forces and civilian personnel, equipment, and supplies move from sites off of naval ships (e.g., ashore or on another vessel) onto naval shipping. The actions discussed within should be incorporated into each unit's Chemical, Biological, Radiological and Nuclear Defense Bill.

4. SECNAVINST 5510.31 provides procedures for disclosing this publication or portions thereof to foreign governments or international organizations.

BY DIRECTION OF THE COMMANDANT OF THE
MARINE CORPS

Lieutenant General, U. S. Marine Corps
Commanding General
Marine Corps Combat Development Command
Quantico, Virginia

Rear Admiral, U. S. Navy
Commander, Navy Warfare Development Command

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1. NTTP 3-02.1.1/MCWP 3-37.6 was reviewed for format and approved Joint and Navy Service Terminology. The contents of NTTP 3-02.1. /MCWP 3-37.61 supports Navy Strategic and Operational Level doctrine.

Commander
Navy Warfare Development Command

Month and Year of Issue

PUBLICATION NOTICE

ROUTING

1. NTTP 3-02.1.1/MCWP 3-37.6, RECOVERY OPERATIONS IN A CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR (CBRN) ENVIRONMENT (U), is available in the Navy Warfare Library. It is effective upon receipt.

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Glossary

A

aeromedical evacuation The movement of patients under medical supervision to and between medical treatment facilities by air transportation. Also called **AE.**

aerosol A liquid or solid composed of finely divided particles suspended in a gaseous medium. Examples of common aerosols are mist, fog, and smoke.

agent See biological or chemical agent. (Note: This term and its definition are applicable only in the context of this publication and cannot be referenced outside this publication.)

amphibious operation A military operation launched from the sea by an amphibious force, embarked in ships or craft with the primary purpose of introducing a landing force ashore to accomplish the assigned mission.

amphibious task force A Navy task organization formed to conduct amphibious operations. The amphibious task force, together with the landing force and other forces, constitutes the amphibious force. Also called **ATF**.

area of operations An operational area defined by the joint force commander for land and naval forces. Areas of operation do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces. Also called **AO**.

aviation life support system(s) Items of equipment and clothing worn by aircrew members and aircraft passengers to function within all parameters of the flight environment, to safely egress from disabled aircraft and descend/ascend to the surface, to survive on land and water, and to interface with rescue forces.

avoidance Individual and/or unit measures taken to avoid or minimize chemical, biological, radiological, and nuclear (CBRN) attacks and reduce the effects of CBRN hazards.

B

backload The process of putting returning personnel and/or vehicles and their associated stores and equipment into ships and/or aircraft; such personnel and equipment having been once embarked in ships and/or aircraft and used to support operations ashore. See also **embarkation** or **loading**.

battle messing The process by which personnel are fed onboard ships during periods of prolonged manning of battle stations in support of General Quarters. In accordance with a ship’s Battle Messing Bill, respective battle stations would send, when directed, a representative or two to the area designated to receive food. Personnel would travel along a prescribed route provided by the ship’s damage control assistant. The representative would receive sufficient rations (e.g., “box lunches”) to feed all personnel on their station, to include berthing compartments where embarked forces would assemble.

biological agent A microorganism that causes disease in personnel, plants, or animals or causes the deterioration of materiel.

blister agent Chemical agents that injure the eyes and lungs and burn or blister the skin; also called vesicants. They include mustard (H) and lewisite (L).

biological defense The methods, plans, and procedures involved in establishing and executing defensive measures against attacks using biological agents. (JP 1-02)

biological environment Conditions found in an area resulting from direct or persisting effects of biological weapons. (JP 1-02)

biological operation Employment of biological agents to produce casualties in personnel or animals or damage to plants.

biological threat A threat that consists of biological material planned to be deployed in order to produce casualties in personnel or animals or damage plants.

biological warfare See biological operation.

biological weapon An item of materiel that projects, disperses, or disseminates a biological agent including arthropod vectors. (JP 1-02)

blister agent A chemical agent that injures the eyes and lungs, and burns or blisters the skin. Also called vesicant agent. (JP1-02)

blood agent A chemical compound, including the cyanide group, that affects bodily functions by preventing the normal utilization of oxygen by body tissues. (JP1-02)

C

calcium hypochlorite The standard shipboard decontaminant for chemical and biological agents. Also called **HTH**.

casualty receiving and treatment ship In amphibious operations, a ship designated to receive, provide treatment for, and transfer casualties. (JP 3-02)

CBRN Bill Ship or unit's instruction that defines procedures to be implemented in the event of an attack by a hostile force that uses chemical, biological, radiological or nuclear (CBRN) contaminants; or when recovering personnel and/or equipment that has been contaminated by CBRN agents. Also referred to as the CBR Defense Bill.

centigray A unit of absorbed dose of radiation (one centigray equals one rad).

chemical agent Any toxic chemical intended for use in military operations.

Chemical and Biological Defense Officer The Commanding Officer's advisor on all matters regarding chemical and biological defense. Also called **CBDO**.

chemical contamination See contamination.

chemical defense The methods, plans and procedures involved in establishing and executing defensive measures against attack utilizing chemical agents. See also NBC defense. (JP 1-02)

chemical environment Conditions found in an area resulting from direct or persisting effects of chemical weapons. (JP 1-02)

chemical operations Employment of chemical agents to kill, injure, or incapacitate for a significant period of time, personnel or animals, and deny or hinder the use of areas, facilities, or material; or defense against such employment. (JP1-02)

chemical warfare All aspects of military operations involving the employment of lethal and incapacitating munitions/agents and the warning and protective measures associated with such offensive operations. Since riot control agents and herbicides are not considered to be chemical warfare agents, those two items will be referred to separately or under the broader term “chemical,” which will be used to include all types of chemical munitions/agents collectively. Also called **CW**.

chemical warfare agent Any toxic chemical intended for use in military operations. Also called **CWA**.

chemical weapon Together or separately, (a) a toxic chemical and its precursors, except when intended for a purpose not prohibited under the Chemical Weapons Convention; (b) a munitions or device, specifically designed to cause death or other harm through toxic properties of those chemicals specified in (a), above, which would be released as a result of the employment of such munitions or device; (c) any equipment specifically designed for use directly in connection with the employment of munitions or devices specified in (b), above.

Circle William Ventilation fittings onboard ships that can be closed to limit the spread of contamination in the event of an NBC attack.

civil support Department of Defense support to United States civil authorities for domestic emergencies, and for designated law enforcement and other agencies. Also called **CS**.

clear report Announcement made to advise personnel that a previously identified contaminated area has been rendered safe.

collective protection system A system of air locks, high pressure fans, and high efficiency filters providing pressurized, filtered air to total protection (TP) zones and filtered air to limited protection (LP) zones on ships. See also total protection zone and limited protection zone. Collective protection ashore can be provided by mobile, expeditionary, or field-expedient shelters.

contaminated remains Remains of personnel which have absorbed or upon which have been deposited radioactive materials, or biological or chemical agents. (JP 1-02)

contamination 1. The deposit, absorption, or adsorption of radioactive material, or of biological or chemical agents on or by structures, areas, personnel, or objects. See also fallout; induced radiation; residual radiation. (DoD) 2. Food and/or water made unfit for consumption by humans or animals because of the presence of environmental chemicals, radioactive elements, bacteria or organisms, the byproduct of the growth of bacteria or organisms, the decomposing material (to include the food substance itself), or waste in the food or water. (JP 1-02)

contamination control Procedures to avoid, reduce, remove, or render harmless, temporarily or permanently, nuclear, biological, and chemical contamination for the purpose of maintaining or enhancing he efficient conduct of military operations. (JP 1-02)

contamination control area The CCA is a liquid chemical hazard area or a biological infectious hazard area for removal of contaminated individual protective equipment or outer garments and preparation of personnel for processing through a shipboard conventional decontamination station. Also called **CCA**.

containment pit An area used to collect contaminated run-off. See also sump as defined in JP 1-02.

countermeasures washdown system A dry-pipe sprinkler system equipped with nozzles designed and arranged topside to throw a large salt water spray pattern on weather surfaces; salt water is supplied from the ship's fire main. Originally designed as a countermeasure system for nuclear fallout, it is also effective in the control of chemical and biological contamination. Also called **CMWDS**.

D

Damage Control Assistant The DCA is responsible, under the engineering officer, for the control of damage. This includes the control of stability, list, and trim. It also includes fighting fires, repairing damage, and maintaining CB defense. Also called **DCA**.

Damage Control Central Ship's engineering space where the DCA monitors and directs the ship's damage control team response actions for emergency situations; space is manned continuously at sea and during General Quarters (GQ) and maintains a record of the material readiness of the ship. Also called **DCC**.

decontaminant Any substance used to break down, neutralize, or remove a chemical, biological, or radioactive material posing a threat to equipment or personnel.

decontamination The process of making any person, object, or area safe by absorbing, destroying, neutralizing, making harmless, or removing chemical or biological agents, or by removing radioactive material clinging to or around it. (JP 1-02)

decontamination station A building or location suitably equipped and organized where personnel and materiel are cleansed of chemical, biological, or radiological contaminants.

detection In nuclear, biological, and chemical (NBC) environments, the act of locating NBC hazards by use of NBC detectors or monitoring and/or survey teams.

detector Any mechanism by which the approach or presence of a chemical or biological agent is made known.

dirty NBC contaminated.

dispersion In chemical and biological operations, the dissemination of agents in liquid or aerosol form. (JP 1-02)

doff To remove clothing, chemical protective suits, or equipment.

don To put on clothing, chemical protective suits, or equipment.

dosimetry The measurement of radiation doses. It applies to both the devices used (i.e., dosimeters) and to the techniques.

decontamination solution number 2 Widely used decontamination agent that is based upon a calcium hypochlorite solution; solution is extremely caustic. Also called **DS2**.

E

electromagnetic pulse The electromagnetic radiation from a nuclear explosion caused by Compton-recoil electrons and photoelectrons from photons scattered in the materials of the nuclear device or in a surrounding medium. The resulting electric and magnetic fields may couple with electrical/electronic systems to produce damaging current and voltage surges. May also be caused by non-nuclear means. Also called **EMP**. (JP 1-02)

embarkation The process of putting returning personnel and/or vehicles and their associated stores and equipment into ships and/or aircraft. See also **loading**. (JP 1-02)

Executive Order 11850 The executive order dated, 8 April 1975, *Renunciation of Certain Uses in War of Chemical Herbicides and Riot Control Agent*s, renounced first use of herbicides in war (except for specified defensive uses) and first use of RCA in war except for defensive military modes to save lives.

expeditionary force An armed force organized to accomplish a specific objective in a foreign country.

Expeditionary Strike Group Naval task organization that will generally consist of three amphibious ships (i.e., LHA or LHD, LPD, and LSD), two AEGIS ships (CG or DDG), one DD/FFG type ship, one SSN, a MEU(SOC), and appropriate staff manning (i.e., ESG, PHIBRON, and MEU(SOC) commanders staffs) and other commanders and staffs as appropriate to support mission objectives. Also called **ESG**.

F

flexible deterrent option A planning construct intended to facilitate early decision by laying out a wide range of interrelated response paths that begin with deterrent-oriented options carefully tailored to send the right signal. The flexible deterrent option is the means by which the various deterrent options available to a commander (such as economic, diplomatic, political, and military measures) are implemented into the planning process. Also called **FDO.**

force health protection All services performed, provided, or arranged by the Services to promote, improve, conserve, or restore the mental or physical well-being of personnel. These services include, but are not limited to, the management of health services resources, such as manpower, monies, and facilities; preventive and curative health measures; evacuation of the wounded, injured, or sick; selection of the medically fit and disposition of the medically unfit; blood management; medical supply, equipment, and maintenance thereof; combat stress control; and medical, dental, veterinary, laboratory, optometry, medical food, and medical intelligence services. Also called **FHP**.

foreign object debris Any material found in the vicinity of flight operations that could contribute to the accidental damaging of an aircraft, generally as a result of an aircraft ingesting such material into an engine and damaging its internal workings. Also called **FOD.**

H

half-life The time required for the activity of a given radioactive species to decrease to half of its initial value due to radioactive decay. The half-life is a characteristic property of each radioactive species and is independent of its amount or condition. The effective half-life of a given isotope is the time in which the quantity in the body will decrease to half as a result of both radioactive decay and biological elimination.

health service support All services performed, provided, or arranged by the Services to promote, improve, conserve, or restore the mental or physical well-being of personnel. These services include but are not limited to the management of health services resources, such as manpower, monies, and facilities; preventive and curative health measures; evacuation of the wounded, injured, or sick; selection of the medically fit and disposition of the medically unfit; blood management; medical supply, equipment, and maintenance thereof; combat stress control; and medical, dental, veterinary, laboratory, optometric, medical food, and medical intelligence services. Also called **HSS**. (JP 4-02)

High Test Hypochlorite Widely used decontamination agent that is based upon a calcium hypochlorite solution. Also called **HTH**.

host nation A nation that receives the forces and/or supplies of allied nations, coalition partners, and/or NATO organizations to be located on, to operate in, or to transit through its territory. Also called **HN**.

host-nation support Civil and/or military assistance rendered by a nation to foreign forces within its territory during peacetime, crisis or emergencies, or war based on agreements mutually concluded between nations. Also called **HNS**. (JP 1-02)

hot spot Region in a contaminated area in which the level of radioactive contamination is considerably greater than in neighboring regions in the area. (JP 1-02)

hot spot report Announcement made to advise personnel of the location of contamination.

I

immediate decontamination Decontamination carried out by individuals immediately upon becoming contaminated. It is performed in an effort to minimize casualties, save lives, and limit the spread of contamination. Also called emergency decontamination.

individual protection Actions taken by individuals to survive and continue the mission under nuclear, biological, and chemical conditions.

individual protective equipment In nuclear, biological and chemical warfare, the personal clothing and equipment required to protect an individual from biological and chemical hazards and some nuclear effects. (JP 1-02)

J

joint Connotes activities, operations, organizations, etc., in which elements of two or more Military Departments participate. (JP 1-02)

joint force commander A general term applied to a combatant commander, sub-unified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force. Also called **JFC**. (JP 1-02)

joint task force A joint task force that is constituted and so designated by the Secretary of Defense, a combatant commander, a sub-unified commander, or an existing joint task force commander. Also called **JTF**. (JP 1-02)

Joint Warning and Reporting Network The JWARN is a standardized software application intended to provide NBC warning and reporting, downwind hazard prediction, operations planning, and NBC management capabilities for Joint Forces, from battalion to theater-level command. Also called **JWARN**.

L

landing craft A craft employed in amphibious operations, specifically designed for carrying troops and their equipment and for beaching, unloading, and retracting. It is also used for re-supply operations.

Landing Force Operations Center (LFOC) Landing Force commander's command center onboard naval vessels. Center maintains a plot of all activity involving landing force personnel, and serves as the location from where the landing force commander directs and coordinates the movement of forces before transferring authority ashore. Space is continuously manned once landing forces are embarked.

Law of War That part of international law that regulates the conduct of armed hostilities. Also called **the law of armed conflict**.

limited protection zone A zone within a collective protection system that provides protection against liquid and solid CBR agents, but not agents in vapor form. Also called **LPZ**.

limited operational decontamination A level of decontamination for Naval forces where teams conduct gross decontamination to remove or reduce concentrations of contaminants and clear vital areas and equipment for tactical use. See also operational decontamination.

loading The process of putting personnel, materiel, and supplies on board ships, aircraft, trains, road vehicles, or other means of conveyance. See also **embarkation**. (JP 1-02)

logistics The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations which deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition or construction, maintenance, operation, and disposition of facilities; and d. acquisition or furnishing of services.

logistic support Logistic support encompasses the logistic services, materiel, and transportation required to support the continental United States-based and worldwide deployed forces.

logistic support (medical) Medical care, treatment, hospitalization, and evacuation as well as the furnishing of medical services, supplies, materiel, and adjuncts thereto.

M

maritime prepositioning ships Civilian-crewed, Military Sealift Command-chartered ships that are organized into three squadrons and are usually forward-deployed. These ships are loaded with pre-positioned equipment and 30 days of supplies to support three Marine expeditionary brigades. Also called **MPS**.

mass casualty Any large number of casualties produced in a relatively short period of time, usually as the result of a single incident such as a military aircraft accident, hurricane, flood, earthquake, or armed attack that exceeds local logistic support capabilities.

Mass Casualty Bill Ship or unit's instruction that details procedures to be used when providing medical support to any large number of casualties produced in a relatively short period of time usually as a result of a single incident such as a military aircraft accident, hurricane, flood, earthquake, or armed attack that exceeds local logistical support capabilities.

Marine Air Ground Task Force A task organization of Marine forces (command element, ground combat element, aviation combat element, and combat service support element) under a single command and structured to accomplish a specific mission. MAGTF components will normally include command, aviation combat, ground combat, and combat service support elements (including Navy Support Elements). Three typical types of organized MAGTFs are the Marine Expeditionary Unit (MEU) Marine Expeditionary Brigade (MEB), and Marine Expeditionary Force (MEF). Also called **MAGTF**.

medical treatment facility A facility established for the purpose of furnishing medical and/or dental care to eligible individuals.

military operations other than war Operations that encompass the use of military capabilities across the range of military operations short of war. These military actions can be applied to complement any combination of the other instruments of national power and occur before, during, and after war. Also called **MOOTW.** (JP 3-07)

mission-oriented protective posture A flexible system of protection against nuclear, biological, and chemical contamination. This posture requires personnel to wear only that protective clothing and equipment (mission-oriented protective posture gear) appropriate to the threat level, work rate imposed by the mission, temperature, and humidity. Also called **MOPP**.

mission-oriented protective posture gear Military term for individual protective equipment including suit, boots, gloves, mask with hood, first aid treatments, and decontamination kits issued to soldiers. Also called MOPP gear.

N

nerve agent A potentially lethal chemical agent which interferes with the transmission of nerve impulses. (JP 1-02)

noncombatant evacuation operation Operations directed by the Department of State, the Department of Defense, or other appropriate authority whereby noncombatants are evacuated from foreign countries when their lives are endangered by war, civil unrest, or natural disaster to safe haves or the United States. Also called **NEO**.

Noncombatant Evacuation Operation Bill Ship or unit's instruction that details the procedures for the conduct of providing support during a NEO. Also called **NEO Bill**.

nonpersistent agent. A chemical agent that when released dissipates and/or loses its ability to cause casualties after 10 to 15 minutes. (JP 1-02)

nuclear, biological, and chemical defense Defensive measures that enable friendly forces to survive, fight, and win against enemy use of nuclear, biological, or chemical (NBC) weapons and agents. US forces apply NBC defensive measures before and during integrated warfare. In integrated warfare, opposing forces employ nonconventional weapons along with conventional weapons (NBC weapons are non-conventional).

nuclear, biological, and chemical environment Environments in which there is deliberate or accidental employment, or threat of employment, of nuclear, biological, or chemical weapons; deliberate or accidental attacks or contamination with toxic industrial materials, including toxic industrial chemicals; or deliberate or accidental attacks or contamination with radiological (radioactive) materials.

O

operational decontamination Decontamination carried out by an individual and/or a unit, restricted to specific parts of operationally essential equipment, material, and/or working areas, in order to minimize contact and transfer hazards and to sustain operations. This may include decontamination of the individual beyond the scope of immediate decontamination, as well as decontamination of mission-essential spares and limited terrain decontamination.

operationally complete decontamination A level of decontamination for Naval forces where detailed decontamination is carried out as operations permit. Also, see thorough decontamination.

OPREP-3 NAVY BLUE A report made to a higher authority on a significant event or incident that has either national or high U.S. Navy interest. Reports of national interest are classified as PINNACLE, while reports that are not of national interest but are of great concern to the Chief of Naval Operations or other senior naval commanders are classified as NAVY BLUE. The report is initially made as a voice report with a follow-up message report or series of reports.

P

pathogen A disease-producing microorganism.

persistency In biological or chemical warfare, the characteristic of an agent which pertains to the duration of its effectiveness under determined conditions after its dispersal. (JP 1-02)

persistent agent A chemical agent that when released remains able to cause casualties for more than 24 hours to several days or weeks. (JP 1-02)

preventive medicine The anticipation, communication, prediction, identification, prevention, education, risk assessment, and control of communicable diseases, illnesses and exposure to endemic, occupational, and environmental threats. These threats include non-battle injuries, combat stress responses, weapons of mass destruction, and other threats to the health and readiness of military personnel. Communicable diseases include anthropoids-, vectors-, food-, waste-, and waterborne diseases. Preventative medicine measures include field sanitation, medical surveillance, pest and vector control, disease risk assessment, environmental and occupational health surveillance, waste (human, hazardous, and medical) disposal, food safety inspection, and potable water surveillance. Also called **PVNTMED.** (JP 4-02)

propeller wash Wind produced by the propeller of an aircraft.

protective mask A protective ensemble designed to protect the wearer's face and eyes and prevent the breathing of air contaminated with chemical and/or biological agents.

R

radiological defense Defensive measures taken against the radiation hazards resulting from the employment of nuclear and radiological weapons.

radiological environment Conditions found in an area resulting from the presence of a radiological hazard.

radiological survey The directed effort to determine the distribution and dose rates of radiation in an area.

RAPID Ruggedized Advanced Pathogen Identification Device. A platform for real-time Polymerase Chain Reaction (PCR) that amplifies and analyzes up to 32 samples, automatically collects, interprets, and reports data and results.

residual contamination Contamination which remains after steps have been taken to remove it. These steps may consist of nothing more than allowing the contamination to decay normally.

recovery operations Those operations in which military forces and civilian personnel (to include casualties), equipment, and supplies move from sites off of naval ships (e.g., ashore or on another vessel) onto naval shipping. These operations may include pre-planned amphibious withdrawal of forces subsequent to operations ashore (e.g., reconnaissance forces), noncombatant or other evacuations, recovery of personnel and equipment, movement of forces and equipment from shore-to-sea as part of ongoing tactical, humanitarian, or logistical operations, and/or operations undertaken to investigate the nature of materials being transported on a vessel at sea using a ship's boarding party or specialized landing force team.

riot control agent Any chemical, that is not listed in the Chemical Weapons Convention, which can produce rapidly in humans sensory irritate or disabling physical effects which disappear within a short time following termination of exposure.

rotor wash Wind produced by the rotor blades of an aircraft.

S

scrubber team Personnel assigned to perform decontamination duties.

spot decontamination A technique used in immediate decontamination in which limited areas of the aircraft are decontaminated to allow ingress/egress of aircrew, launch/recovery of aircraft, inspections, servicing, or maintenance.

super tropical bleach A mixture of calcium oxide and bleaching powder that contains approximately 30 percent chlorine and is used for decontamination. Also called **STB**.

survey The directed effort to determine the location and the nature of a chemical, biological, and radiological hazard in an area. (This term and its definition are approved for inclusion in the next edition of JP 1-02.)

survey team Personnel assigned to inspect interior and exterior spaces and equipment for indications of CBRN contamination.

T

Tactical and Logistic Center Space onboard a naval vessel from which the movement of personnel to other ships or ashore is monitored and coordinated. Also called **TACLOG**.

thorough decontamination (1) Aim — reduce contamination to the lowest possible levels, to permit partial or total removal of IPE, and maintain operations with minimum degradation. (2) When — conducted when operations, manning, and resources permit. (3) Who — units or wings, with or without external support. (4) What — personnel, equipment, material, or work areas (may include some terrain beyond the scope of operational decontamination). See also Operationally Complete Decontamination.

total protection zones A zone within a collective protection system that provides protection against liquid, solid, and gaseous CBR agents. Also called **TPZ**.

toxic chemical Any chemical which, through its chemical action on life processes can cause death, temporary incapacitation, or permanent harm to humans or animals. This includes all such chemicals, regardless of their origin or of their method of production, and regardless of whether they are produced in facilities, in munitions or elsewhere.

toxin See toxin agent.

toxin agent A poison formed as a specific secretion product in the metabolism of a vegetable or animal organism as distinguished from inorganic poisons. Such poisons can also be manufactured by synthetic processes. (JP 1-02)

Toxic Industrial Materials (TIMs) Toxic industrial compounds, which include toxic industrial chemical (TIC), toxic industrial biological (TIB), toxic industrial radiological (TIR) materials that present threats to the force and could interfere with military operations. May also be referred to as Toxic Industrial Hazards (TIHs).

W

walking blood bank Procedure wherein shipboard medical departments establish a list of personnel capable of providing blood and blood products, and who can be called upon in the event of an emergency in order support critical medical procedures. List is organized according to blood types. It is intended to augment the ship's frozen blood supply if an in adequate quantity of required blood products is determined to exist.

weapons of mass destruction (WMD) In arms control usage, weapons that are capable of a high order of destruction and/or being used in such a manner as to destroy large numbers of people. Can be nuclear, chemical, biological, and radiological weapons, but excludes the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon. Also called **WMD**.

weathering The process by which chemical and biological agents deteriorate from surface areas by the natural action of the environment, especially evaporation by temperature and wind for chemicals, and ultraviolet (UV) light for biologicals.

List of Abbreviations/Acronyms

A

AC	Hydrogen Cyanide Blood Agent
ACAA	Automatic Chemical Agent Alarm
ACADA	Automatic Chemical Agent Detector and Alarm
AE	Aeromedical Evacuation
AEL	Allowance Equipage List
AFDPO	Air Force Departmental Publishing Office
AFFF	Aqueous Film Forming Foam
AFMAN	Air Force Manual
AFTTP	Air Force Tactics, Techniques and Procedures
AIT	Aeromedical Isolation Team
AJP	Allied Joint Publication
ALSS	Aviation Life Support Systems
AMAD	Automatic Agent Detector
AMAL	Authorized Medical Allowance List
AO	Area of Operation
AOA	Amphibious objective area
AR	Army Regulation
ARG	Amphibious Ready Group
ARS	Acute Radiation Syndrome
ATF	Amphibious Task Force
ATLS	Advanced Trauma Life Support
ATP	Allied Tactical Publication
AUIB	Aircrew Uniform Integrated Battlefield

B

BA	Biological Agent
BAL	British Anti-Lewisite
BC	Blood Culture
BD	Biological Defense
BDO	Battle Dress Overgarment
BDRD	Biological Defense Research Directorate
BIDS	Biological Integrated Detection System
BIO	Biological
BSK	Biological Sampling Kit
BUMED	Bureau of Medicine
BUMEDINST	Bureau of Naval Medicine Instruction
BW	Biological Warfare
BZ	Psychochemical Code

C

C	Citrated Blood
cGy	Centigray
CA	Bromobenzylcyanide Irritant
CAM	Chemical Agent Monitor
CATF	Commander Amphibious Task Force
CAPDS	Chemical Agent Point Detector System
C/B	Chemical/Biological
CBR	Chemical, Biological and Radiological
CBRD	Chemical, Biological and Radiological Defense
CBRN	Chemical, Biological, Radiological and Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear and High Yield Explosive

CCA	Contamination Control Area
CCJTF	Commander Combined Joint Task Force
CDC	Centers for Disease Control and Prevention
CESG	Commander Expeditionary Strike Group
CG	Phosgene Choking Agent **–or-** Guided Missile Cruiser
CFR	Code of Federal Regulations
CI	Combat ineffective
CIMIC	Civil-Military Cooperation
CINC	Commander in Chief
CJCS	Chairman of the Joint Chiefs of Staff
CK	Cyanogens Chloride Blood Agent
Cl	Chlorine Choking Agent
CLF	Commander Landing Force
CMWDS	Countermeasure Washdown System
CMU	Chemical Protective Undershirt
CN	Chloroacetophenone Tear Agent
CNC	Liquid CN Tear Agent
CNS	Central Nervous System
CO	Commanding Officer
COA	Course of Action
COMMSC	Commander Military Sealift Command
COMSEC	Communications Security
COMUSTRANSCOM	Commander, U.S. Transportation Command
CONUS	Continental United States
COT	Commander of Troops
CPG-2	Commander, Amphibious Group TWO

CPO	Chemical Protective Overgarment
CPS	Collective Protection System
CR	Dibenz(b,f)-1:4-Oxazepine Irritant
CRRC	Combat Rubber Raiding Craft
CS	O-chlorobenzlmalonitrile Tear Agent **– or –** Civil Support
CSF	Cerebrospinal Fluid
CSS	Combat Service Support
CSSE	Combat Service Support Element
CT	Counter Terrorism
CV/CVN	Aircraft Carrier/Nuclear Aircraft Carrier
CW	Chemical Warfare
CWA	Chemical Warfare Agents
CWDD	Chemical Warfare Directional Detector
CX	Phosgene Oxime Blister Agent

D

DA	Department of the Army
DAP	Decontaminating Apparatus, Portable
DCA	Damage Control Assistant
DCC	Damage Control Central
DDG	Guided Missile Destroyer
DFU	Dry Filter Unit
DIA	Defense Intelligence Agency
DLAI	Defense Logistics Agency Instruction
DM	Adamsite Vomiting Agent
DNA	Deoxyribonucleic Acid
DNBI	Daily Disease and Non-Battle Injury

DoD	Department of Defense
DOT	Department of Transportation
DP	Diphosgene Choking Agent
DS2	Decontaminating Solution Number TWO
DTRA	Defense Threat Reduction Agency

E

E-NBC	Enhanced-Nuclear, Biological and Chemical
EDATF	Emergency Defense of the Amphibious Task Force
EEE	Eastern Equine Encephalitis
ELISA	Enzyme-Linked Immunosorbent Assay
EM	Electron Microscope
EMP	Electromagnetic Pulse
EMT	Emergency Medical Treatment
EPW	Enemy Prisoners of War
ESF	Expeditionary Strike Force
ESG	Expeditionary Strike Group

F

FA	Fluorescent Antibody
FBI	Federal Bureau of Investigation
FDA	Food and Drug Administration
FDO	Flexible Deterrent Operations
FDPMU	Forward Deployable Preventive Medicine Unit
FFG	Guided Missile Frigate
FHP	Force Health Protection
FM	Field Manual
FMFM	Fleet Marine Field Manual

FOD	Foreign Object Debris
FSS	Fast Sealift Ship

G

g	Gram
GA	Tabun Nerve Agent
GB	Sarin Nerve Agent
GD	Soman Nerve Agent
GI	Gastrointestinal
GVO/BVO	Green or Black Vinyl Overshoes

H

H	Heparin
H2S	Hydrogen Sulfide
HA	Humanitarian Assistance
HAZMAT	Hazardous Material
HEPA	High Efficiency Particulate Air
HHA	Hand Held Assay
HLZ	Helicopter Landing Zone
HN	Host Nation
HNS	Host-Nation Support
HPAC	Hazard Protection and Assessment Capability
HPLC	High-Pressure Liquid Chromatography
HSS	Health Service Support
HSV	High Speed Vessel
HTH	High Test Hypochlorite
HVAC	Heating, Ventilation and Air Conditioning

I

IATA	International Air Transportation Association
IBAD	Interim Biological Agent Detector
IBADS	Interim Biological Agent Detector System
ICAM	Improved Chemical Agent Monitor
ICAO	International Civil Aviation Organization
IEDK	Individual Equipment, Decontamination Kit
IMDG	International Maritime Dangerous Goods
IND	Investigational New Drug
IPB	Intelligence Preparation of the Battlespace
IPDS	Improved Point Detection System
IPE	Individual Protective Equipment
IQD	Internationally Quarantineable Disease

J

JBPDS	Joint Biological Point Detection System
JFC	Joint Force Commander
JFMCC	Joint Force Maritime Component Commander
JIC	Joint Intelligence Center
JP	Joint Publication
JRAC	Joint Rear Area Coordinator
JSCP	Joint Strategic Capabilities Plan
JSLIST	Joint Service Lightweight Integrated Suit Technology
JSLSCAD	Joint Service Lightweight Standoff Chemical Agent Detector
JTF	Joint Task Force
JWARN	Joint Warning and Reporting Network

K

Km	Kilometer
KI	Potassium Iodine
KT	Kiloton

L

L	Lewisite Blister Agent
LCAC	Landing Craft Air Cushioned
LCE	Load Carrying Equipment (e.g., web gear)
LCM-8	Landing Craft Mechanized
LCPL	Landing Craft Personnel
LCU	Landing Craft Utility
LF	Landing Force
LFOC	Landing Force Operations Center
LHA	General Purpose Amphibious Assault Ship
LHD	General Purpose Amphibious Assault Ship (with internal dock)
LgG	Immunoglobulin Class G
LgM	Immunoglobulin Class M
LOGREQ	Logistic Request
LP	Limited Protection **– or –** Low Pressure
LPD	Landing Platform Dock
LRBSDS	Long Range Biological Standoff Detector System
LSD	Landing Ship Dock
LZ	Landing Zone

M

M	Meter
MA	Mortuary Affairs

MAA	Master-at-Arms
MADCP	Mortuary Affairs Decontamination Collection Point
MCCDC	Marine Corps Combat Development Command
MCO	Marine Corps Order
MCRP	Marine Corps Reference Publication
MCWP	Marine Corps Warfighting Publication
MEDEVAC	Medical Evacuation
MER	Medical Event Report
MEU (SOC)	Marine Expeditionary Unit (Special Operations Capable)
Mil	Millimeter
ml	Milliliter
MOOTW	Military Operations Other Than War
MOPP	Mission-Oriented Protective Posture
MOS	Military Occupational Specialty
MPS	Maritime Prepositioned Ship
MSC	Military Sealift Command
MTF	Medical Treatment Facility
MTTP	Marine Tactics, Techniques and Procedures
MWB	Motor Whaleboat

N

N4	Materiel Officer
NATO	North Atlantic Treaty Organization
NATOPS	Naval Air Training and Operating Procedures Standardization
NAVMED	Naval Medicine
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command

NAVSUP	Naval Supply Systems Command
NBC	Nuclear, Biological, and Chemical
NBCWRS	NBC Warning and Reporting System
NCIS	Naval Criminal Investigative Service
NDRS	Naval Disease Reporting System
NEC	Navy Enlisted Classification (i.e., rating specialty code)
NEO	Noncombatant Evacuation Operation
NEPMU	Navy Environmental Preventive Medicine Unit
NMRC-BDRD	Navy Medical Research Center – Biological Defense Research Directorate
NSTM	Naval Ships Technical Manual
NSN	National Stock Number
NTRP	Navy Tactics Reference Publication
NTTP	Navy Tactics, Techniques and Procedures
NWP	Naval Warfare Publication

O

OMFTS	Operational Maneuver From The Sea
ONI	Office of Naval Investigation
OPGEN	Operations General
OPLAN	Operation Plan
OPNAV	Naval Operations, i.e., Office of the Chief of Naval Operations
OPORD	Operations Order
OPREP	Operational Report
OPSEC	Operations Security
OPTASK	Operations Task
ORM	Operational Risk Management

P

PA	Protective Antigen
PCR	Polymerase Chain Reaction
PD	Performance Degraded
PDDA	Power Driven Decontamination Apparatus
PHEL	Physiological Exposure Limit
PHIBRON	Amphibious Squadron
PHS/PVNTMED	Preventive Health Services/Preventive Medicine
PQS	Personnel Qualification Standards
PS	Project Sponsor – **or** – symbol for Chloropicrin
PTM	Personnel Transport Module
PVNTMED	Preventative Medicine

Q

QC	Quality Control

R

RADIAC	Radiological Detection Indication and Computation
RAPID	Ruggedized Advanced Pathogen Identification Device
RCA	Riot Control Agents
RDD	Radiological Dispersion Device
RECON	Reconnaissance
RFI	Ready for Issue
RHIB	Rigid Haul Inflatable Boat
ROE	Rules of Engagement
ROTA	Release Other Than Attack
RSCAAL	Remote Sensing Chemical Agent Alarm
RT	Red Top

RTD	Return to Duty
RT-PCR	Reverse Transcriptase PCR
RSOI	Reception, Staging, Onward Movement and Integration

S

SACADA	Shipboard Automatic Chemical Agent Detection Alarm
SACPS	Selected Area Collective Protection System
SCALP	Contamination Avoidance and Liquid Protection Suit
SDK	Skin Decontamination Kit
SEAL	Sea, Air and Land
SEAOPS	Sea Operations
SEB	Staphylococcus Enterotoxin B
SECDEF	Secretary of Defense
SECNAVINST	Secretary of the Navy Instruction
SOC	Special Operations Command
SOF	Special Operations Force(s)
SOFA	Standards of Forces Agreement
SORTS	Ship's Operational and Readiness Training Report
SSBN	Ballistic Missile Nuclear Submarine
SSN	Nuclear Submarine
STANAG	Standing NATO Agreement
STB	Supertropical Bleach
STOM	Ship to Objective Maneuver

T

T-AH	Auxiliary Ship - Hospital
TACLOG	Tactical Logistics
TACMEMO	Tactical Memorandum

TCN	Third Country National
TEU	Technical Escort Unit
TGD	Thickened Soman Nerve Agent
TIB	Toxic Industrial Biological
TIC	Toxic Industrial Chemical
TIH	Toxic Industrial Hazards
TIM	Toxic Industrial Material
TIR	Toxic Industrial Radiological
TM	Technical Manual
TMST	Theater Medical Surveillance Team
TP	Total Protection
TRANSCOM	Transportation Command
TRE	Transient Radiation Effects
TREE	Transient Radiation Effects on Electronics
TT	Tiger Top
TTP	Tactics, Techniques, and Procedures

U

UAV	Unmanned Aerial Vehicle
U/I	Unit of Issue
UN	United Nations
US	United States
USACHPPM	US Army Center for Health Promotion and Preventive Medicine
USAF	US Air Force
USAMRIID	US Army Medical Research Institute for Infectious Disease
USTRANSCOM	US Transportation Command
USDA	US Department of Agriculture

UV	Ultraviolet

V

VEE	Venezuelan Equine Encephalitis
VHF	Viral Hemorrhage Fever
VIG	Vaccinia Immune Globulin
VLSTRACK	Vapor, Liquid, and Solid Tracking System
VX	Ethyl-S-Dimethylaminoethyl Methylphosphonothiolate Nerve Agent

W

W & R	Warning and Reporting
WDCO	Well Deck Control Officer
WEE	Western Equine Encephalitis
WHO	World Health Organization
WMD	Weapons of Mass Destruction
WTD	Water Tight Door

PREFACE

NTTP 3-02.1.1/MCWP 3-37.6, RECOVERY OPERATION IS A CHEMICAL, BIOLOGICAL, RADIOLOGICAL AND NUCLEAR (CBRN) ENVIRONMENT (U) designed as a guide to provide the available information that is essential for operating status. This publication should be used in conjunction with all applicable damage control and expeditionary warfare publication, particularly those cited in the bibliography.

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WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to "WARNINGs," "CAUTIONs," and "Notes" found throughout the manual.

An operating procedure, practice, condition that may result in injury or death if not carefully observed or followed.

An operating procedure, practice, condition that may result in damage to equipment if not carefully observed or followed.

Note

An operating procedure, practice, or condition that is essential to emphasize.

WORDING

The concept of word usage and intended meaning which has been adhered to in preparing this publication is as follows:

"Shall" has been used only when application of a procedure is mandatory.

"Should" has been used only when application of a procedure is recommended.

"May" and "need not" have been used only when application of a procedure is optional.

"Will" has been used only to indicate futurity, never to indicate any degree of requirement for application of a procedure.

Executive Summary

EX.1 PURPOSE

This Navy Tactics, Techniques and Procedures (NTTP) manual is applicable to all forces conducting operations in naval shipping; though it is principally intended for expeditionary strike group (ESG) commanders, amphibious squadron commanders, landing force commanders, embarked units and/or staffs performing recovery operations in a chemical, biological, radiological and nuclear (CBRN) environment. When tailored, the principles can be used by any size Marine Air Ground Task Force (MAGTF) (e.g., a single-ship MAGTF or an expeditionary strike force or amphibious task force) or by ships responding to a CBRN attack. This document focuses on the unique aspects of ESG operations that are not currently addressed in existing doctrine including decontamination standards, guidance for consolidating uncontaminated personnel and equipment, and recommended procedures for caring for personnel following completion of decontamination procedures. This NTTP will evolve as the concepts mature and routine updates or supplemental guidance is determined to be required.

EX.2 INTRODUCTION

Current and emerging doctrine is striving to address the complexities of modern chemical, biological, radiological, nuclear and high yield explosive (CBRNE) weapons and contaminants, as well as providing a repository for guidance for actions to take to defend against or respond to casualties stemming from their use. Data on operationally relevant health effects are being developed in order to establish acceptable exposure limits; however, such research may not be completed until 2009. Additionally, various legacy documents are being updated, as well as numerous new publications prepared to reflect the emerging changes. Interim guidance is herewith provided as well as in the Office of the Chairman, Joint Chiefs of Staff memorandum MCM-0026-02, dated 29 April 2002, which discusses chemical exposure limits and reporting requirements.

Various studies and intelligence reports continue to cite the proliferation of weapons of mass destruction (WMD) and associated technology, as well as the increased and ready availability of by-products from commercial industry in the form of toxic industrial materials (TIMs). Some have even described chemical and biological weapons as the "poor man's atom bomb," but such statements can convey a misleading impression of their ease of production and utility. Nevertheless, naval forces are operating at an increased risk of encountering these threats and becoming casualties from natural or man-made disasters, terrorist acts, and acts of war. Likewise, these forces, upon completion of their assigned mission, could, when returning to the United States or an allied territory, contribute to the spread of these CBRN agents to a previously uncontaminated area. A myriad of doctrine exists within the Services to conduct decontamination procedures in their respective normal operating environments. This document bridges the gap and provides TTPs for addressing the conduct of time-sensitive recovery operations for contaminated personnel and equipment when moving from areas ashore or other shipping onto amphibious shipping.

EX.3 BACKGROUND

Depending upon the branch of Service and/or convention, the chemical, biological, radiological and nuclear environment is defined by using a variety of permutations of these elements to create the assortment of acronyms currently in use. Regardless of these differences, paramount to any discussion of the various facets of CBRNE is an understanding that, while the letters can be interchanged and presented in a number of combinations, the consequences and actions associated with each element must never be confused to state that the effects and response to each will be the same. Contaminants will not disperse evenly nor will they always be visible as the proverbial misty cloud. Similarly, the time available to react will often differ significantly: a chemical or nuclear attack may be readily detected by visual observation or the response of detection equipment; conversely, in a biological attack, knowledge of an attack may, in some cases, only come about after days or weeks have elapsed.

This document does not discuss "high yield explosive" weapons as their effects generally parallel a munitions detonation with an attendant high number of injuries, i.e., a mass casualty scenario.

The primary concern for commanders is the recovery of all forces, and critical to discussing recovery operations in a CBRN environment is acknowledging these operations will take place only when no alternative other than recovering the contaminated forces exists to fulfill the decontamination requirement. The principles discussed within this document are aimed primarily at addressing those situations when 1,000 to 2,000 personnel must be recovered in approximately 24 to 72 hours, but can be applied across the spectrum of recovery operations over varying amounts of time. Ships tasked to support smaller-sized recovery efforts, e.g., platoons, Force Reconnaissance (Force RECON) or a SEAL squadron should consider processing personnel using standard procedures undertaken when responding to a CBRN attack launched against ships at sea.

For purposes of this document, the term *"recovery operations"* encompasses those operations in which military forces and civilian personnel (to include casualties), equipment, and supplies move from sites off of naval ships (e.g., ashore or on another vessel) onto amphibious shipping. These operations may include a pre-planned amphibious withdrawal of forces subsequent to operations ashore (e.g., reconnaissance forces), noncombatant or other evacuations, recovery of personnel and equipment, movement of forces and equipment from shore-to-sea as part of ongoing tactical, humanitarian, or logistical operations, and/or operations undertaken to investigate the nature of materials being transported on a vessel at sea using a ship's boarding party or specialized landing force team.

EX.4 PRINCIPLES AND OPERATIONAL CONCEPTS

Chapter 1 sets forth the principles and operational concepts that must be kept in mind when conducting recovery operations in a hostile or potentially hostile CBRN environment. Although no two operations will be exactly alike, planners must operate with a common understanding of principles and operational concepts in order to ensure the entire force, both at sea and ashore, is synchronized. The mobility and ability to remain dispersed inherent in naval expeditionary forces, especially at sea, makes them difficult to target. New vessels such as the High Speed Vessels (HSVs) and concepts such as operational maneuver from the sea (OMFTS), ship to objective maneuver (STOM), sea strike and sea-basing capitalize on these traits, and further reduce vulnerabilities. On the other hand, even a small amount of a CBRN agent, if it contaminates key assets such as amphibious ships, or critical areas, such as landing zones or penetration points, can seriously affect recovery operations. The overriding concerns when conducting recovery operations in a CBRN environment must be the safety and security of the force and its reconstitution at sea as quickly as possible. Key nodes and critical vulnerabilities must be identified. Planning must focus on the key considerations that include: a threat assessment, logistics, command and control, and level of training.

EX.5 COMMAND AND CONTROL

Chapter 2 sets forth command and control principles. The command relationships described parallel those used during the planning and execution of the ship-to-shore movement. CBRN weapons as well as toxic industrial materials offer the potential to inflict significantly greater harm than conventional weapons, and their use or threatened use, as well as incidents arising from an accidental discharge or release of contaminants will significantly stress command and control structures, procedures, and responsibilities during every stage of an operation. It is therefore important to understand not only the capabilities of CBRN agents and weapons but also their limitations. There are a number of complex, and potentially sensitive, policy issues that will involve the force commanders and require consultation at the highest levels. Media attention will also be intense, particularly in light of recent efforts to "embed" media personnel with forward deployed forces; and international and national laws as well as environmental regulations provide additional challenges.

The identified or perceived threat of CBRN contamination generates considerable attention both in the area of operations and at home. In some situations, the risk of chemical, biological or radiological casualties must be accepted to permit accomplishment of a high priority mission, but this risk should always be minimized and "Operational Risk Management" should be used to make informed tradeoffs. To assure the readiness of forces, commanders must train and organize their personnel to respond to such threats and ensure operations are planned, conducted, and supported against the possible risks and challenges associated with the CBRN threat. Warning and reporting networks shall be used and CBRN defense management cells should be established; and commanders have to agree upon the best location to locate these organizations.

EX.6 CONTAMINATION CONTROL

Chapter 3 discusses contamination control procedures, including requirements and procedures for taking and submitting samples of suspected contaminants and actions that individuals can perform to minimize the spread of contaminants; e.g., clothing exchange procedures, laundering requirements and handling of personal effects. The key to contamination control is contamination avoidance. Whenever possible forces shall maneuver or take actions that will, in such way, preclude contact with a contaminated source. If contamination cannot be avoided, forces will take the necessary actions to minimize the level of exposure and perform decontamination procedures as soon as practicable. In order to minimize the spread of contaminants within a ship, contamination control areas will be established following the recommended guidelines presented for erecting such facilities in ships. The chapter concludes with a discussion of various installed shipboard systems that serve to minimize the spread of contaminants and an introduction to the currently available individual protective equipment.

EX.7 DECONTAMINATION

Chapter 4 provides information regarding the conduct of decontamination operations including actions to be taken when supporting flight deck and/or well deck operations; and sets forth established minimum standards for decontamination. Decontamination consists of the removal, destruction, or neutralization of contamination. The most important principle is to decontaminate as soon as possible. In the event decontamination is required, the standard decontaminant available on Navy ships is calcium hypochlorite mixed with detergent in aqueous solution. The principles of decontamination are: decontaminate as soon as possible, decontaminate only what is necessary, decontaminate as far forward as possible (i.e., off the ship if possible), and decontaminate by priority.

Current standards for acceptable field decontamination levels equate to the lowest detectable level using available equipment. Accordingly, decontamination procedures may eliminate all contaminants, but likewise may only remove such contaminants to the lowest detectable level and thus produce situations in which some residual contamination may remain. As a result, all previously contaminated personnel are considered to have some residual contamination and shall be monitored for signs of contamination induced illnesses.

When preparing for operations in a CBRN environment, commands need to plan for additional personnel to man required stations; particularly for flight deck and well deck billets. Additionally, commands need to acquire additional items of clothing, both IPE and items such as flight deck jerseys and cranials.

EX.8 LOGISTICS

Chapter 5 provides information regarding logistics planning and associated procedures. The ability of a force to sustain itself throughout the course of an operation is often viewed as the critical linchpin to achieving mission success; and the onus for planning such support rests largely with unit logisticians. By the very nature of expeditionary operations the complexity of such planning is magnified; however, because the forces of an ESG generally begin to integrate their planning at an early stage in a deployment cycle many of the impediments that can be encountered are minimized. Teamwork between a ship's supply officer and a unit's logistics officer and embarked staffs within an ESG is essential. Logistics and combat service support (CSS) planners must respond accordingly and consider the distinctive support requirements, the timely re-supply of consumable supplies, and the potential for mass casualties and elevated death counts. The importance of accurately reporting the status of a command or unit's CBRN readiness through the monthly Ship's Operational Readiness and Training Status

(SORTS) Report and the annual CBRN inventory of equipment cannot be understated. There may be instances when units not in-theater will be required to support forward-deployed units. If unit reports are accurate, the redistribution of material is simplified. Additionally, pre-staging additional materiel during the planning phase should be considered and implemented when possible.

The duties of the supply department and logistic units are varied. In addition to the items cited above, they are tasked with ensuring collected samples are properly submitted and custody requirements are maintained. They also oversee mortuary affairs for contaminated remains.

EX.9 HEALTH SERVICE SUPPORT OPERATIONS

Chapter 6 sets forth medical principles and concepts for the conduct of recovery operations in a hostile or potentially hostile CBRN environment. The chapter likewise provides a basic clinical overview of the CBRN agents to provide a context for other sections concerning healthcare planning, operations, and logistics support. Because of the unique properties of CBRN weapons, medical personnel require a firm understanding of the pathogenesis, methods of transmission (i.e., biological) or contamination (i.e., radiological/chemical), diagnostic modalities, and available treatment options for each of the potential agents. The information presented in this chapter is not intended to supplant the guidance and medical protocols presented in physician reference texts or other detailed medical manuals. Rather, it provides an overview of the medical concerns that all levels of command should be aware of when assessing the operational alternatives.

Examining such issues as prevention and levels of care, the chapter goes on to present medical planning information that helps to prepare for patient flow and management and resource planning, as well as healthcare operations and the steps necessary to be taken to move casualties within a ship. The chapter concludes by addressing sampling requirements and medical evacuation (MEDEVAC) concerns.

CHAPTER 1

Principles and Operational Concepts

1.1 INTRODUCTION

This chapter sets forth the principles and operational concepts that must be kept in mind when conducting recovery operations in a hostile or potentially hostile chemical, biological, radiological or nuclear (CBRN) environment. While no two operations will be exactly alike, planners must operate with a common understanding of the principles and operational concepts in order to ensure the entire force, both at sea and ashore, is synchronized. Nothing in this chapter is intended to contradict or supplant established joint doctrine for conducting operations in a CBRN environment; rather, it is intended to apply that doctrine to the unique conditions naval and landing forces may face in an expeditionary operation. As appropriate, ships should incorporate the tenants of this document into their CBRN Bill.

For purposes of this document, the term *recovery operations* encompasses those operations in which military forces and civilian personnel (to include casualties), equipment, and supplies move from sites off of naval ships (i.e., either ashore or on another vessel) onto naval shipping. Further, this publication discusses recovery operations conducted in a hostile or potentially hostile situation in which CBRN weapons or toxic materials pose a threat. These operations may include pre-planned amphibious withdrawal of forces subsequent to operations ashore (e.g., reconnaissance forces), noncombatant or other evacuations, recovery of personnel and equipment, movement of forces and equipment from shore-to-sea as part of ongoing tactical, humanitarian, or logistical operations, and/or operations undertaken to investigate the nature of materials being transported on a vessel at sea using a ship's boarding party or specialized landing force team. While the forces are likely to be predominantly from the United States that may not always be the case, especially in crises. The joint force conducting recovery operations must be prepared to operate with coalition forces as well as civilians and local and international governmental and non-governmental agencies. This should not, however, change the basic methods and concepts used to conduct the operation. Navy Warfare Publication (NWP) 3-02.1/ Fleet Marine Field Manual (FMFM) 1-8, *Ship to Shore Movement,* provides additional discussion of movement planning and execution considerations.

1.2 BACKGROUND

CBRN weapons pose a significant and increasing threat to US forces and strategic interests around the world. The proliferation of such weapons means that even the most poorly equipped adversaries could field them, even if only in rudimentary form. Such threats range from air and indirect-fire delivered chemical, biological, or nuclear ordnance to terrorist attacks using crude weapons and dispersal systems to the threat of toxic industrial materials that may be released either intentionally or from collateral damage, or from a natural or man-made industrial disaster.

Naval expeditionary forces face some unique situations that both exacerbate and mitigate the potential effects of CBRN contaminants that should be understood by those planning recovery operations. The mobility and ability to remain dispersed inherent in naval expeditionary forces, especially at sea, makes them difficult to target. New vessels such as the High Speed Vessels (HSVs) and concepts such as operational maneuver from the sea (OMFTS), ship to objective maneuver (STOM), sea strike and sea-basing capitalize on these traits, and further reduce vulnerabilities. On the other hand, even relatively small amounts of CBRN agents, if they contaminate key assets such as amphibious ships and sea bases, or critical areas, such as landing zones or penetration points, can seriously affect recovery operations. In most situations, the threat is greatest for forces ashore and decreases as forces are positioned further to sea; not withstanding operations undertaken to intercept vessels at sea suspected or known to be carrying hazardous materials. This is due to the proximity of adversaries, mobility, and targeting. Naval expeditionary forces and units ashore, especially those positioned in close proximity to enemy forces, face the greatest danger from CBRN weapons and agents. Detailed knowledge from intelligence sources and experts must be obtained for each operation in order to develop a current and more complete picture; both general and specific characteristics of these threats can be found in current doctrinal and intelligence publications. The following few paragraphs offer a summary of the threat to embarkation operations posed by CBRN hazards; additional information is presented in Chapter 6 and Appendix A to this publication.

In terms of the most dangerous threats to a force conducting recovery operations, persistent chemical weapons and toxic industrial materials must be ranked first, then non-persistent chemical agents, followed by biological weapons and radiation sources. It must be remembered that chemical and biological agents are not the same, despite often being placed together when threats are analyzed. Planners must understand the differences and the measures to be taken to combat each, and effect a successful decontamination. Radiological weapons can best be classified as psychological while nuclear weapons, albeit catastrophic if used, so dramatically change the dynamics of a situation as to make recovery operations in the vicinity of a blast impractical. However, for weapons that could spread radioactive contamination, the force must be prepared to conduct decontamination. While the threats posed by CBRN weapons are significant, they are not insurmountable, and can be overcome or avoided with careful planning.

1.2.1 Chemical Weapons and Toxic Industrial Chemicals

Toxic industrial chemicals (TICs), a sub-set of toxic industrial materials (TIMs), and chemical weapons comprise the most likely threats to be encountered by expeditionary forces. In a sophisticated threat environment, chemical weapons can be delivered by aircraft, unmanned aerial vehicles (UAVs), missiles and rockets, or indirect-fire. In a less-sophisticated environment, an adversary could employ sprayers, mines, indirect fires or even homemade bombs to disperse chemicals. The primary effect will be casualties, especially among unprotected military and civilian personnel, to include local inhabitants. In addition, areas in which forces may operate can be contaminated so as to create obstacles to movement. While chemical weapons will not damage equipment and supplies ashore, their contamination poses significant problems both to nearby personnel and to the ships to which they may be sent. The greatest threat of chemical agents is their persistency. For recovery operations, this threat is particularly acute for contaminated landing craft and rotary-wing aircraft which must move between shore and ships and can become carriers of contamination. Fortunately, the effects of chemical agents tend to be local in nature, rather than widespread, and, with careful planning and detection, can be avoided by forces ashore and at sea. The exception to this is found not in weapons, but in toxic industrial chemicals, which, because they are often located in urban areas and near ports, can be released with widespread devastating effects and may be very difficult to avoid. While a man-made disaster, the 1984 chemical plant incident in Bhopal, India none the less offers a prime example of the potential magnitude of such operations.

WARNING

IPE is not effective against most toxic industrial chemicals (TICs), specialized suits are required.

1.2.2 Biological Weapons, Diseases and Toxic Industrial Biologicals

Biological weapons, diseases and toxic industrial biologicals (TIBs), while less likely to be used by adversaries, can be potentially catastrophic, and are by far, more insidious than chemical weapons. Many are difficult to detect, can be spread by human contact or natural vectors, or go undetected. Additionally, contamination may not always come from a hostile source: evacuees or indigenous populations suffering from endemic, contagious and infectious diseases pose an equally lethal threat, especially if brought aboard the confined spaces of a naval ship where infections can spread readily. The first indication a force may have been exposed to biological contamination could come about days later: when the force is apparently safely aboard naval vessels and a rise in infections is detected by the ship's medical department representatives.

1.2.3 Radiological Weapons, Radiological Dispersion Devices and Toxic Industrial Radiologicals

Radiological weapons, radiological dispersion devices (RDDs), and toxic industrial radiologicals (TIRs), although capable of creating panic among indigenous populations, pose only minimal dangers. Tests have shown that, unless very large quantities of high-grade radioactive material are used, the level of contamination will likely be very small and confined to the immediate area of the blast itself. Conversely, forces tasked to support humanitarian efforts following natural or man-made disasters at nuclear facilities could be subjected to a more significant threat from the associated hazard. Radiological weapons and RDDs, i.e., "dirty bombs," are most likely to be used by Special Forces, insurgents, or terrorists for their psychological impact. Radiological weapons consist of an explosive device that disperses radioactive material; whereas RDDs may or may not use an explosive device to scatter dangerous and sub-lethal amounts of radioactive material over a general area or specific target. Terrorist use of RDDs is considered far more likely than use of a nuclear device because they require very little technical knowledge to build and deploy compared to that of a nuclear device as discussed in paragraph 1.2.4. RDDs also appeal to terrorists because certain radiological materials are used widely in medicine, agriculture, industry and research, and are much more readily available compared to weapons grade uranium or plutonium. TIRs can generally be regarded as radiological materials that exist in everyday items, industrial facilities or nuclear waste sites, which if removed from designed safeguards, can result in radiation casualties. Radiation can contaminate equipment that may be nearby and thus poses a potential risk if transported to naval shipping. Advance knowledge of the presence of radiological contaminants will serve to mitigate any potential threat to forces.

1.2.4 Nuclear Weapons

Nuclear weapons are those weapons that have been designed for the specific purpose of producing, upon completing the prescribed arming, fusing and firing sequence, an intended nuclear reaction and release of energy. They consist of a complete assembly, i.e., implosion type, gun type, or thermonuclear. Nuclear weapons, if employed against the expeditionary force, are of such destructiveness as to make recovery operations problematic, at least in the area of their use. Employment of such weapons against an expeditionary strike group/force likely will either end the operation or require a hasty withdrawal, *in extremis*, of any forces remaining ashore. If nuclear weapons have been used in the area of operations, but not against the expeditionary force, then the primary threats will be radioactive fall-out and residual contamination. In that case, avoidance and decontamination will be the primary operational concerns.

1.3 PRINCIPLES OF OPERATIONS IN A CBRN ENVIRONMENT

The overriding concerns when conducting recovery operations in a CBRN environment must be the safety and security of the force and its reconstitution at sea as quickly as possible. To accomplish these tasks, the following principles must drive both planning and operations.

1.3.1 Deterrence

The naval expeditionary force deters use of CBRN weapons by denying the adversary any meaningful advantage from the employment of such weapons. The commander of the force must be prepared to implement flexible deterrent options (FDOs) consistent with theater plans. These may include exercises and demonstrations of preparedness to counter and mitigate the effects of CBRN attacks as well as demonstrating the readiness and commitment to hold potential adversaries and leadership at risk in response to CBRN use.

1.3.2 Avoidance

The best means of preventing damage to the force from CBRN weapons is to avoid the threat. Avoiding contamination requires the ability to recognize the presence or absence of such hazards to both ships and forces ashore, especially in assembly areas, helicopter and craft landing zones, and penetration points along movement routes and on objectives. In addition, ships and aircraft must know where potential air and waterborne hazards are located, while forces ashore must be able to quickly identify equipment and personnel that have been contaminated. Dependent upon the current threat, continuous CBRN reconnaissance and surveillance will be necessary. In planning for contamination avoidance, commanders must understand and include an assessment of the capabilities of available detection systems.

Operational plans must include designation of alternate landing zones, penetration points, routes, and assembly areas; as well as address where forces will perform decontamination procedures on naval shipping if required. Operations should include plans for continuous repositioning of forces, both at sea and ashore; while boarding parties should remain alert for possible contamination sources. Planning for branches and sequels, eliminating or significantly reducing the vulnerability of critical nodes, synchronizing deception, assuring multiple units and ships are prepared to assume vital missions, and continuous training and exercising to ensure readiness to assume shifting missions are all essential to avoiding CBRN hazards. In addition, offensive and defensive measures must be fully integrated so that threats can be immediately identified and neutralized. This should include every effort to prevent an adversary's use of CBRN weapons, to the fullest extent allowed by the rules of engagement.

In recovery operations in a CBRN environment this tenet may not always hold true; particularly in situations where commanders consciously elect to bring contaminated personnel and/or equipment onto amphibious shipping or where the presence of contaminants is not known or suspected. In these circumstances it will then be critical to the safety of all personnel to ensure every measure is undertaken at the first indication of the presence of a hazard to control the situation and reduce the potential for spreading the contamination; thus leading back to the principle of avoiding contact with contaminants.

1.3.3 Protection

The multi-dimensional nature of naval expeditionary forces, comprising air, land, and sea elements, makes protection both essential and highly complex in its execution. Protecting the force consists of those actions taken to prevent or mitigate hostile use of CBRN weapons or exposure to CBRN hazards. Primarily, it involves the planning, preparation, training, and execution of physical defenses to protect personnel, equipment, supplies, vehicles, aircraft, craft, and ships from the effects of CBRN weapons and agents. These actions must be clearly communicated and rehearsed at all levels. The force commander has overall responsibility for adopting the necessary mission-oriented protective posture (MOPP) to establish readiness levels for individual protection, based on the threat and the ability of the force to quickly increase its protective posture. In addition, the use of medical prophylaxis, pre-treatments, antidotes, immunizations, and other medical treatments must be carefully planned for and the necessary supplies obtained and positioned, both afloat and ashore. In addition, protective clothing as well as covers for equipment and supplies must be readily available. Similarly, ships must maintain and operate systems such as their Collective Protection System (CPS) and Countermeasure Washdown System (CMWDS) that will increase the potential for survivability. Finally, as personnel (i.e., both military and, potentially, civilian) and equipment returns to offshore ships, careful planning is essential to ensure contamination is not spread and the potential for an outbreak of disease is minimized.

1.3.4 Decontamination

Decontamination supports the post-attack or exposure restoration of forces and operations to a near-normal capability. It should minimize the amount of time required to return personnel and equipment to a mission-capable state. In backload operations, performing decontamination should also ensure the effects of exposure to CBRN agents remains localized and is not spread throughout the force, especially to off-shore shipping. Because in recovery operations time and assets may be limited, commanders must prioritize and decontaminate only what is necessary. The level of decontamination conducted by forces must be based on the situation and time available; such operations, however, should usually begin with the forces ashore and move to shipping at sea.

Decontamination is organized into three basic categories: immediate, operational, and thorough. The goal of immediate decontamination is to minimize casualties, save lives, and limit exposure. For landing forces, it is normally conducted ashore; for at-sea forces, it consists of shipboard washdown systems and immediate setting of appropriate readiness conditions. This type of decontamination may be carried out in situations in which the landing force has limited assets ashore and is attempting to withdraw quickly, often while in contact with the enemy, as in a raid, extraction of a covert force, or when conducting a non-combatant evacuation operation (NEO) in a non-permissive environment. It is the least preferred since such forces returning to offshore ships will bring contamination with them. Operational decontamination limits exposure and spread while helping to sustain operations. It includes MOPP gear exchange for personnel and washdown of mission-essential equipment, to include landing craft and rotary wing aircraft. Operational decontamination of the landing force should be conducted ashore whenever possible, but can be conducted on flight decks and well decks of ships, as well in hangar bays; however, the latter could pose the threat of a spread of significant amounts of contamination within those ships if not carefully controlled. Thorough decontamination reduces or eliminates the need for wearing of individual protective equipment and restores equipment to unrestricted use. It should be the final step in decontamination, after immediate and operational, and will normally be conducted aboard ships at sea or at fully secure areas ashore. Ideally, when conducted aboard ship, the amounts of CBRN contamination will be minimal and pose a small risk to ships, largely involving detailed inspection and spot decontamination. Every attempt should be made not to increase the threat by bringing contaminated equipment and supplies back to ships.

Recovery operations pose a set of unique decontamination challenges and require special planning. Rotary-wing aircraft and landing craft (i.e., both conventional and air cushion) present the most significant source of CBRN exposure to offshore shipping, short of direct attack by an adversary, while personnel present the greatest potential of transferring contamination to the interior of a vessel. Because they may continuously re-enter contaminated areas while moving personnel and equipment from shore to ship, they will require constant monitoring and immediate and operational decontamination, both ashore and afloat. Limited shipping, space aboard ships and afloat decontamination capabilities will require careful planning and close cooperation between ships and embarked forces to ensure decontamination is effectively carried out and that all involved understand their responsibilities. There can be no artificial organizational divisions between naval and landing forces; decontamination must be an integrated whole that begins ashore and culminates with a team effort at sea. Forces should begin at the earliest opportunity to train for such integrated tasks, to include pre-deployment training, and establishing memorandums of understanding that will help to define mutual expectations.

1.3.5 Force Reconstitution

The ultimate goal for naval expeditionary forces when conducting recovery operations in a CBRN environment must be reconstitution of the force. Other than in operations in which the force is deployed exclusively for a single mission, or in which the recovery operation is an evacuation of personnel or assets not intended for further operational use, naval expeditionary forces must retain their ability to strike with sea-based air and ground forces on short notice. For that reason, landing forces returning to their ships at sea must be able to rapidly reconstitute their combat power. Likewise, naval shipping must also be able to rapidly resume their missions and cannot afford to have their capabilities curtailed for long periods by CBRN contamination or damage. When planning for re-embarkation operations in a CBRN environment, this principle must always be kept in mind.

1.4 OPERATIONAL CONCEPT FOR RECOVERY OPERATIONS IN A CBRN ENVIRONMENT

1.4.1 Key Nodes and Critical Vulnerabilities

The key nodes of a naval expeditionary force conducting recovery operations consist of amphibious ships, landing craft, and rotary wing aircraft. For the ships, flight decks and well decks should be considered critical vulnerabilities; if hangar bays are used they should be included as well. Areas such as zones and beaches, where landing craft and rotary-wing must halt or stage, must also be considered critical vulnerabilities as they provide the vital umbilical between shore and ship. If interdicted, the recovery operation will fail. Because of the difficulties in attempting to target individual aircraft, landing craft or ships, an enemy may not opt for such measures; rather, opposition forces are likely to elect to concentrate their efforts to contaminate places where movement stops or is channeled, if even for a few minutes.

1.4.2 Focus of Effort

The focus of effort when conducting recovery operations in a CBRN environment must be denying an adversary the capability to contaminate flight decks, well decks, rotary-wing aircraft and landing craft. Denial includes all those measures, passive and active, that prevent the enemy from effectively employing CBRN weapons, especially at those locations and times when the critical vulnerabilities are most exposed. Landing zones, craft landing zones, assembly areas, and landing beaches must therefore be protected. In addition, denial must also include implementing the appropriate tactics, techniques and procedures that will prevent contamination from reaching the ships incident to the return of boarding parties, landing forces, rotary-wing aircraft, or landing craft.

1.4.3 Concept of Operations

The concept of operations aimed at denying the enemy the capability to effectively employ CBRN weapons and minimizing the effects of indigenous toxic industrial material threats integrates the principles of avoidance, protection, decontamination, and force reconstitution in a layered manner, beginning ashore and progressively moving seaward as the force is withdrawn. The main effort resides with the landing force, which must seek to limit exposure to CBRN attack through a combination of maneuver and force protection measures.

CBRN avoidance primarily depends on the actions of forces ashore. Alternate landing zones and beaches, assembly areas, and routes must not only be designated, but also require CBRN reconnaissance and surveillance (R&S) (i.e., intelligence, reconnaissance and surveillance) to ensure they are free of contamination, an act which could result in R&S teams becoming contaminated. The recovery operation may need to be conducted from multiple sites in order to minimize the ability of the enemy to target the force as a whole. Deception should be carefully integrated in order to keep adversaries off-balance. Intelligence, rapid maneuver and flexibility are necessary to shift forces away from potentially hazardous areas. In addition, forces ashore must also have the capability to protect both personnel and equipment using individual and collective protection, prophylaxis, and the protection afforded by terrain and man-made structures. Force protection is a critical part of avoidance. To belabor the obvious, a landing force or boarding team that is not contaminated greatly simplifies a recovery operation and ensures the protection of the naval expeditionary force as a whole.

The naval expeditionary force maneuvers at sea to avoid the CBRN threat; in doing so it may add both time and distance to the ship-to-shore movement. The force commander will establish an integrated chemical and biological (CB) surveillance zone to detect, identify, and avoid possible contaminants. Ship commanders will employ all available detection equipment, including the Interim Biological Agent Detector (IBAD), the Improved Point Detection System (IPDS), Dry Filter Units (DFUs), Chemical Agent Point Detector System (CAPDS), Joint Biological Point Detection System (JBPDS), and Hand Held Assays (HHAs), as well as the AN-KAS-1 Shipboard Automatic Chemical Agent Detector and Alarm (SACADA), and Radiological Detection Indication and Computation (RADIAC) AN/PDR-65 depending on the threat. The network will also incorporate detection equipment ashore, which could include the Biological Integrated Detection System (BIDS), Chemical Agent

Monitor (CAM), Improved Chemical Agent Monitor (ICAM), Long Range Biological Standoff Detector System (LRBSDS), and in some cases the M93A1 Fox System. When available, the Joint Service Lightweight Standoff Chemical Agent Detector (JSLSCAD) will also play an important role in surveillance, especially if helicopter mounted. To ensure the network is fully integrated, a single command center should be established that links air, land, and sea assets and reporting.

If avoidance and protection cannot prevent exposure to CBRN agents, decontamination will then be required. The intent is to decontaminate as much of the force as possible, to the greatest degree possible, and as far from the ships as possible. Ideally, if the situation permits, immediate, operational, and thorough decontamination will be conducted ashore; although some degree of thorough decontamination aboard ships will probably still be required, especially for landing craft and aircraft. At a minimum, the landing force must be prepared to conduct immediate decontamination and should plan for operational decontamination.

Decontamination priorities should be established prior to the beginning of recovery operations. Although every situation has unique characteristics, the following priorities should be considered a guide:

1. Personnel

2. Sensitive Equipment (e.g., Communications Security (COMSEC), etc.)

3. Combat Essential Equipment and Supplies

4. Other Equipment and Supplies.

All aircraft and landing craft must practice contamination transfer control procedures (i.e., minimization and/or avoidance actions and procedures) at all times during recovery operations in a CBRN environment. If possible, this should occur ashore so as to lessen the possibility that they will bring contamination back to the ships. While transit in the air and at sea may provide some decontamination, it should never be considered sufficient.

With few exceptions, regardless of the level of decontamination of personnel, equipment, and air and landing craft conducted ashore a possibility for bringing contaminants onto the ship exists. Accordingly, shipboard monitoring and decontamination of returning personnel and equipment shall be conducted; the object of which shall be to limit CBRN effects on the ship and to quickly restore the force to operational readiness. It is essential to remember ships contend with unique considerations: it may be very difficult to achieve thorough decontamination on flight decks and in well decks. Casualties evacuated to a ship may require careful handling and decontamination to ensure medical spaces are not affected. Prior to recovering contaminated casualties it is advisable to determine if a platform is in-theater with advanced decontamination facilities as a part of its medical facilities, e.g., LHD or LHA. These specially designed decontamination stations allow for a more rapid decontamination process when handling injured personnel. Personnel may be infected with biological agents or endemic disease will necessitate screening, quarantine, and treatment that will require careful pre-planning.

1.5 KEY CONSIDERATIONS

1.5.1 Threat Assessment

A threat assessment consists of three parts: identifying the CBRN weapons or agents an enemy can employ, determining the means of delivery, and analyzing probable effects of an attack. An effective threat assessment should focus on the types of attacks most likely to occur at the particular locations from which landing forces will be withdrawn. A detailed discussion of conducting a threat and vulnerability assessment is provided in FM3-14/MCRP 3-37.1A, (i.e., Marine Tactics Techniques and Procedures (MTTP) for) *Nuclear, Biological and Chemical Vulnerability Analysis.*

The specific threats to a recovery operation must be determined based on the most recent intelligence analysis. Identification of chemical and biological agents that can be used by an enemy is a dynamic process. Threat assessments must be re-evaluated and updated continuously to account for advances in technology and the worldwide proliferation of chemical and biological weapons and the quest for nuclear and radiological weapons and technology. Additionally, the likely presence of toxic industrial materials (i.e., TICs, TIBs and TIRs) in or near a port compounds the problem. Aside from the obvious hazards and applications of some industrial chemical, biological or radiological materials, toxic industrial materials can be released by an enemy or in consonance with a random explosion from a conventionally armed missile or bomb.

Delivery systems vary with respect to the capabilities of the enemy, terrain, friendly force locations, and type of agent to be employed. Each delivery means has capabilities and limitations. Missiles can deliver a large amount of chemical agent over a large area, but targeting inaccuracies associated with missiles and uncertainties in wind speed and direction could cause the agent to miss the intended target. Aircraft can deliver large amounts of chemicals through bombs or spray tanks, but may have difficulty penetrating integrated air defenses. Delivery by special operations forces (SOF) or terrorists can be more flexible and less dependent on accurate targeting data, but the effects will be more localized. However, such forces can attack toxic chemical storage facilities, delivery trucks and railcars, or pipelines with relative ease. It should also be understood that more than one delivery means may be attempted by an enemy: a terrorist attack coupled with a ballistic missile attack can present two asymmetric threats using two different agents, greatly compounding avoidance and denial problems. Despite these possibilities, care should be taken not to exaggerate the threat. All analysis must be based on accurate intelligence rather than speculation.

Finally, the threat assessment should postulate the probable effects of an attack, not just in terms of contamination and effects modeling, but in terms of the impact such an attack will have on the ability of the recovery operation to continue. In determining effects, planners must consider key nodes and vulnerabilities; determining vulnerabilities that would be most affected by an attack. For example, chemical agents react with different materials in different ways, resulting in specific hazards and risks. Characteristics of ships, equipment, and facilities vary from hard metal surfaces, such as flight decks and expeditionary landing pads, to soft materials, such as wood-lined well decks, protective canvas covers, and rubber tires and fenders. When retrograding from ports it is important to remember that concrete and asphalt used for piers and wharves also represent unique contamination challenges. Some contaminated materials will remain a hazard for an extended period, while others will not. Some materials absorb chemical agents quickly, reducing the contact hazard but prolonging the vapor hazard. The wide variety and distribution of these surfaces complicates the problem of defining effects. It is noteworthy that a single agent can have different contamination effects among facilities and equipment in the same area.

1.5.2 Logistics

Availability of necessary equipment and supplies may mean the difference between success and failure of a recovery operation. Available cargo stowage area aboard naval ships is limited and must be reserved for those items that ensure immediate survivability. Other items should be pre-staged either close to the area of operations (AO) or be readily available for rapid transport to the AO. Other considerations include:

1. Medical support is a responsibility of the commander of the naval expeditionary force, but must be planned and coordinated with the landing force and area commanders as well as, where applicable, Host Nation civilian and military medical facilities present in and adjacent to the area of operations. Medical treatment of contaminated casualties should be addressed in great detail. At a minimum, it should include specific instructions for storage, inspection and use of chemical and biological agent antidotes; specific guidance for treatment of personnel suffering conventional wounds who have also been exposed to CBRN weapons; and instructions for segregating contaminated patients, to include considerations for quarantine aboard designated ships. Also included should be detailed guidance for reporting specific information on

potential symptoms of biological or chemical agent exposure as well as preventive medicine measures that must be followed. See Chapter 6 for further information.

2. CBRN Defense operations require special equipment (e.g., detection and analysis equipment), the procurement, maintenance, embarkation, and storage of which requires careful consideration. The naval expeditionary force should establish a notional list of the special CBRN defense equipment needed and available as well as the units and ships identified as responsible for the use, maintenance, and accountability of the equipment. Additionally, plans should specify the list of essential, organic CBRN equipment required for each unit involved in the recovery operation.

3. All expendable CBRN defense items of supply, both on-hand in each unit and ship and readily available on short notice, should be identified. In addition to protective suits, these inventories should also include mask filters, antidote injectors, individual and unit decontamination kits, bulk decontaminants, and medical supplies. Similarly, the plan should provide guidance for specific classes of supplies that may require special secure storage or handling as a result of CBRN attack, particularly Class I, III, VII. See Chapter 5 for an additional discussion and details.

4. All CBRN defense equipment and supplies embarked on naval ships or held by units ashore must be maintained, periodically inspected, inventoried, and calibrated in accordance with relevant technical manuals. Planning should specify the timing, standards, and nature of these actions.

1.5.3 Command and Control

Within the naval expeditionary force, the Expeditionary Strike Group/Force commander has overall command responsibility for recovery operations in a CBRN environment. Command relationships between subordinate units currently set forth in joint doctrine for naval expeditionary and amphibious operations apply to recovery operations. Clear understanding of the designation, roles, and responsibilities of supported and supporting commands must be openly established and agreed upon prior to commencement of operations. See Chapter 2 for further details.

The Expeditionary Strike Group (ESG) commander establishes a CBRN planning and operations cell (i.e., CBRN defense management cell) within the afloat command center, composed of naval and landing force personnel, capable of providing technical CBRN defense advice and planning, predicting and assessing CBRN hazards, and developing CBRN plans. It should also contain an intelligence cell capable of disseminating intelligence concerning the CBRN threat and conducting threat analysis, performing intelligence preparation of the battlespace (IPB) and providing hazard prediction and assessments. Ideally, the intelligence cell should be capable of receiving timely intelligence from the joint, theater, and national intelligence sources. Located within the at-sea command center, the CBRN defense management cell provides warning to all units, ashore and afloat; controls and coordinates the actions of all elements conducting recovery operations; and maintains full awareness of the CBRN situation, to include the contamination status of key nodes and critical vulnerabilities. Finally, the cell must be capable of directing the preparation of and forwarding of CBRN samples, through the rear area intelligence chain, to appropriate laboratories for analysis and verification.

When possible, CBRN detection and warning networks should be linked by computer-based systems that integrate the various detectors and monitors and provide instant warning of an attack. Additionally, the ESG commander should strive to establish a computer-based local area network, if not resident in the CBRN detection and warning network, to link subordinate units operating in the AO in order to provide a common operational picture.

1.5.4 Training

The success of recovery operations depends, ultimately, on the level of individual and collective training of the units that must conduct them. Current joint mission essential task lists establish required individual and collective training standards for each component of the naval expeditionary force. Meeting these training standards is the responsibility of the service components. However, this only meets basic standards of readiness. The force as a whole should train together prior to the operation, to the maximum extent possible. Regular individual and unit training in CBRN defense should continue en route to the area of operations and throughout periods of mutual operations. A primary objective should be rehearsing elements of the recovery plan, especially actions during early warning and alert, collective protection, and decontamination. A discussion of recommended training is provided in Appendix B.

1.5.5 Other Considerations

Commanders, at all levels, should be prepared to take into consideration various other factors including:

a. Civilian Personnel. Local civilians may be exposed to CBRN attack and could create a severe strain on forces ashore. The force must be prepared to conduct consequence management operations in order to at least provide immediate aid and assistance if the mission warrants it. This may include emergency medical treatment of casualties, identification of clear areas, monitoring, immediate decontamination of key areas or facilities, and basic mortuary services. During noncombatant evacuation operations, planning should also include whether it will be possible and/or required to provide necessary individual protective equipment and rapid evacuation of exposed personnel. Accordingly, ships must be prepared to handle civilian casualties in large numbers who may have been exposed to CBRN prior to contact with U.S. military forces. Coordinating a ship's NEO and Mass Casualty Bills with this instruction will be essential.

b. Environmental Concerns. During operations in situations other than combat, such as evacuations or humanitarian operations, existing international and bilateral environmental protection laws and agreements may remain in effect. Planners must be aware of the content and practical effects of these laws and make provisions to ensure compliance. Those restrictions that could prevent mission accomplishment must be identified and relief sought from the appropriate levels of command. Likewise, additional forces, equipment, or supplies may need to be requested.

Note

National-level approval will be required if the commander determines that environment laws must be violated in order to accomplish the mission.

CHAPTER 2

Command and Control (C2)

2.1 INTRODUCTION

This chapter provides commanders and their subordinates with a variety of C2 considerations that should be reviewed prior to or in conjunction with undertaking recovery operations in a contaminated environment. It broadly addresses some of the basic tenets of command and control, including assignments, duties and responsibilities, but many details of these same tenets cannot be discussed as they will be dependent upon the content of the mission statement or operations order and the forces involved.

Commanders must ensure the expeditionary force is capable of operating in a chemical, biological, radiological and nuclear (CBRN) environment to attain the force objectives. CBRN warfare defense is not a function a unit performs in isolation from other tasks: it is expected to operate in hazardous environments, including a variety of toxic environments. Hence, a contaminated environment should be viewed as a potential overlay on any warfare task; albeit it may impair the ability of a unit to perform its assigned mission. The employment of most CBRN countermeasures and protective equipment makes normal activities and operational evolutions more difficult, and the use or even the threatened use of CBRN weapons may force a unit into a protective posture that degrades operational capabilities. Commanders face the difficult task of choosing a defensive posture that is appropriate to both the level of the threat and requirements of the mission. In some situations, the risk of chemical, biological or radiological casualties must be accepted to permit accomplishment of a high priority mission, but this risk should always be minimized and "Operational Risk Management" should be used to make informed tradeoffs. It is therefore important to understand not only the capabilities of CBRN agents and weapons but also their limitations. This knowledge provides the ability to make informed decisions about the level of protection required and much more. Protective measures and decontamination procedures can then be limited to those that are necessary and suspended as soon as possible; thus minimizing the negative impact on a unit's operational capability.

2.2 BACKGROUND

It is generally accepted that the proliferation of the CBRN threat continues worldwide despite sustained efforts at arms control and verification. As a result, the possibility exists that forces may be required to operate in areas where there are such risks. CBRN weapons as well as toxic industrial materials offers the potential to inflict significantly greater harm than conventional weapons, and their use or threatened use, as well as incidents arising from an accidental discharge or release of contaminants will significantly stress C2 structures, procedures and responsibilities during every stage of an operation. Commanders must ensure the expeditionary force is capable of operating in a CBRN environment to attain force objectives.

Expeditionary operations commence with an order issued by the commander with establishing authority to the force commander. The order initiating the operation may come in the form of a warning order, an alert order, a planning order, or an operation order (OPORD); the complete information required to conduct the operation may come from a combination of these orders (e.g., a warning order followed by an alert or OPORD). There will be a number of complex, and potentially sensitive, policy issues that will involve the force commanders and require consultation at the highest levels. Media attention will also be intense, particularly in light of recent efforts to embed media personnel with forward deployed forces. The identified or perceived threat of CBRN contamination will generate considerable attention both in the area of operations (AO) and at home. Clearly, these factors will have a significant impact upon the planning and actions taken to recover personnel and their equipment onto naval shipping. Commanders will have to assess what actions they can take in order to achieve their objectives, allowing at the same time a reasonable safeguard against the hazards presented by an adversary's use of these weapons. They will likewise have a responsibility, particularly during military operations other than war

(MOOTW), to avoid exposing individuals to contamination; but, if this is not possible, to minimize the exposure to the lowest possible levels. Exposures, or suspected exposures, to CBRN hazards must be recorded to assist in the short and possible long-term treatment and future employment of personnel. Commanders must also remain aware of degradations in performance resulting from wearing individual protective equipment for protracted periods, and the hazards of bodily fluid loss in hot or humid conditions. Physical and psychological isolation and problems of personal recognition may cause difficulty in exercising command functions, and communication equipment will become more difficult to use. Commanders must keep the CBRN threat and risk under constant review, and promulgate updated threat assessments as the situation dictates in order to ensure subordinates can make informed decisions.

2.3 C2 PRECEPTS

A variety of issues influence the C2 organizations and decisions made by commanders, many of which the commander may have only little control over. These issues could range from consideration for international and national laws and regulations to dealing with concerns for the environment and the make-up of the force and mission requirements. The following paragraphs present an overview of some of these precepts.

2.3.1 Laws and Regulations

Forces are guided by the principles of international and national laws and regulations in the conduct of military operations, to include should an adversary use CBRN weapons or agents and what responses will be directed. The force Judge Advocate General officer assigned to the staff should be consulted for an opinion and recommendation as required.

2.3.1.1 International Law

Naval forces operate independently or as part of a joint force in response to national tasking or as part of a multinational force in pursuit of a common objective. International Law prohibits the use of chemical weapons in armed conflict. It likewise prohibits all biological weapons or methods of warfare whether directed against persons, animals, or plant life. Biological weapons include microbial or other biological agents or toxins, regardless of their origin (i.e., natural or artificial) or methods of production. Despite these laws and prohibitions recent operations have shown some nations and or organizations may use CBRN weapons and forces must be prepared to complete their assigned duties in a contaminated environment.

2.3.1.2 Law of Armed Conflict

It is the policy of the United States to apply the Law of Armed Conflict to all circumstances in which the armed forces of the United States are engaged in combat operations, regardless of whether such hostilities are declared or otherwise designated as "war." Relevant portions of Part II of NWP 1-14 (M), *The Commander's Handbook on the Law of Naval Operations*, are, therefore, applicable to all hostilities involving U.S. naval forces irrespective of the character, intensity, or duration of the conflict; and should be consulted for additional details.

2.3.2 Environmental Considerations

The Department of Defense (DoD) is committed to protecting human health and the environment to the extent practical while performing its military mission. The doctrine contained herein can provide a basis for environmental protection during national or multinational maritime operations and achieve the DoD's goal of operating in an environmentally sound manner. Various military operations other than war have been undertaken as "multinational maritime operations." For these situations, in absence of multinational doctrine, the force commander will apply national rules. Operations occurring on the high seas are subject to the requirements of the *U.S. Endangered Species and Marine Mammal Protection Acts*. Additionally, the *Ocean Dumping Act* prohibits vessels from transporting material from land to sea for the express purpose of dumping without a permit (e.g., captured weapons or munitions). Early in the planning process, a determination must be made whether compliance with these Acts would impede operations. If so, these constraints must be forwarded immediately up the chain of command to the Chief of Naval Operations or Commandant of the Marine Corps in order for the respective staffs to pursue the necessary exemptions. If the operations are a joint undertaking, and depending on the command relationships established, the request would be forwarded to the appropriate force commander.

2.3.2.1 Rules of Engagement

The commander can develop and publish environmental rules of engagement (ROE) in the environmental appendix in order to minimize the impact on the operation; generally Appendix L to an operation plan (OPLAN) or OPORD. The commander should review, with the assistance of the command's Judge Advocate General officer, theater and national ROE and solicit from the appropriate command or agency governing direction that will enable the commander to react to the threat. If the initial request for ROE is determined to be insufficient, the commander should then attempt to receive supplemental guidance. A discussion of the required ROE cannot be provided as it would be predicated on the mission statement or OPORD.

2.3.2.2 MOOTW

MOOTW are operations that encompass the use of military capabilities across the range of military operations short of war; for example: counterterrorism, peace enforcement, peace operations, counterdrug operations, civil operations, evacuation of U.S. or third world country nationals, and humanitarian assistance. These operations are generally located within the exclusive economic zone, territorial sea, or territory of another nation. Therefore, U.S. environmental laws would not be directly applicable to U.S. naval operations. However, naval forces should comply with environmental planning requirements and exercise sound environmental management inside the AO to the fullest extent that operational conditions and mission accomplishment allow. When an operational commander is unable to fully comply with these management requirements because of operational objectives, the commander must then try to minimize detrimental effects on the environment. During the withdrawal phase of a successful operation, the level of environmental concern should increase to a level appropriate to the tactical situation. The peaceful transit back to homeport or another deployed site should have an even higher level of environmental concern, consistent with peacetime operations. Operational commanders and their planning staffs must consider all these factors in preparation for such operations. Chapter 3 to NWP 4-11, *Environmental Protection*, provides more detail to MOOTW and impacts to the environment.

2.3.2.3 Wartime Operations

The principal considerations regarding environmental protection during wartime operations are contained in NWP 1-14(M)/MCWP 5-2.1/COMDTPUB P5800.7, *The Commander's Handbook on the Law of Naval Operations*. Environmental conditions inside and outside the theater(s) of war may differ and warfare, by its nature, is destructive to humans and their physical habitat. Environmental damage is a natural consequence of combat operations, including during recovery operations, and any attempts to limit such damage could adversely affect the options and force available to the commander. Although concern about environmental damage during war may, at first, seem illogical or irrational to the commander whose job demands victory, it should nonetheless be a considered factor. Hence, planners and commanders must be informed and remain aware of these differences and plan operations accordingly.

2.3.2.4 Disposal of Materials

Forces moving to recover to a ship should attempt to dispose of contaminated materials before embarking in the ship. When possible, they should coordinate the transfer of contaminated materials with ashore commands and/or complete the disposal per local instructions coordinated with the host nation. When the operational or tactical situation permit, particularly during combat operations, the safest method of field disposal is burning, followed by deep burial (i.e., over 6 feet). Disposal by burning or deep burial requires prior authorization and specific guidance of higher authority and prior coordination with local health authorities and religious leaders should also be accomplished if possible. If burning is used to dispose of contaminated materials, a downwind hazard prediction must be completed and the appropriate units warned if required. Burial sites must be located at a safe distance from watersheds and populated areas, and items not burned should be double-bagged. Disposal of body parts, tissues, and Class VIIIB blood and blood products obtained during operative or diagnostic procedures is, preferably, accomplished in the same manner to that used during peacetime medical evolutions. If following such procedures would represent a hazard to shipboard personnel, medical personnel will exercise all due caution in disposing of the waste in the safest possible manner.

Port Guides are generally written to support peacetime operations and frequently discuss various provisions regarding the environment. Attachés and other respondents should emphasize this in responses to logistic request (LOGREQ) messages where such exchange of information might likely occur while supporting an operational requirement; e.g., forces conducting a humanitarian assistance mission. When port visit material or the Standards of Forces Agreement (SOFA) does not provide sufficient information, operational commanders should attempt to follow corresponding requirements of U.S. navigable waters or ports. Where this is not feasible, Navy ships should operate in a manner consistent with that of host nation warships. Naval forces ashore are required to comply with applicable SOFA provisions dealing with the environment.

2.3.2.5 "Force Majeure"

"Force Majeure" is related to the doctrine of necessity that allows, for a given situation, holding in abeyance a law that ordinarily applies, but which if strictly observed under the unusual circumstances of the situation, will lead to greater harm than that resulting from disobeying the law. The doctrine does not hold if an individual, because of their own negligence, brought about the situation forcing the commander to choose to obey or disobey. For example, one aspect of "Force Majeure" refers to the inability of a vessel to obey a law because of a breakdown or malfunction of equipment. Inoperable machinery provides a legal defense for not obeying a law that otherwise is binding; however, the machinery must not be inoperable because of negligence on the part of the vessel using the defense. This doctrine can also pertain to the effect of breakdowns of waste treatment machinery (e.g., trash compactor or incinerator) and the consequent inability to obey an environmental law. Additionally, some of the laws governing environmental protection have clauses allowing noncompliance under certain stated circumstances. However, the doctrine of necessity is applicable to all laws. No law protecting the environment requires a commanding officer or master to hazard the ship and risk the lives of the crew. In other words, if compliance with an environmental law risks loss of ship or crew, that is grounds for noncompliance/non-adherence.

2.3.3 CBRN Defense Responsibility

As noted in JP 3-02, *Joint Doctrine for Amphibious Operations*, and JP 3-02.1, *Joint Doctrine for Landing Force Operations*, as well as associated documents, within the amphibious force, the Commander Amphibious Task Force is responsible for the CBRN defense of the assigned expeditionary force afloat, including the landing force while embarked; the Commander Landing Force is responsible for CBRN defense of the landing force once ashore. In light of the doctrinal transition to expeditionary strike groups (ESGs) and expeditionary strike forces (ESFs), within the context of this document such doctrine will be interpreted to mean that, unless otherwise specified, the commander of the ESG or ESF will assume responsibility for the CBRN defense and remediation procedures of the assigned expeditionary force afloat, including the landing force, while the Commander Landing Force will retain responsibility for the CBRN defense and decontamination of the landing force once ashore.

2.4 COMMAND RELATIONSHIPS

2.4.1 General

Command relationships described herein parallel those used during the planning and execution of the ship-to-shore movement. Joint Publication (JP) 3-02, *Joint Doctrine for Amphibious Operation* states: the terms "Commander Amphibious Task Force" (CATF) and "Commander Landing Force" (CLF) have been used doctrinally in the past to signify the commanders assigned to spearhead amphibious operations. Within the context of this document, as in JP 3-02, this publication disassociates any historical implications of the terms "CATF" and "CLF" from command relations. Rather, the terms "CATF" and "CLF" refer to those commanders who are instrumental to the conduct of expeditionary operations. Under JP 0-2, *Unified Action Armed Forces*, the establishing authority may choose from a variety of command relationship options between the CATF, CLF, and other designated commanders involved in amphibious operations. ESGs will deploy in "support relationships" (i.e., supported and supporting) with traditional titles such as amphibious squadron (i.e., PHIBRON) and Marine Expeditionary Unit, Special Operations Capable (MEU(SOC)) commander being substituted as necessary for CATF and CLF respectively.

2.4.2 Joint and Combined Operations

Once tasked, the combatant commander decides how the command should conduct the recovery operation. If the recovery operation is an entirely amphibious operation, the relationship between the commander and the commander, landing force will follow established doctrine. If a joint and/or combined force is formed to conduct the operation, the composition of the force will be defined in the order establishing the force. The commander combined joint task force (CCJTF) exercises operational control over assigned forces and normally over attached forces through designated component commanders. Other forces may operate in support of, or under the tactical control of, the combined joint task force as directed by the combatant commander.

2.4.3 Expeditionary Forces

An expeditionary force deploys by a variety of tactical and strategic modes of transportation. It does so under the direction of the commander ESG (CESG) or CATF, but under control of a variety of unified commands, Commander, U.S. Transportation Command (COMUSTRANSCOM), and fleet movement control agencies. An ESG will generally consist of three amphibious ships (i.e., LHA or LHD, LPD, and LSD), two AEGIS ships (CG or DDG), one DD/FFG type ship, one SSN, a MEU(SOC), and appropriate staff manning (i.e., ESG, PHIBRON, and MEU(SOC) commanders staffs) and other commanders and staffs as appropriate to support mission objectives. Expeditionary operations could also involve the use of Maritime Prepositioned Ships (MPS), Fast Sealift Ships (FSS), and other Service prepositioned ships. These ships are time chartered by and assigned to Military Sealift Command or other commanders as specified by the respective Services, and are generally operated under contract by merchant shipping companies. Operational control is usually retained by the fleet commander. The initiating directive will specify the command relationships in the various operation phases. Refer to NWP 3-02.3 (Rev. A)/MCWP 3-32 (Formerly NWP 22-10) FMFM 1-5, *Maritime Prepositioning Force Operations* and NWP 3-02.21 (Formerly NWP 22-8 (Rev. D)), *MSC Support of Amphibious Operations* for additional guidance should these assets be part of an operation. In the event strategic mobility assets become contaminated, COMUSTRANSCOM will coordinate with the geographic combatant commander to decontaminate the asset or allow the asset to weather to negligible levels. Once the landing force (LF) is embarked, CESG assumes full responsibility for the ESG and the operation. CLF is responsible for the conduct of operations ashore within a coordinated supported relationship with the CESG or CATF during a recovery operation. To carry out the command responsibilities (e.g., decontamination decisions including selecting a ship or ships to contaminate, not recovering selected equipment or supplies, etc…), parallel chains of command are established. No significant decision by either commander that affects the plans, disposition, or intentions of the other should be made without consulting the commander concerned.

2.5 DEFENDING FORCES DURING CBRN RECOVERY OPERATIONS

2.5.1 Establishing Local Defense Networks

Exposure of forces to CBRN hazards can have an immediate effect on a unit's ability to complete its assigned mission. Exposure to such hazards can affect the health of personnel and their ability to survive subsequent exposures. Procedures put into place prior to the commencement of recovery operations can likewise serve forces during backload operations. For example, the establishment of a local defense detection, warning and reporting system can reduce the possibility of forces becoming contaminated. Among the key components of such a system is an air surveillance plan in the AO that includes surveillance for chemical vapors and biological aerosols. Shipboard air search radars, as well as counter battery radars ashore, can help provide tactical warning for incoming CBRN weapons and provide information to support immediate attacks on their sources by naval fire support and surface combat air patrols. Similarly, mobile and installed CBRN sensors can aid in alerting and detection. Although warning and reporting activity generally takes place post-event, an in-theater system of warning and reporting for CBRN events and the resulting CBRN hazards prediction should be established so that the risk to the force is minimized. Within each ship, procedures exist to alert personnel of a potential attack or the presence of contaminants on the ship.

2.5.1.1 ESG Warning and Reporting Coordination

Commanders must be prepared to process and utilize the data received from other units, e.g., nuclear, biological and chemical (NBC) reports. This information can be used to minimize or avoid contamination as well as to change the force's CBRN readiness posture. Responsibility for reporting attacks or incidents rests with the unit's commanding officer and appropriate personnel must be familiar with all required reports in the Nuclear, Biological, Chemical Warning and Reporting System (NBCWRS). When preparing reports concerning attacks that involve the enemy's use of CBRN weapons, the operations officer will need to indicate the extent of the unit's contamination. Report formats are contained in ATP 45, *Manual of Nuclear, Biological and Chemical Defence Training on Land.* The following is a basic list of those reports:

1. NBC 1. Observers' report giving basic data on CBRN reports.

2. NBC 2. Evaluated data based on a series of NBC 1 reports compiled by a staff.

3. NBC 3. Immediate warning of a predicted hazard area after attack that has just occurred.

4. NBC 4. Passing of monitoring and survey results, indicating extent of contamination.

5. NBC 5. Actual hazard area associated with a CBRN attack.

6. NBC 6. Upon request from higher authorities, detailed information on a CBRN attack.

WARNING

Reports concerning the initial use of CBRN weapons will be transmitted unclassified by FLASH precedence. Follow-on messages will be sent "Operational Immediate" or lesser precedence based on the circumstances.

2.5.1.2 Shipboard Internal Warning and Reporting

The shipboard internal warning and reporting process for alerting personnel of an imminent attack or that an attack is in progress is by using the ship's General Announcing System, i.e., 1 MC, and audible alarms. Following an attack or while supporting CBRN recovery operations, ships will find it necessary to use survey teams to monitor detection equipment (e.g., M8/M9 paper and dry filter units (DFUs)) and locate contaminants with hand held devices. Survey teams report their findings to a repair locker which in turn reports this information to the ship's Damage Control Central (DCC). The information is processed and forwarded to the ship's Bridge from where a "Hot Spot" or "Clear" announcement is made – note, in some ships this announcement may be made by personnel in DCC. Hazard areas are cleaned by personnel assigned to "Scrubber Teams." A sample of shipboard announcements alerting personnel of a possible attack or that contaminants have been found on the ship is provided in Figure 2-1.

Situation	Announcement
Conventional or nuclear attack is imminent	*General Quarters alarm sounded.* "General Quarters, General Quarters, all hands man your battle stations. Set material condition ZEBRA throughout the ship. Traffic pattern is up and forward on the starboard side, down and aft on the port side."
Chemical or biological attack is imminent	*General Quarters alarm sounded.* "General Quarters, General Quarters, all hands man your battle stations…. Set MOPP Condition 4." Guidance regarding taking shelter will also be provided. *Chemical Alarm is sounded.*
Contamination detected on the ship	"Hot spot, hot spot. Hot spot located at… (Location specified). Safe stay time is… (i.e., the time is expressed in minutes or hours)." This report is followed up with a "Clear" report that will state what area has been found to be clear.

Figure 2-1. Shipboard Warning and Reporting Announcements

During recovery operations when returning forces and equipment are known to be contaminated, the ship will use a similar process wherein the aircraft or landing craft controlling station will notify the ship's Bridge of contaminated craft being inbound. Personnel will follow directions promulgated over the ship's announcing system, dispatching survey and decontamination teams. Upon locating contamination, ships will once more follow established procedures for promulgating the location of the contamination, order actions to commence controlling the spread and eliminating the source of the contamination, as well as to provide information when areas have been determined to be clear of contaminants. To guard against unexpected contaminants, ships will follow theater commander guidance for operation of chemical and biological detection equipment, and take actions as appropriate in response to indications of possible contamination.

2.5.2 Mission-Oriented Protective Posture (MOPP)

Commanders must adopt a mission-oriented protective posture (MOPP) to establish flexible force readiness levels for individual CBRN protection. Figure 2-2 provides an explanation of the various MOPP levels and details differences between at-sea and ashore levels for Navy and Marine Corps personnel.

2.5.3 Preparatory Measures

Defense planning includes preparatory measures. Preparatory measures make it more likely that the ship will be able to perform its mission after or while being exposed to contaminants, reducing the subsequent decontamination workload, the potential for casualties, and the potential consumption of key supplies and equipment such as individual protective suits which, under current guidance, must be replaced within 24 hours of becoming contaminated. Actions that can be accomplished include, but are not limited to: activating the counter-measure washdown system and wetting external surfaces, removing porous materials from topside spaces, pre-positioning individual protective equipment, initiating a program to inoculate personnel, and preparing decontamination stations for activation.

<table>
<tr><th colspan="2">MARINE MOPP LEVELS</th><th colspan="2">NAVY MOPP LEVELS</th></tr>
<tr><td>MASK ONLY</td><td>Mask worn hood rolled up or down and fastened. Rarely used.</td><td>MASK ONLY</td><td>Mask worn. All other gear readily accessible. Command may be given to certain workspaces within ship if the ship has not sustained physical damage.</td></tr>
<tr><td>MOPP READY</td><td>Mask carried. All other equipment accessible within 2 hours.</td><td>MOPP 1</td><td>Mask and equipment issued to personnel and staged at respective battle stations.</td></tr>
<tr><td>MOPP 0</td><td>Mask carried. MOPP Suit, boots, and gloves immediately accessible.</td><td>MOPP 2</td><td>Same as MOPP 1, <u>EXCEPT</u> mask is carried.</td></tr>
<tr><td>MOPP 1</td><td>Mask carried. Overgarment worn open or closed based on temp. Boots and gloves carried or immediately accessible</td><td rowspan="2">MOPP 3</td><td rowspan="2">Install new filter on mask. Mask carried. Overgarment worn open or closed based on temp. Boots worn. Gloves carried in cargo pocket. Personnel outside skin of ship don wet weather gear over protective gear.</td></tr>
<tr><td>MOPP 2</td><td>Mask carried. Overgarment worn open or closed based on temp. Boots worn. Gloves carried or readily accessible.</td></tr>
<tr><td>MOPP 3</td><td>Mask worn with hood rolled up or down based on temp. Overgarment worn open or closed based on temp. Boots worn. Gloves carried.</td><td rowspan="2">MOPP 4</td><td rowspan="2">Mask worn. Overgarment worn closed. Boots worn. Gloves worn. Non-essential personnel directed to shelter. Smoking and eating prohibited.</td></tr>
<tr><td>MOPP 4</td><td>Mask worn with hood down and fastened. Overgarment worn closed. Boots worn. Gloves worn. Full protection.</td></tr>
</table>

Figure 2-2. At-sea and Ashore MOPP Levels

2.5.4 Meteorological Planning Tools

The ship or staff Meteorology and Oceanography (METOC) Officer should obtain or have access to scenario modeling systems. Computer dispersion models, such as the Navy Vapor, Liquid and Solid Tracking (VLSTRACK) system and the Defense Threat Reduction Agency (DTRA) Hazard Protection and Assessment Capability (HPAC) program, can be used to determine probable patterns and concentration for agent dispersion under various climatic conditions for a designated area. Ships or ESGs not ordinarily assigned a METOC Officer can request a temporarily assigned mobile meteorology team (i.e., Mob MET Team) prior to departure from the Chief of Naval Meteorology and Oceanography Command.

2.6 CBRN DEFENSE MANAGEMENT

2.6.1 CBRN Management Cell

The use of a CBRN management cell is critical to controlling the flow of information and the decision making process. The four basic principles of CBRN defense management are:

1. Expertise. The primary function of a CBRN defense management cell is to provide expert advice to the commander. The cell's expertise gives the commander an ability to develop an assessment of the situation based upon detector, laboratory, and on-scene reporting inputs.

2. Operations. One aspect of a CBRN incident is the coordination of the wide range of forces involved in such an event. The cell establishes liaison with all forces to integrate capabilities into a group or force-wide resource and response posture.

3. Communications. The CBRN cell provides an ability to control and allocate these resources. This requires the ability to communicate on joint, coalition, and fleet circuits.

4. Resource management. In addition to the cell's operational and advisory roles, it also monitors the overall level of available resources within the force.

2.6.2 CBRN Defense Center

In a CBRN environment, the CESG or CATF and each ship's ship-to-shore movement control agency shall establish a CBRN defense management center or cell to coordinate with the tactical and logistical operations center (TACLOG) or landing force operations center (LFOC). The cell should be headed by the CESG's materiel officer (i.e., N4), or in the case of a ship, the executive or CBRN officer, and consist of sufficient personnel with the requisite expertise to monitor circuits, make reports, and perform the required plotting as well as provide appropriate assessments and recommendations consistent with the operation. In most instances, the existing center manning will suffice to meet the increased monitoring and reporting requirements but changes may be required; watch organizations should be evaluated during pre-deployment training and modifications made as determined. Use of the TACLOG or LFOC may be feasible and/or coordinated and is recommended in view of their inherent links to operations ashore. The center should provide information on the operations area and ground zero, to include initial estimates of CBRN contamination. This combined with information from the CESG movement control center and TACLOG will forms the basis for decisions to continue with or alter the operation. The joint intelligence center (JIC) is an integral part of the defense center. It provides intelligence estimates and assessments on the enemy's capabilities and political will to employ CBRN weapons, and evaluates information from theater and national sensors to provide early warning on their potential employment.

Support from the LF commander's staff can be expected, but situations could develop where the LF's CBRN officer and/or subordinates may be involved in the operation ashore and unavailable to assist on the ship. In all situations, such conditions should be discussed prior to commencing operations and agreements attained on reporting and controlling responsibilities. In that the CESG shall be responsible for the contamination control effort on the ships during recovery operations, it will be essential to maintain a perspective on the established command relationship for the operation and continue the coordination procedures exercised during the planning process; thus ensuring both commanders are involved in the decision process.

2.7 DECIDING TO CONTAMINATE SHIPPING

2.7.1 Principles

In principle, electing to contaminate shipping during recovery operations has the same effect as if a ship has been attacked with a CBRN weapon. Accordingly, commanders should not be intimidated by the process of determining which ship or ships will receive contaminated forces or equipment as the procedures established for how to decontaminate personnel and the ship following an attack can be applied to processing retrograding contaminated forces and their equipment (i.e., NTRP 3-20.31.470, formerly NAVSEA NSTM Chapter 470, provides guidance for survey and scrubber teams, and decontaminating ship surfaces; additional guidance is provided in FM 3-11.34/ MCWP 3.37.5/ NTTP 3-11.23/ AFTTP (I) 3-2.33 *Multi-Service Procedures for Nuclear, Biological, and Chemical (NBC) Defense of Theater Fixed Sites, Ports, and Airfields*).

Operations conducted ashore or while inspecting vessels at sea have the potential to introduce contamination into an ESG. Commanders should ensure that prior to the commencement of any operation a review of the requirement to activate decontamination stations is initiated and acted upon if determined to be warranted.

Selection of shipping to receive contaminated personnel or equipment will require a detailed analysis of the options be conducted. Commanders shall consider such issues as, but not limited to, ship capabilities (e.g., extent of medical facilities and the presence or absence of a collective protection system), the ability to conduct self-decontamination or isolate the contamination, follow-on mission, and the age of the ship. Appendix C provides a more thorough checklist while Figure 2-3 provides information for determining possible courses of action.

The use of submarines to receive contaminated personnel should not be attempted nor considered a viable option; an alternate venue will be required to support such forces upon returning from operations in a contaminated area and a determination will be made based upon the assets available.

Equally important to any decision made to contaminate shipping should also include a realization that a similar review of the consequences; options and procedures will be required for the landing craft and aircraft. It is essential to understand that any decision to use landing craft and/or aircraft in a contaminated environment will require a reasonable period of time be made available to prepare the craft for such operations, as well as to ready the receiving stations and subsequent washdown equipment and stations. Hence, as with all efforts to move contaminated personnel and their equipment, an assessment of the impact to the helicopters and landing craft will also need to be accomplished, and a decision made regarding risks and what procedures can be instituted to minimize the spread of contaminants.

2.7.2 Decision Timing

In most instances, conditions for deciding what actions will be taken in a CBRN environment during recovery operations will have, or should have, been made during the initial phases of an operation; specifically, during the planning phase and incorporated into appropriate documents, e.g., OPGENs and OPTASKs (i.e., operational tasking). Commanders should not be forced to create solutions “on-the-fly” or after an operation has become “dirty.” Critical to ensuring this sort of “crisis management” does not occur is conducting vulnerability assessments where the opposition forces and political will are examined versus the likelihood of the availability and/or use of CBRN weapons; notwithstanding some instances of a CBRN contamination can be the unintended (e.g., it may be the result of biological decay or forces/personnel retrograded to a ship passed through an area of contamination such as a farm where parasites or toxins could exist in animal feed, pests or waste). To prevent such events from happening, forces inserted to conduct the operation should be warned of potential hazards and cautioned regarding the necessity to maintain the highest possible degree of personal sanitary standards. Additionally, ships should be prepared to initiate decontamination procedures for all operations. At a minimum, environmental samples should be taken and examined by properly trained personnel as well as discussions held with the host nation, when possible, to ascertain the likelihood of accidental contamination.

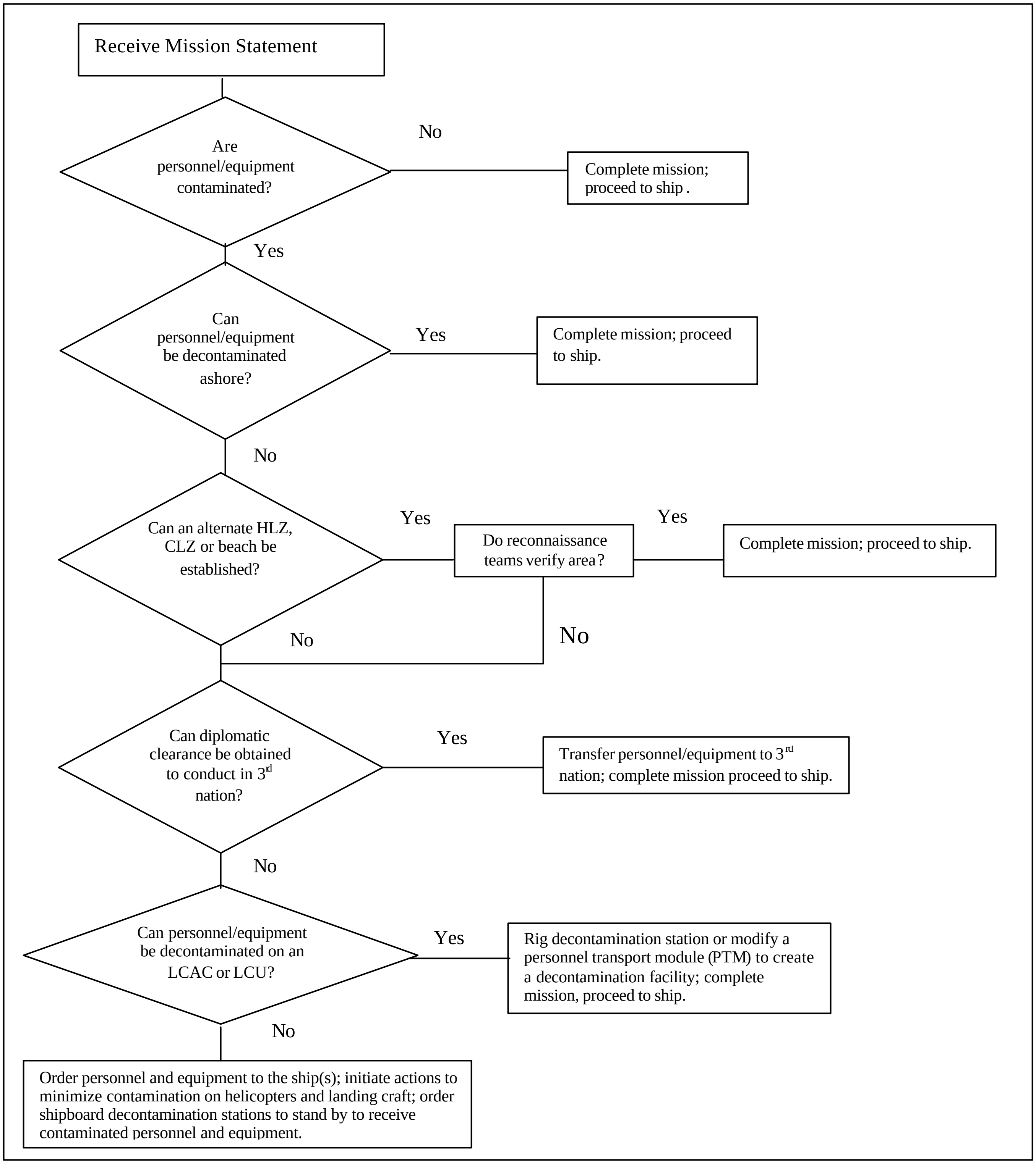


Figure 2-3. Decontamination Location Determination Process

2.7.3 Decision Authority

Not withstanding the comments of the preceding paragraph, the decision to recovery contaminated personnel and/or equipment to amphibious shipping will be made on a case-by-case basis and be influenced by the circumstances of the operation and the follow-on mission requirements. All decisions will be forwarded through the respective chain of command to the commander with establishing authority to the force commander and be subject to review, i.e., being over-ridden or amended. In an *"in extremis"* situation the force (i.e., on-scene) commander, to include the commanding officer of a ship, shall determine if the contaminated personnel or equipment will retrograde to the ship. In situations where guidance has not been provided in the initiating directive or orders associated with the operation, e.g., the execute order or an OPTASK or OPGEN, and an *"in extremis"* situation does not exist, the on-scene commander shall forward a recommendation up the chain of command, through the theater commander, to the commander with establishing authority to the force commander for authorization to recover contaminated personnel and equipment.

In certain situations, the decision to contaminate amphibious shipping is made by the Secretary of the Navy and/or Secretary of Defense. The intent to recover residually contaminated equipment to the Continental United States (CONUS) or an intermediate location must be communicated through the Chairman of the Joint Chiefs of Staff (CJCS) due to potential risks and political/environmental sensitivities. A summary of the decision authority is provided in Figure 2-4.

Commander	Decision Authority
Ship or Unit	*In-extremis*
On-scene Commander (e.g., CESG or PHIBRON commander)	*In-extremis* or as directed
Commander Landing Force	Operations ashore or as directed
COMMSC/COMUSTRANSCOM	Contaminate MPF/Strategic Mobility Assets
Fleet and Unified Commanders	Contaminate Units – Units to remain in-theater
CJCS	Redeploy to CONUS

Figure 2-4. Decision Authority Summation

2.8 OPERATIONAL RISK MANAGEMENT

2.8.1 Operational Risk Management Process

Operational Risk Management (ORM) is a process that assists decision makers in reducing or offsetting risk by systematically identifying, assessing, and controlling risks arising from operational factors and making decisions that weigh risks against mission benefits. Risk is an expression of a possible loss or negative mission impact stated in terms of probability and severity. The ORM process provides leaders and individuals a method to assist in identifying the optimum course of action (COA) and facilitates mitigation of the risks to the force. ORM must be fully integrated into planning, preparation, and execution as commanders are responsible for the application of risk management in all military operations. The ORM process has two levels of application:

1. Crisis Action**.** Crisis action risk management is an "on-the-run" mental or verbal review of the situation using the basic ORM process. The crisis action process of risk management is employed to consider risk while making decisions in a time-compressed situation. This level of risk management is used during the execution phase of training or operations as well as in planning and execution during crisis responses. It is particularly helpful for choosing the appropriate COA when an unplanned event occurs.

2. Deliberate**.** Deliberate risk management is the application of the complete process when time is not critical. It primarily uses experience and brainstorming to identify threats and develop controls and is, therefore, most effective when done in a group.

Time is the basic factor that contributes to the selection of the level of application to be used. Figure 2-5 provides an example of the ORM assessment process.

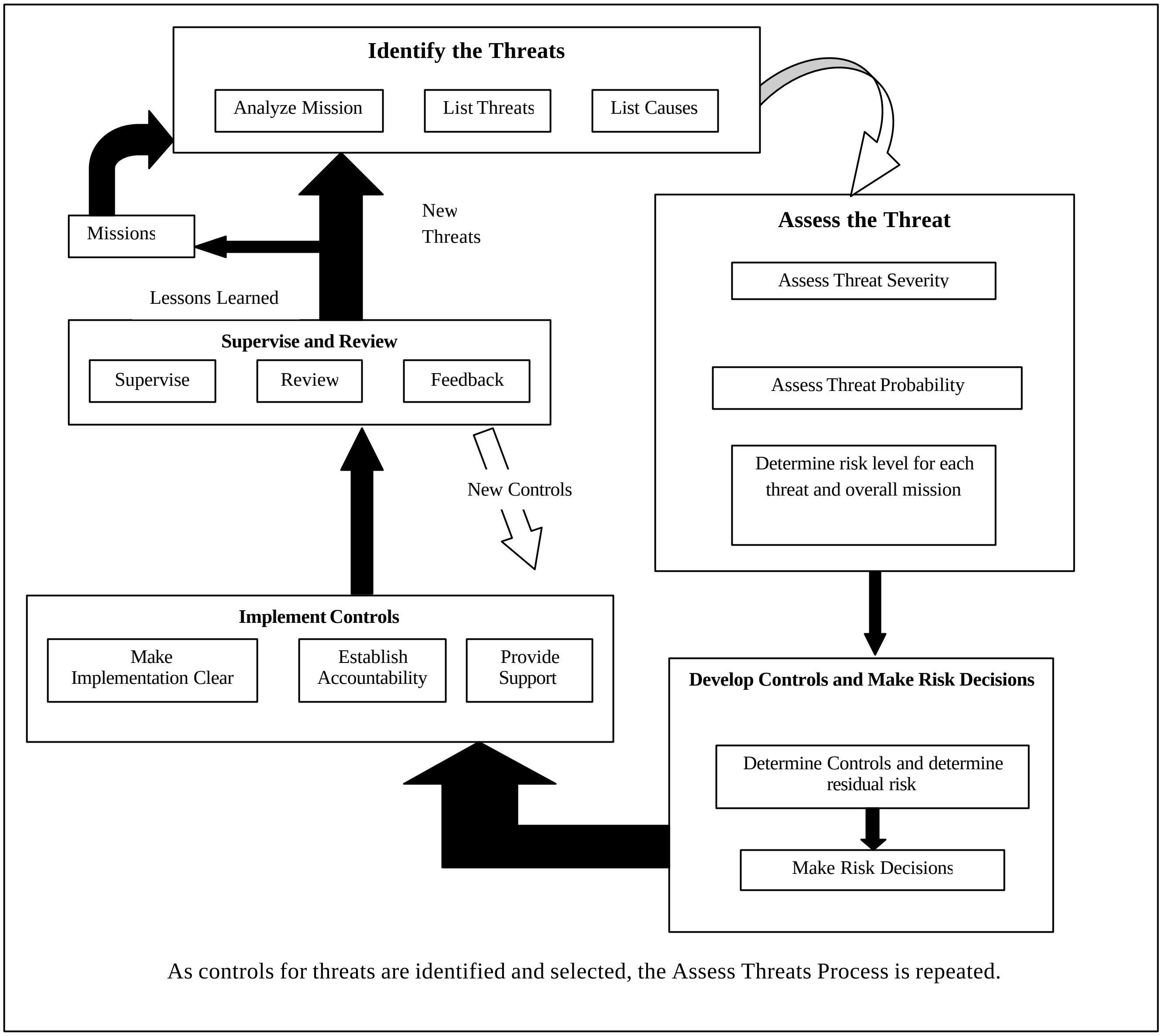


Figure 2-5. Continuous Application of Operational Risk Management

2.8.2 Mission Analysis Considerations

The hazards of operating in a CBRN environment requires a higher degree of mission analysis, planning, and training than that normally associated with established primary missions and collateral activities. Mission analysis conducted by a higher headquarters provides operational element commanders with sufficient information to begin mission planning. The commander's intent must be clearly understood.

2.8.3 Risk Assessment

Risk is the assessed difference between the threat level and the use of appropriate levels of countermeasures. The risk of casualties and contamination is evaluated and weighed against the potential mission degradation from MOPP measures implemented, such as personnel heat stress from reduced ventilation or protective clothing.

A risk assessment begins with an intelligence assessment describing the threat with a time frame for employment. Intelligence information consists of:

1. Status of enemy CBRN warfare capability.

2. Assessment of the political will to employ CBRN weapons or agents under the current and projected tactical situation.

3. Ranges of CBRN delivery systems.

4. Threat axis and potential attack patterns.

2.8.4 Mission-Oriented Protective Posture (MOPP) Analysis

MOPP analysis (i.e., the process of determining a recommended MOPP) integrates CBRN protection requirements, derived from threat assessments, with mission requirements in light of the performance degradation caused by wearing protective equipment.

2.8.5 CBRN Risk Levels

The risk of encountering a CBRN attack is categorized into four levels of increasing probability. These levels constitute decision points for implementing corresponding MOPP countermeasures. These risk categories are:

1. Suspected**.** Enemy possesses a CBRN capability. Implementation of MOPP-1 countermeasures is warranted.

2. Possible. The political will to use CBRN weapons exists. Implementation of MOPP-2 is warranted.

3. Probable. A statement of intent to employ CBRN weapons, changes in political or military posture, or the use of CBRN weapons in the objective area has already occurred. Implementation of MOPP-3 is warranted.

4. Imminent. Confirmation of increased activity for immediate employment of CBRN weapons; implementation of MOPP-4 is warranted.

2.8.6 Decontamination and Risk Management

Decontamination is the primary countermeasure process supporting sustained operations in CBRN environments. Risk management requires decisions regarding the level of decontamination to be implemented and the optimum time and location for such implementation.

2.9 PUBLIC RELEASE OF INFORMATION

Appendix F to the Joint Strategic Capabilities Plan (JSCP) prescribes procedures for the release of all CBRN (*sic*, NBC) defense, Riot Control Agents (RCAs), and herbicide information to the public. This policy does not apply to requests for information made under the Freedom of Information Act. Release of information may be subject to operational security (OPSEC) considerations and specified conditions as stipulated by the Secretary of Defense (SECDEF).

2.10 TRAINING REQUIREMENTS

When practicable, embarked forces receive training with their ship's company counterparts in the conduct of CBRN warfare as it applies to the ship within which they are embarked. Similarly, as part of the pre-deployment training, commanders should look to opportunities to have shipboard decontamination teams complete training with their MEU (SOC) counterparts. As noted earlier, in today's environment of unconventional warfare and MOOTW, forces will not always have detailed warning of a specific threat as might be encountered when engaged in a declared war. Accordingly, forces should be prepared to transition from a "clean" environment to a "dirty" environment with little warning. Training should be conducted in phases of increasing complexity and begin during pre-deployment work-ups or, no later than, during trans-oceanic passages. Appendix B provides a listing of recommended training forces should attempt to complete in an effort to improve their ability to operate in a CBRN contaminated environment; specifically to support recovery operations. Additionally, CBRN scenarios are presented during the ARG (i.e., Amphibious Ready Group)/MEU Workshop and field training provided to landing forces. Marine Expeditionary Units have the option of deploying with an enhanced nuclear, biological and chemical (E-NBC) suite. E-NBC capability sets provide the commander with a more robust means of CBRN force protection and rapid response across the full spectrum of CBRNE threats. The MEU commander should deploy with the E-NBC set when the threat of expected exposure to unknown hazardous materials and/or toxic industrial materials (TIMs) exists. In order to fully realize this capability, Marines must undergo specialized training with elements of the Marine Corps Chemical Biological Incident Response Force (CBIRF) located at Indian Head, Maryland, during the MEU (SOC) work-up.

CHAPTER 3

Contamination Control

3.1 INTRODUCTION

This chapter sets forth principles and procedures to aid in limiting hazards stemming from receiving contaminated personnel and equipment onto expeditionary strike group (ESG)/amphibious ready group (ARG) shipping. The procedures described herein are intended for vessels that have not sustained damage from combat or forces of nature; when damaged, commanders should review their capabilities and tailor their responses accordingly. Likewise, commanders and commanding officers shall review these procedures and adapt them to their specific task group or ship; including comments as appropriate in the Chemical, Biological, Radiological and Nuclear (CBRN) Defense Bill.

Contamination control is the employment of systems, equipment and procedures to minimize the negative impact of contamination on a unit's operational capabilities; it ranges from action done prior to encountering contaminants to action taken to minimize the impact of receiving contaminated personnel by implementing procedures to detect and control the spread of contaminants. This principle applies whether the contamination occurs as a result of an attack or the deliberate act of receiving contaminated personnel and equipment in conjunction with operations. The keys to achieving effective contamination control are prior planning, training and anticipating possible contingencies. Failing to analyze an adversary's capabilities or to anticipate requirements, commanders may be faced with holding off helicopters or landing craft until decontamination teams are on station. In today's uncertain threat environment, even if the use of CBRN weapons is not anticipated, having decontamination stations pre-rigged and teams on stand-by can help reduce any delay, limit the risk of the spread of contaminants, and minimize or preclude the loss of life. The conduct of recovery operations in a CBRN environment requires a paradigm shift in thinking from the traditional understanding of shipboard CBRN defense to the unique requirements and considerations of recovering contaminated personnel and equipment: many of the actions taken to prepare for, or in response to, a shipboard CBRN attack will be similar to those required in the recovery operations. The object of such operations therefore becomes a matter of maximizing planning, and optimizing the control and timing of the events in order to minimize the consequences.

WARNING

Never receive contaminated personnel or equipment without first initiating contamination control procedures.

Preventive maintenance is a must: equipment is expected to be operated at designed specifications and to have been maintained in such a manner that it will support the prescribed material condition of readiness as seemingly insignificant material deficiencies could have grave consequences in a CBRN environment and facilitate the rapid spread of contaminants. For example, an inoperable deck drain or improperly caulked stuffing tube may result in only the minor spread of flooding; whereas, the same deck drain or stuffing tube in a CBRN environment could contribute to severe ship-wide contamination. Once hazards are identified, personnel must implement measures to limit their spread. Any spread of CBRN hazards is likely to risk the contamination of personnel and operational assets, jeopardize the mission, and result in personnel being required to wear individual protective equipment (IPE) for additional periods of time.

In addition to the equipment carried by ships to conduct contamination avoidance and decontamination procedures, based upon the situation in the area of operations (AO), a Marine Expeditionary Unit (Special Operations Capable (MEU (SOC)) may be deployed with an Enhanced Nuclear, Biological and Chemical (E-NBC) Force Protection Set that can provide the MEU (SOC) commander the ability to:

1. Conduct an initial entry into a contaminated area
2. Conduct a hazard assessment
3. Perform initial detection and identification
4. Collect samples (e.g., biological warfare (BW) samples)
5. Perform a limited casualty extraction of six non-ambulatory patients
6. Conduct hazard reduction operations.

3.2 CONTAMINATION AVOIDANCE

Forces shall act to avoid contact with contaminants whenever and wherever possible and, because of the challenges associated with decontaminating a ship, make every effort to preclude bringing contaminated personnel or equipment onto naval shipping. When contamination is an issue, commanders shall evaluate mission objectives and ascertain if forces can be maneuvered to another site to conduct the operation. Where circumstances permit, alternate helicopter and craft landing zones or beaches will be chosen to divert forces to so as to continue the operation. If necessary, commanders will seek permission to continue operations by using sites in a third country. When operations or diplomatic and other considerations prevent avoiding contamination, forces will complete their assigned missions and perform, if possible and to the extent practicable, decontamination procedures ashore. In instances where forces cannot complete decontamination procedures ashore, commanders shall ensure such forces are transported to naval shipping to complete the decontamination process and complete a review of the force composition with an eye towards consolidating clean and non-contaminated personnel and equipment. As a minimum, contaminated forces should attempt a mission-oriented protective posture (MOPP) gear change out and/or do self-decontamination before retrograding to amphibious shipping. Forces shall notify the ESG/ARG of suspected or known contaminants, and procedures completed en route or ashore. The principal concern for all commanders is the safe return of personnel to the ESG/ARG, including the remains of those that have been killed. As forces return to the ship, shipboard decontamination teams shall implement procedures to determine if returning forces are contaminated and conduct, as determined, follow-on surveys to ensure decontamination procedures have been effective. The jettisoning of contaminated equipment will be consistent with applicable environmental regulations as discussed in Chapter 2.

Note

> Not all contaminants are contagious or capable of being spread simply by being on or in a person. If a person is determined to be contaminated with a substance that is not contagious (i.e., not capable of being spread), actions taken at the scene can serve to mitigate decontamination requirements and follow-on care.

3.2.1 Consolidation Considerations

The decision to bring contaminated personnel or equipment onto naval shipping will be made by the force commander(s) on a case-by-case basis; though commanding officers shall always retain the right to assert resisting hazarding their vessel. If contaminated equipment is to be returned to naval shipping, commanders will consider consolidating non-essential personnel and high value equipment onto ships that will remain clean.

Mission requirements, including follow-on operations and ship capabilities will be used to determine whether vehicles or equipment are discarded, disabled or destroyed as an ESG/ARG has limited capabilities to perform detailed decontamination for vehicles and equipment. Vehicles and equipment will normally be given the lowest priority for required actions, and should be scheduled to be received only after the majority of the personnel have been transported to the ESG/ARG. Figure 3-1 provides a brief summary of CBRN defense capabilities resident in each class of amphibious shipping. When recovering vehicles and equipment takes on a higher priority, commanders may consider sending such items to one ship and personnel to another.

Ship Class	Collective Protection System	Number of Decontamination Stations	Medical Decontamination	Well Deck Sprinklers	Confirmatory Labs
LHA 1,2,4,5	IN PROGRESS	4	IN PROGRESS	YES	YES
LHA 3	YES	4	YES	YES	YES
LHD 1-5	YES	5	YES	YES	YES
LHD 6-8	YES	5	YES	YES	YES
LSD 36-39	NO	4	NO	YES	NO
LSD 41-43	NO	4	NO	YES	NO
LSD 44-52	YES	4	NO	YES	NO
LPD 4-15	NO	4	NO	YES	NO
LPD 17-21	YES	4	NO	YES	NO
DDG-51 CLASS	YES	2	NO	N/A	NO
CG/FFG	NO	2	NO	N/A	NO

Figure 3-1. ESG/ARG CBRN Defense Capabilities

3.2.2 Preparatory Actions

Upon notification of CBRN detection ashore, commanders should anticipate the potential for the ESG/ARG to become contaminated. Knowledge of the suspected hazard greatly reduces the impact to the ship and can contribute to minimized IPE requirements. In order for the ESG/ARG to be adequately prepared to respond to contaminated forces and equipment, retrograding forces shall report all known or suspected hazard information to the CBRN Defense Cell and/or shipboard movement controlling agencies (e.g., tactical logistic center (TACLOG), landing force operations center (LFOC), Flag Plot…) at the first opportunity and throughout the re-embarkation operation. The following steps shall also be accomplished:

1. Before receiving contaminated personnel or equipment onto ESG/ARG ships, the ESG commander shall:

    a. Ensure the appropriate MOPP level per intelligence reports has been ordered set.

    b. Direct ships to initiate required actions within each ship's CBRN Bill.

    c. Designate ship(s) to receive contaminated personnel and equipment.

d. Disperse clean equipment from ship(s) to be contaminated onto ship(s) that will remain clean.

2. Before receiving contaminated personnel or equipment, ship commanding officers shall:

a. Remove all unnecessary equipment and in particular absorbent and porous fiber equipment from weatherdecks. Spot not in service aircraft upwind of landing spots to be used. In order to create clear routes from the receiving areas to decontamination stations and/or interior spaces, re-position vehicles and aircraft as necessary to minimize exposure to contamination.

Note

Protective covers can be used to protect topside equipment and deck loads that cannot be stored in the interior of the ship; e.g., use engine intake and exhaust covers, and plastic or pre-manufactured covers.

b. Initiate/continue use of point detection and other monitoring and/or detection equipment to locate possible contamination (e.g., the improved point detection system (IPDS), the shipboard automatic chemical agent detection alarm (SACADA), etc…).

c. Establish decontamination stations; if necessary, rig temporary stations.

d. Notify all hands to prepare to don appropriate IPE; Condition 1A well deck and flight deck personnel and decontamination teams shall don IPE.

e. Direct helicopters to fly at high speeds and to have doors and windows open to assist in decontaminating the aircraft through natural means.

f. Direct aircraft and landing craft to execute NAVSEA/NAVAIR recommended and approved maneuvers, tactics and procedures for minimizing the amount of contamination brought back to the ship; landing craft utility (LCUs) shall activate their countermeasure washdown system (CMWDS); aircraft shall use procedures as detailed in NAVAIR 00-80T-121 *Preliminary NATOPS Chemical and Biological Defense.* Note: this is a preliminary manual and additional changes may be forthcoming. Because fixed-wing aircraft fly at high altitudes and speeds they may not see the same levels of exposure as rotary winged aircraft but must still be handled with due caution. Similarly, concern must be exercised for spotting them on deck to avoid becoming contaminated. Prior to embarking personnel or equipment in landing craft, craftmasters should pre-wet deck surfaces and limit personnel to topside spaces and/or personnel transport modules (PTMs).

g. Direct personnel to don IPE as helicopters or landing craft with contaminated personnel near the ship. Warn personnel not to drink, except from approved IPE mask canteens, or smoke, chew tobacco products or eat until further notice. Commence internal and external monitoring of M8/M9 paper and associated sampling equipment consistent with the known or suspected hazard.

h. Direct medical representatives to identify trained personnel who are qualified to tend casualties (e.g., certified emergency medical technicians and personnel qualified in Advanced First Aid).

i. Commence operation of the ship's Collective Protection System (CPS) and set Circle WILLIAM in accordance with ship's CBRN Bill. Initiate intermittent (e.g., 15 minute intervals) use of the CMWDS. In some situations (e.g., if widespread contamination is not suspected), the CMWDS can be limited to operating in anticipated affected zones; e.g., aft flight deck spots or well deck areas. The well deck sprinkler system, with aqueous film forming foam (AFFF) isolated, can also be used to pre-wet surfaces.

CAUTION

> While pre-wetting is a recommended technique to minimize contamination, use of the salt water CMWDS will necessitate initiating emergency reclamation of aircraft procedures. If pre-wetting the flight deck is desired, a fresh water washdown should be considered in the helicopter landing area prior to receiving any contaminated helicopter.

j. Order medical personnel to prepare for the treatment of contaminated personnel and plan for additional isolation areas for treatment of contaminated personnel.

k. Direct the supply officer to remove from storage spare clothing for personnel to wear following decontamination and ready it for distribution to the decontamination stations. In addition, gather spare clothing for personnel to wear (e.g., gym clothing, coveralls, disposable coveralls, shower-shoes, etc…); consider gender specific needs when establishing requirements and collecting items.

3.2.3 Agent Detection, Monitoring, Sampling and Testing

One of the most time-critical activities associated with a CBRN attack is the actions taken to detect and monitor for contamination. Equally important is the necessity to collect samples and determine, and subsequently confirm, the identity of the contaminants. Collection of environmental and agent samples is the responsibility of the ashore special response teams and the shipboard repair party monitoring teams. As discussed in Chapter 6, biomedical sampling (i.e., specimens such as nasal swabs, skin scrapings, blood, or other fluid from humans) is the responsibility of the medical department. When responding to a situation involving BW agents, a laboratory technician or other corpsman should also be made available for queries made by the decontamination teams. Details of sample collection are complex and, in order to be done efficiently, require care and practice. Guidelines for operating a BW confirmatory laboratory are provided in Appendix F. Sampling to detect BW contamination differs from chemical or radiological hazard surveys in two important respects:

1. Current technology does not allow an on-scene capability to instantly identify all biological contaminants within a sample or at a location and confirm the absence of all other potential agents. Rather, biological surveys are primarily conducted to collect samples for subsequent analysis (e.g., presumptive, confirmatory, "definitive," etc.). On-scene hand-held assays may indicate the presence of specific types of organisms, but additional, highly sophisticated analyses are necessary to confirm the presence or absence of all potential biological agents and to support the selection of appropriate medical treatment.

2. Selection of sampling locations for biological surveys is based on the likelihood of finding viable samples for analysis. Internal (e.g., shipboard, landing craft, aircraft and vehicles) locations should include surveying of ventilation systems and potable water taps. NTRP 3-20.31.470, *Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasures (NSTM CHAPTER 470)* provides additional information for conducting biological sampling. It is important to remember that outside environmental conditions during, and following, an attack play a significant role in the decay rates of biological agents on surfaces. For example, many pathogens require moisture to stay alive, while dry aerosols tend to collect where dirt collects. Sample collection should commence as soon as possible after a BW attack before the agents begin to degrade. Operations of the DFU and IBADS should be continuous during all MOPP 2 operations. Samples, properly refrigerated and stored away from direct light, provide the most viable means for analyzing and confirming the identity of agents.

3.2.3.1 Monitoring Equipment

Appendix F, Figure F-1 provides a summary of the various types of equipment presently available to assist in detecting and monitoring for CBRN hazards. Equipment operators are cautioned that false readings can be experienced when testing in the vicinity of petroleum products.

WARNING

Personnel who are color-blind shall not analyze M256A1 sampler-detector test results; tests are based on color comparisons. An incorrect reading of test results could lead to premature removal of protective clothing and cause casualties.

WARNING

Do not perform the tests under red light at night. A red light can conceal a positive response when testing for blood or blister agents and can make the interpretation of other results difficult. If using a flashlight, the red lens should be removed.

WARNING

A number of substances or conditions can produce unreliable or false positive test results with the M256A1 sampler-detector.

3.2.3.2 Sampling Equipment and Testing Procedures

The Navy uses a variety of equipment to detect and test for contamination, Appendix F, Figure F-2 provides a listing of the detection capabilities of Navy ships. First response and survey teams should have immediate access to pre-staged sampling equipment to collect samples as part of their initial assessment capability. The quicker contaminants are collected, transported to appropriate laboratories for evaluation, and definitively identified, the quicker appropriate medical treatment of casualties can commence. Appendix H, Figure H-3 delineates flow of BW specimens for processing and analysis for afloat and ashore units. Chain of custody protocols must be established to ensure traceability of samples.

3.2.3.2.1 BW Agent Detection Levels for Environmental Samples

There are two main classes of environmental samples that can be collected for analysis. The first is collected over an extended period of time in the vicinity of a ship, pier, base or objective ashore. These samples can be collected by a variety of systems that include: interim biological agent detectors (IBADS), Biological Identification and Detection System (BIDS), Portal Shield, Dry Filter Units (DFUs), and Joint Biological Point Detection System (JBPDS). The second consists of environmental samples from a specific point source (e.g., a letter or package). BW agent detection levels are identical for all environmental samples. For biological agents, there are three defined levels of identification: presumptive, confirmatory (i.e., field confirmatory), and definitive.

a. Presumptive Identification: Individuals who conduct routine environmental surveillance or first respond to a specific BW incident carry out presumptive identification. A test for presumptive identification has the following characteristics: it is rapid (i.e., completed on the order of minutes); inexpensive, and requires limited training to perform. Although other types of technologies may be developed, all currently deployed presumptive tests are immunochemically-based. These include: IBADS; BIDS; Portal Shield; DFUs with hand-held assays (HHAs); and the JBPDS. Presumptive identification acts as a precursor to follow-on confirmatory testing and is the lowest level of testing to provide an initial assessment of the nature of the contaminant; it generally gives an early identification of biological agents. They are highly sensitive but generally have a low level of specificity and should be regarded as preliminary.

b. Confirmatory Identification: Confirmatory identification is a second, independent test carried out on a sample that has already undergone presumptive testing. A test for confirmatory identification is rapid, but will likely take longer to conduct than a presumptive identification test (i.e., hours versus minutes). Confirmatory testing must be completed within 24 hours of when the original environmental sample was collected and must rely on a technology distinct from that used for presumptive testing. Confirmatory tests commonly use the PCR to amplify genetic signatures of BW agents. They can also use microbiological culture for agents capable of being cultured such as some relatively fast-growing bacteria. Within the expeditionary and carrier strike groups, recent changes to the Allowance Equipage Lists on LHAs, LHDs and CV/CVNs have added confirmatory laboratory equipment to assist in rapidly identifying many contaminants; this capability also exists with the MSC's hospital ships (i.e., T-AHs) and Naval Environmental Preventative Medicine Units (NEPMUs). Field confirmatory tests use enzyme-linked immunosorbent assays (ELISA), polymerase chain reaction (PCR), and culture. They are highly sensitive and specific and yield results with a high level of confidence. The HHAs provide rapid presumptive identification with minimal training and real-time PCR provides a rapid and accurate confirmatory identification capability. Combining HHAs and real-time PCR with classical microbiology provides a highly accurate, state-of-the-art and cost-effective approach to detection and sample identification.

c. Definitive Identification: Definitive identification is accomplished at a select few Continental United States (CONUS)-based laboratories such as the Biological Defense Research Directorate, U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM), and the Centers for Disease Control and Prevention (CDC) by scientific experts. Scientists at this level of testing may employ all presumptive and confirmatory technologies, while also employing additional technologies and analyses that may not be available to forward-deployed units. Their analysis may occur over multiple days, with the ultimate purpose of providing the most definitive identification of a BW agent and collect forensic data. The U.S. Navy definitive laboratory is the Naval Medical Research Center's (NMRC – UIC 32398) Biological Defense Research Directorate (BDRD) in Silver Spring, MD. Scientists/technical experts at BDRD also provide real-time technical reach-back to presumptive and confirmatory platforms and can be contacted via unclassified internet (i.e., NIPRNET) at: bdrwdw@nmrc.navy.mil; or via a classified account (i.e., SIPRNET) at bdrd.ops@intecwash.navy.smil.mil.

WARNING

Chemical protective gloves and masks shall be worn while collecting environmental biological samples. Survey team members and their clothing and equipment shall be processed for decontamination upon completion of their duties.

Table 470-4-2 of NTRP 3-20.31.470, reproduced in Figure 3-2, provides a list of components for outfitting a biological sampling kit (BSK). Although some of the listed items are available through the Navy's supply system, other items such as suitable sterile shipping containers will need to be acquired from external sources.

Description	Quantity
Tube, Biological Culture Sampling, Plastic With Transport Medium (unit of issue, package of 100)	6 each
Tube, Biological Culture Sampling, Plastic (unit of issue, package of 100)	2 each
Container for Liquid Samples	3 each
Sterile Cotton Swabs	1 box
Metal Spoon	2 each
Pen with Indelible Ink	2 each
Saline Solution	
Ammunition Can or Wooden Box for Storage of BSK Items	1 each
Styrofoam (Cut to fit Storage Box)	As needed
Plastic Bags (sealable)	12 each
Tape (Anti-seizing)	1 roll
Labels, Paper, Pressure Sensitive	1 sheet
Tape, Pressure Sensitive, Adhesive	1 roll
Any 140-150 milliliter (approximately 5 fluid oz) glass container with a screw-type cover can be used to collect liquid samples. The original contents of the container shall be completely removed and it shall be soaked, along with its cover, in a strong detergent solution. The container and its cover shall be thoroughly rinsed and dried.	

Figure 3-2. Biological Sampling Kit (BSK) Component List

3.2.3.3 Specialized Sampling Procedures

Certain circumstances will require specialized sampling procedures. The following paragraphs provide guidance.

3.2.3.3.1 Sampling Procedures for Dry or Moist Areas

If dirt deposits are thick enough to scoop, use a clean spoon to collect samples and place them in a test tube or bottle. Otherwise, use a sterile cotton swab to conduct a swipe test and then place it in a test tube. A swab moistened with water (i.e., bottled water if distilled water is not available) is recommended for sampling dry particles deposited on surfaces. Use forceps to pick up suspected vectors or small solid objects. Two samples should be taken at each location: one for each type of test tube in the BSK. Thoroughly clean and disinfect sampling implements (e.g., spoons, forceps, etc.) between drawing samples.

3.2.3.3.2 Sampling Procedures for Liquids

Use the following procedures for collecting samples of potable water, condensate from air conditioner cooling coils, or any other suspect liquids:

1. Use a clean leak-proof container with a screw type cover.

2. Wash the container and its cover beforehand with detergent and thoroughly rinse them.

3. Before taking the sample, rinse the inside of the container and its cover with the liquid from which the sample is being taken.

4. Collect the sample from a tap, with an eyedropper or disposable plastic pipette, or by submersing the container in the liquid.

5. After the container is closed with the sample in it, swab the outside of the container and the cover with bleach and carefully rinse and dry them.

6. Clean and disinfect the eyedropper or replace the disposable pipette between collecting samples.

3.2.3.3.3 Sampling Requirements for Potable Water

The procedures for sampling liquids also apply to the collection of potable water samples but with the following added requirements:

1. Collect samples at the farthest taps from the disinfecting system.

2. Record on the label the residual chlorine or bromine levels at the tap and in the storage tanks.

3. Collect the samples in accordance with NAVMED P5010, *Manual of Naval Preventive Medicine*.

4. Potable water sampling containers must be sterile for culturing.

3.2.3.3.4 Labeling Sample Containers

For shipboard settings, NTRP 3-20.31.470, Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasures (NSTM CHAPTER 470), recommends sample containers be pre-labeled with indelible ink for each designated interior location; the requirements of conducting recovery operations will mandate that adjustments be made to accommodate the procedures set in place to process returning forces and/or civilians. Like specific topside shipboard locations that are not generally pre-designated for surveys, the ship's damage control assistant (DCA) and embarked unit CBRN officer will have to select appropriate areas for surveying for returning equipment and supplies. Survey teams should attempt to locate moist, shaded areas from which to obtain samples. Similar environmental considerations apply when selecting outside sampling locations on shore installations. Sample containers for external surveys should only be pre-labeled with sample numbers; the location of each sample should be recorded on the survey form during the survey. At the completion of the survey, i.e., when preparing the containers at the decontamination station for forwarding, transfer the locations recorded on the survey form to the labels of the corresponding sample containers.

3.2.4 Contaminated Areas

During recovery operations, standard shipboard procedures will be followed and coupled with landing force (LF) procedures for marking suspect vehicles, supplies and areas. It should be remembered that marking contaminated areas and equipment only serves to warn personnel of a hazard and help them avoid the contamination. Marking the contaminated area does not provide the extent of the hazard; rather, it merely indicates the presence or potential presence of a hazard that must be investigated using established survey procedures. When the presence of a biological hazard is suspected or detected, monitoring and survey teams shall mark all likely entry points into the area and report the contamination to internal and external higher authorities. Markers used by Navy and Marine Corps personnel are the North Atlantic Treaty Organization (NATO) standard triangular signs with colors and inscriptions indicating the type of hazard; any additional information will be written on the front of the marker. They are made of a rigid material with holes for hanging. They are to be placed on the suspect vehicles, equipment or supplies, as well as the surrounding bulkheads, railings, ladders, lifelines, and any other clearly visible place. The biological contamination marker shown in Figure 3-3 is a blue triangle with "BIO" printed in red block letters; chemical hazards would be shown on a yellow triangle with the word "GAS" in red while radiological/nuclear hazards would be shown on a white triangle with "ATOM" printed in red. The name of the agent, date and time of detection are printed on the side facing away from the contamination. It is important that all personnel receive training so that they can recognize these markers in order to avoid the contamination. Areas contaminated by biological agents do not have a distinctive boundary line, in the sense that all contamination is on one side of the line and none on the other. Re-aerolization is most likely in areas where the biological agent is highly concentrated, where there is low ultraviolet (UV) light, and where favorable temperature and humidity conditions ensure agent longevity. The CBRN marking kit contains a variety of markers in an enclosed container that can be dispensed as required.

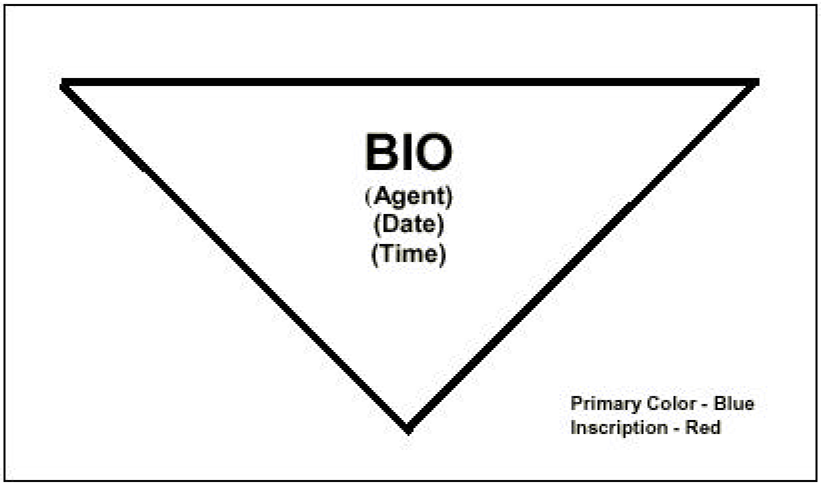


Figure 3-3. Biological Contamination Marker

3.3 CONTAINMENT PROCEDURES

3.3.1 Contamination Control Areas

Commands shall establish Contamination Control Areas (CCAs) in accordance with their CBRN Bill and the guidance contained in NTRP 3-20.31.470, *Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasures,* formerly NAVSEA NSTM Chapter 470. These locations shall be used to facilitate the removal and decontamination of masks and any other individual protective equipment or contaminated clothing by personnel in preparation for processing through a decontamination station. Figure 3-4 provides a representative layout for a single-lane CCA.

3.3.2 CCA Guidance

A minimum of two CCAs is recommended in order to serve as a primary and alternate location. The same CCA can be used to remove outer garments contaminated by chemical, biological or radiological hazards; removal of all such items in the CCA helps to prevent hazards from reaching other parts of the ship's interior. Chapter 4 provides decontamination procedures and added information regarding the inter-relationship of a decontamination station and a CCA in support of expeditionary operations. Decontamination procedures for aircrews involve unique aviation life support systems (ALSS) and survival gear; specific procedures for doffing contaminated aircrew equipment are detailed in naval air training and operating procedures standardization (NATOPS) and other Service technical manuals. The following general guidelines apply for erecting a CCA:

1. Each ship shall identify both primary and secondary CCAs.

2. CCAs can be set up at multiple locations. The actual location can be internal or external; it may be collocated with the decontamination station if the station has a weather access and sufficient room.

3. The CCA is an area between the weather deck and a decontamination station with a working area of approximately 5 feet by 8 feet, or larger if space permits. They must be of sufficient size to contain/store advanced life support systems (ALSS) and other items discarded en route to doffing areas, and have sufficient facilities to handle classified information and weapons, and conduct weapons clearing. They should also have information posted to address the unique nature of aircrew CBRN IPE.

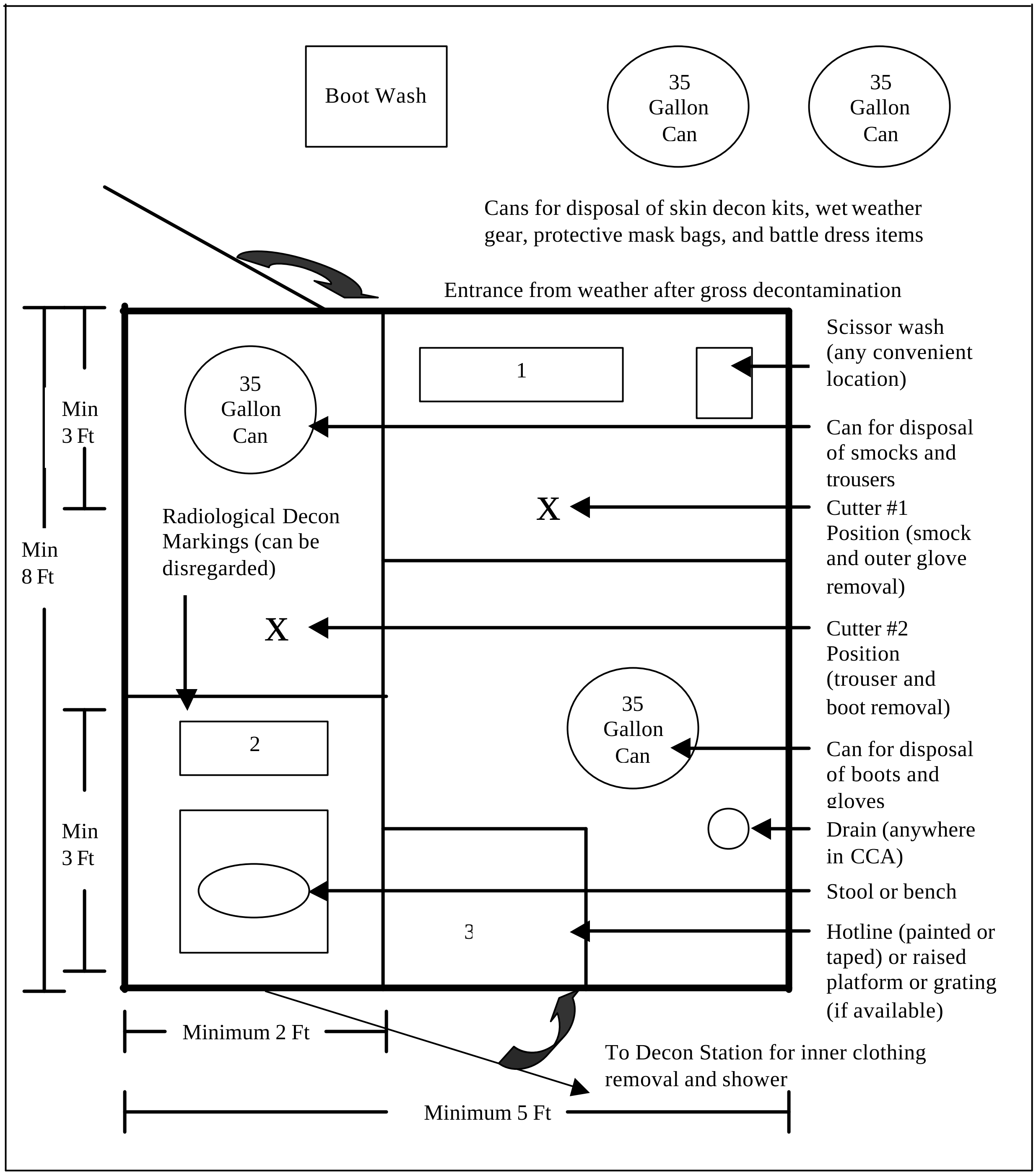


Figure 3-4. Single Lane CCA

4. Each decontamination station can have more than one CCA and it is also possible for a single CCA to serve more than one decontamination station.

5. Personnel will be led to the CCAs by guides/security personnel or follow prescribed routes communicated to them via any available means; a sample of key information to be disseminated is shown in Figure 3-5.

The primary CCA is located:

____

____

Personnel will enter through:

____

____

Personnel will dispose of contaminated clothing in waste receptacles and proceed to decontamination station:

____

____

The Secondary CCA is located:

____

____

Personnel will enter through:

____

____

Personnel will dispose of contaminated clothing in waste receptacles and proceed to decontamination station:

____

____

Figure 3-5. Sample CCA Location Data to Communicate

6. CCAs are generally configured to support decontaminating 25 personnel; provisions must be made for the decontamination and re-supply of a CCA after each group of 25 personnel is processed. When processing large numbers of retrograding personnel (i.e., forces or evacuating civilians) it will be necessary to have several CCAs established and procedures in place to rapidly decontaminate and re-supply a CCA to allow the continued flow of personnel onto the ship.

7. Routes to CCAs should be designated clearly and concisely using watertight door (WTD) numbers, passage numbers and compartment numbers.

3.3.3 Site Selection Criteria

The following factors should be considered before selecting a CCA site:

1. If not part of a ship's design, determine where it will be established: external, internal, or both. Combination internal/external CCAs are preferable.

2. External CCAs provide the best protection from aerosol/vapor hazard buildup during suit doffing and are easier to decontaminate, but are difficult to sustain for prolonged use.

3. Proximity to combat action, the degree of contamination expected, wind direction, and weather may make external CCAs unusable.

4. Equipment placement in external CCAs must be adapted to the location.

5. CCAs should be in close proximity to the decontamination station because personnel transiting between the two stations lack any effective protective clothing once they have processed through the CCA. Personnel should strip down to wearing only underwear/under garments which shall be removed immediately prior to entering or while in the shower and their mask. The mask is to be worn while in the

shower until such time that the individual has been surveyed and confirmed to be free of all hazards. At that time the mask is left behind in the shower and the individual proceeds as directed. The filter on the mask must be replaced should the mask be decontaminated and re-used.

6. Internal CCAs may be harder to decontaminate after use.

7. Internal CCAs may become cluttered as personnel are processed unless contaminated material is periodically removed.

In general, ship spaces are not be altered to accommodate decontamination requirements. External sites should provide overhead cover, shield from direct wind, and be in proximity to the decontamination station entrance. When possible, they should be on the leeward side of the ship and consideration given to the amount of exposed down wind area. Windbreaks and closing hangar doors can minimize spreading contaminants. Steering a course and activating exhaust fans to draw air out of the well deck will contribute to reducing the spread of contaminants in the well deck. Ships should attempt to keep batter boards wet. For internal sites, contaminated materials must be constantly removed to the outside of the ship to prevent off gassing or hazard buildup. The site must not be set up in a vital passageway and personnel must not be routed through messing or medical areas to reach their decontamination site.

3.3.4 CCA Set-up

CCAs can be sized to the space available and the number of lanes to be established. In areas other than the well deck or where CCAs have been designed into the construction of the ship, the deck should be covered with a containment pit manufactured from IPE-like or rubberized fabric (e.g., neoprene). The sidewalls should be approximately 12-inches high with drainage hoses (e.g., old fire hoses that can be discarded after the operation) rigged overboard, vice through the ship's drains. Stations can be modified to process non-ambulatory personnel, using roller assemblies to place stretchers on to facilitate the processing. The ship's cargo roller assemblies can be used; however, once contaminated they may be difficult to decontaminate and may require being jettisoned. Trashcans should be color coded to simplify the decontamination and disposal process. It may be necessary in certain scenarios, most notably during noncombatant evacuation operations (NEOs), to station translators in the CCA, though signs can be substituted to reduce the number of translators. "Chem-lites" can be used to mark pathways for personnel to follow during night operations. For LHAs and LHDs, CCAs should be established in both the vicinity of the flight deck and hangar bay for personnel being retrograded by helicopters as well as in the well deck area for personnel and equipment returning via landing craft. A CCA may be established aft of the superstructure to support personnel being returned as medical casualties while a second CCA may be established in the hangar bay in the vicinity of the aft elevator to support ambulatory personnel. For LHDs, caution must be exercised when using the port side decontamination stations off the gallery deck as personnel could be endangered by flight operations; and the forward starboard decontamination station off the gallery deck by potentially expanding the area contaminated as a result of moving personnel through confined areas or near aircraft. For LSDs and LPDs, CCAs should be set up in the vicinity of the flight deck and in the well deck; the exact location to be a function of whether displacement or non-displacement craft are used. Similarly, the location will be a function of whether a stern gate marriage, normal trim or steep wedge is used to receive the craft for transferring the personnel. In the case of landing craft air cushioned (LCACs), CCAs should be established some distance from the stern gate to minimize foreign object debris (FOD) and wind hazards if the craft are not brought into the well using the emergency recovery rig. CCA supervisors will continuously update command and control nodes within the ship as to the progress of the operations, and in particular, the ship's damage control assistant and combat cargo officer. A list of recommended equipment is listed in NTRP 3-20.31.470, *Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasure.*

3.3.5 CCA Manning

Each shift of the CCA should have the personnel listed in Figure 3-6 on station; or as modified to address the suspected contamination. The volume and frequency of equipment and personnel processing will determine if more personnel are needed. All will be dressed in IPE with masks. Though each recovery operation will likely be different, commanding officers should incorporate into Embarked Troop Regulations anticipated requirements for support from embarked units to assist in manning CCAs, as well as flight deck and cargo throughput nodes that will require augmentation in a CBRN environment. Coordinated training for teams will be essential to ensure operations can be conducted as required. Issues regarding the responsibility for providing IPE shall be resolved prior to deployments, with individual parent commands generally being responsible for providing sufficient quantities of required items.

Position	Function
Doctor and Corpsman	Monitor general health and treat personal injuries.
One CCA Supervisor	Monitor supply levels and control flow through CCA.
One MAA	Monitor for unauthorized or unprocessed persons at egress.
Five Assistants	Accomplish activities as directed by the CCA supervisor.
Two Survey Men	Monitor personnel exiting showers; direct to clean side or to re-shower.
One Equipment Repairman	Effect repairs as necessary.

Figure 3-6. CCA Manning

3.4 MINIMIZING THE RISK TO PERSONNEL

3.4.1 Limiting Exposure

Limiting the number of personnel and equipment used to support the decontamination effort helps to prevent the potential spread of contamination; however, the tempo, weather and duration of the operation greatly influences the number of personnel needed which could result in a larger number than desired becoming involved. Commands should anticipate the need for a minimum of three teams for each decontamination station and CCA to allow for heat stress management. Similarly, multiple relief crews will be required for the flight deck and well deck crews. Commands should also make every effort to limit the amount of area to be affected; establish control lines and mark all areas in use. Evaluating all aspects of established procedures, e.g., examining the route personnel will use to take contaminated clothing from the decontamination station(s) to the ship's laundry or what routes personnel will use to get to or from their work stations and messing and berthing areas within the ship, will lead to increased chances for controlling and/or minimizing the spread of contaminants.

Note

When practicable, use of previously contaminated equipment should be considered for transporting contaminated equipment and personnel, including casualties.

3.4.2 Maintenance Support

While CBRN contaminants pose an immediate threat to unprotected personnel, they also can pose long-term threats to maintenance and support personnel who may gradually uncover unknown pockets of lethal chemical and biological agents long after the initial attack, to include after having been brought back onboard ships. For example, limited amounts of chemical agents may be ingested into the manifolds of vehicles, seep into aircraft systems, and leak into voids and inaccessible spaces on ships, landing craft, and/or aircraft. Consequently, maintenance personnel will likely need to wear MOPP gear in the performance of their regular duties as they replace parts in aircraft and vehicles exposed to an earlier CBRN attack. These additional precautions will slow maintenance work and effect availability rates.

3.4.3 Food and Water Sanitation

Attention to published standards of safe food preparation and water purification, and protection of food and water supplies from incidental airborne contamination or sabotage, are likewise important. Standard methods of disinfection and waste disposal, effective in curbing transmission of naturally occurring microorganisms, are particularly useful in the context of biological warfare. Since biological agents may be spread by mechanical means or natural vectors, effective control of rodents and arthropods is a priority.

3.4.4 Clothing Exchange

Personnel designated to enter a known or potentially contaminated area shall create a "clean clothing exchange kit" before debarking their assigned ship or moving to work in such an area within the ship. Personnel will place in a plastic bag or gym bag a change of clothing that can be issued to them upon completing their duties or returning to the ship. These kits are gathered and secured in their assigned living quarters and held while the forces are ashore or working inside the ship; they shall be transferred to the clean side of the contamination control area for issuing if required. In the case of forces being recovered that were not part of the ship or for civilians, the ship's supply officer will coordinate the transfer of clothing from the ship's store or from a pool of clothing collected for distribution (e.g., gym gear, coveralls, and clothing). If available, disposable medical garments or similar garb can be substituted. Personnel should be advised to keep previously exposed portions of their body uncovered as long as possible since clothing will block or reduce the weathering effect. Additionally, wearing clothing on previously exposed skin can drive any residue further into the skin.

3.4.5 Personal Hygiene

Personal sanitation and general housekeeping are very important when a ship is operating in a CBRN threat area. It is the responsibility of each person to apply standard individual protective and sanitary measures as appropriate. Washing with soap and water is the most effective simple personal hygiene measure for the control of communicable diseases. A simple practice such as washing one's hands with soap and water before eating will reduce the likelihood of ingesting contamination.

3.4.6 Personal Effects

Personnel involved in CBRN operations and decontamination procedures should be cautioned against wearing or carrying sentimental items such as rings, watches and jewelry, as well as carrying large sums of money, as these items may become contaminated and will need to be confiscated with no guarantee of return; claims against the government may offer some compensation. CCA teams need to be particularly vigilant during NEOs for personnel embarking amphibious shipping who could be carrying contaminated personal effects. Evacuating personnel need to be advised that they must part with their items and that there is no guarantee they will ever be returned. Items such as money and jewelry are items that generate considerable concern.

3.4.7 Laundering

Laundering contaminated clothing should only be conducted when, following a risk assessment review, it is determined to be operationally required; e.g., forces must make an immediate return to combat and insufficient time exists to receive new clothing from rear area logistic centers or flight deck safety would be jeopardized if personnel did not have the requisite "colored shirts." While it has been proven in some instances that contaminated IPE can be laundered and rendered safe, the return on the risks associated with such an effort is considered too great to recommend completing the process onboard ships. Nonetheless, if attempted, contaminated clothing should be allowed to off-gas/weather before laundering. When transporting contaminated clothing and personal effects from the CCA to the ship's laundry, such items shall be triple-bagged, vice double-bagged as required for equipment to be disposed of, and labeled to facilitate the return of the clothing or goods to its rightful owner.

WARNING

Personnel working in the ship's laundry will require IPE and careful monitoring for heat stress.

3.4.8 Prophylactics, Antidotes, and Vaccinations

Another method of reducing the effects of pathogens is by taking prescribed prophylactics and antidotes. Personnel will follow directed vaccination programs and commands will institute programs to ensure personnel are monitored for compliance.

3.5 SHIPBOARD INSTALLED PROTECTION SYSTEMS

3.5.1 Collective Protection

A number of measures provide protection to the crew in a collective sense; e.g., pre-positioning of CBRN equipment and medical supplies at battle stations, setting the appropriate material condition of readiness, operation of the countermeasures washdown system and closing Circle WILLIAM fittings. These functions are called collective activities and their performance is managed under MOPP per the guidance in NWP 3-20-31 (Rev. A), *Surface Ship Survivability*. With respect to equipment, the term Collective Protection System (CPS) is used only in reference to a ventilation system that prevents entry of airborne CBRN contamination into a ship's interior. CPS provides required protection but may enhance transmissibility if not properly maintained or if used appropriately.

3.5.2 Collective Protection System (CPS)

A collective protection system uses high pressure fans for the same purposes as a conventional heating, ventilation and air conditioning (HVAC) system. In addition it has CBRN filters that have the capability to remove all known CBRN agents/ contaminants in any form. CPS provides two levels of protection: total protection and limited protection. In Total Protection (TP) zones, all CBRN contaminants in any physical state are filtered from the incoming air supply and a slight positive pressure is maintained to keep airborne contamination from entering by other routes. Any leakage of air at the zone boundaries is from the inside out. The air pressure inside a TP zone is maintained slightly above atmospheric pressure with high pressure fans that supply air to the zone, with devices that control the flow of exhaust air from the zone, and with air locks that prevent excessive pressure loss when someone enters or exits the zone. These zones provide a toxic free environment where it is not necessary to wear IPE or masks. TP may not be affordable in compartments with extremely high airflow requirements, such as machinery spaces. CPS provides a lower level of safety for these areas called Limited Protection (LP) zones. Chemical and biological aerosols are removed from the incoming air supply to LP zones by High Efficiency Particulate Air (HEPA) filters. The standard supply fans do not create a positive pressure and the HEPA filters do not entrap chemical agent vapor. A protective mask is required for protection from chemical agent vapor and the full IPE is needed for a percutaneous chemical vapor hazard. Figure 3-7 provides a representative view of the typical CPS and Selected Area Collective Protection System (SACPS) protection patterns for various classes of naval shipping.

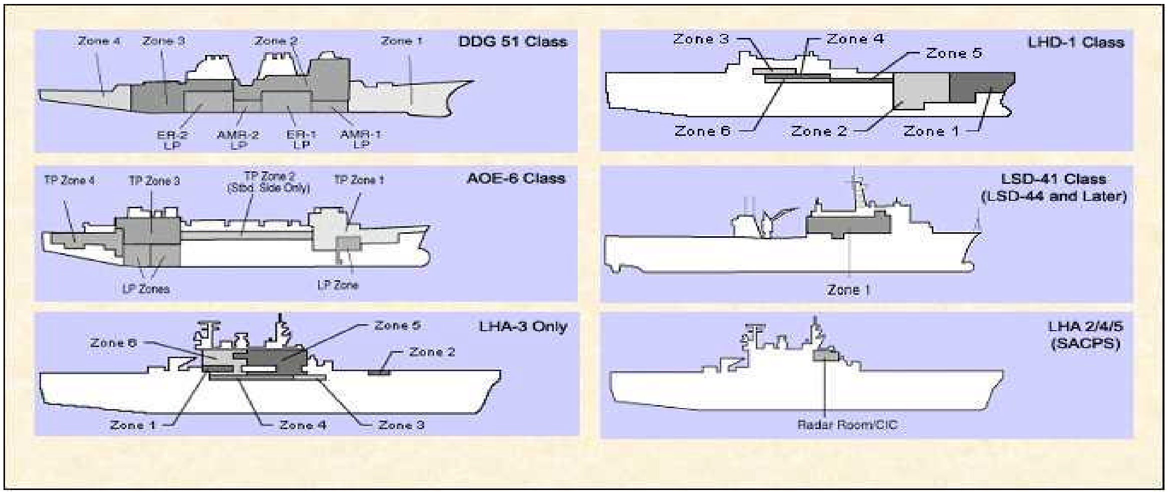


Figure 3-7. Typical CPS and SACPS Layout per Ship Class

The following points are of particular importance for personnel in ships that have installed CPS:

1. The design of the CPS varies from one ship class or flight to another. Specific information on each ship's HVAC system is provided in the Ship's Information Book, the Damage Control Book and Damage Control Plates, Numbers 10 and 11.

2. In order to maintain pressure in a TP zone, proper maintenance of closures and drainage traps is essential.

3. If zone integrity cannot be restored or if pressure cannot be maintained, the damaged zone shall be isolated by personnel wearing the appropriate level of protective clothing.

4. It is essential to control access to protected zones in a contaminated environment. NTRP 3-20.31.470 describes the different closures, including pressure locks and drain traps.

5. If the pressure in a TP zone drops below design pressure an alarm will sound alerting all personnel to don IPE until pressure is restored.

6. The make-up air supply to ship's service diesel generator enclosures and gas turbine enclosures cannot be secured. These enclosures, which are in LP zones on some ships, should be considered contaminated in a hazardous environment and a possible route of entry for aerosols.

7. When supporting recovery operations, regular/periodic surveys shall be conducted and appropriate precautions shall be practiced.

8. High pressure (HP) and low pressure (LP) air is also filtered on CPS ships with the use of CBRN filters. Each system can be used in a contaminated environment as long as maintenance has been performed and certified.

3.5.3 Selected Area Collective Protection System

Selected Area Collective Protection System (SACPS) provides TP for a selected compartment or group of adjacent compartments on ships without total CPS. When activated, it maintains selected compartments contamination-free. In the remainder of ship spaces with only conventional HVAC systems, it is only possible to shut down the HVAC system to limit the intrusion of airborne CB agents. Vapors and aerosols will likely penetrate conventionally vented ship's spaces to some degree; and must be regularly purged. In all cases, ships should attempt to create a safe haven for personnel that will offer the best protection available on the particular ship, and procedures must allow personnel to endure a sustained period of contamination.

3.5.4 Conventional Ventilation Systems and Ventilation Control

Ventilation systems, in the conventional sense, consist of fans designed to continuously replenish interior air with outside air to maintain air quality and remove excess heat. They are designed as supply, exhaust or recirculation systems. These systems have no capability to create a positive pressure environment and they have no unique CBRN filtration capacity: they will not filter out contaminants. On non-CPS ships, the setting of Circle WILLIAM fittings is critical, but due to heat stress factors the complete setting of Circle WILLIAM for any length of time is unrealistic and should not be considered if a need for an extended period is anticipated. The Navy Standard Impingement Filter, which is used in conventional recirculation systems for air conditioned spaces, prevents entry of large particles but is ineffective at stopping aerosol and vapor contaminants. The filters used on non-air conditioned spaces do not stop the entry of any airborne BW contaminants; though securing in-line dampers, duct openings, supply and exhaust fans, and shutting as many closures as possible can minimize the spread of contaminants. Some systems allow recirculation of air with replenishment air shut off which can reduce the amount of contaminated air that can enter the ship's interior. Although intrusion cannot be totally prevented, shutting as many closures and stopping as many fans as possible can minimize it.

Ships should set material condition ZEBRA before encountering a contaminated atmosphere. This action not only closes most accesses but also secures most ventilation. Then, before the ship enters a hazardous atmosphere, the remaining supply and exhaust fans (i.e., those normally classified Circle WILLIAM) will be shut off. Priority should be placed on stopping the forced movement of air into the ship because it may not be practical to close all Circle WILLIAM fittings rapidly enough. The following points are of particular importance to personnel on a ship with spaces served by conventional ventilation systems:

1. If the hazard is clearly non-percutaneous (i.e., will not enter through the skin), it is possible to operate ventilation as necessary with the crew using only eye and respiratory protection.

2. It may be necessary to operate machinery space ventilation when the ship is exposed to an airborne hazard. Heat can build up very quickly in these spaces if ventilation is secured, especially on steam powered ships. In such cases, masks are required and protective clothing may be needed if conditions exist that could produce a percutaneous vapor hazard.

3. If necessary, recirculation fans can be operated in a biological hazard environment if the associated supply fans for replenishment air are shut off. In this way, air conditioning can be provided to vital spaces served by these systems with minimal intrusion of contaminants. Eye and respiratory protection would still be required.

4. The make-up air supply to ship's service diesel generator enclosures, gas turbine enclosures, and combustion air to the boilers cannot be secured and therefore are a possible route of entry for airborne contaminants even when machinery space ventilation is secured. These enclosures should therefore be considered contaminated once the ship has begun operating in a hazardous environment. Appropriate precautions, including prominent warning signs, should remain in force until subsequent sampling can be conducted.

NTRP 3-20.31.470, *Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasure.* provides an excellent discussion of the interaction of chemical agents and shipboard ventilation systems. Among other things, it shows how to estimate the length of time needed to purge toxic chemical vapors from a compartment. This time estimate is based on the knowledge of how long it takes the ventilation system to do one complete air exchange for the compartment.

3.5.5 Uncontaminated Sanctuaries Onboard Ship

It is very difficult for personnel to remain in MOPP 4 continuously for more than 24 hours because of limits on the suit and physiological and psychological stress on the wearer. Hence, there is a need for uncontaminated shipboard safe havens to which personnel can withdraw, do personal housekeeping, and prepare to re-enter the contaminated work environment. Creation of a CB protected shipboard haven for personnel involves two components: protection against non-persistent chemical vapors and CB aerosols, and protection against persistent chemical agents. Ships with CPS and SACPS will find this easier than those ships with only conventional HVAC systems. The interior spaces of most ships offer effective protection against the intrusion of droplets of persistent chemical agents which fall on decks and areas exposed to the weather. The primary concern will be that suited personnel may pick up these agents on weather decks in the course of their work and track them into the ship's interior on the soles of their boots or on exposed surfaces of the individual's protective suit. Controlling the intrusion of contaminants will require the active participation of all personnel moving between contaminated and uncontaminated spaces to prevent the personal transport of these pathogens. Deep shelter will provide a safe haven in a radiological scenario.

WARNING

Personnel must process through a CCA before entering a collectively protected area.

3.6 INDIVIDUAL PROTECTIVE EQUIPMENT

A variety of suits are available to protect service members from exposure to CBRN agents. The Navy presently uses, in shipboard applications, the Joint Service Lightweight Integrated Suit Technology (JSLIST) which is also referred to as the Advanced Chemical Protective Garment (ACPG). As discussed in Appendix A, suits are not required for biological contaminates, though respirators and protection over open wounds is required. Similarly, for radiation hazards, MOPP gear and clothing will provide protection against alpha and beta particles as well as flash burns; but only sheltering will provide protection against gamma radiation. MOPP gear provides the best protection against chemical threats, but limitations exist. For a discussion of aviation-specific IPE refer to NAVAIR 00-80T-121 *Preliminary NATOPS Chemical and Biological Defense.*

The JSLIST is a two-piece garment designed to replace the Navy's chemical protective over-garment (CPO). Under ideal conditions, the JSLIST offers the wearer protection against the vast majority of chemical agents for 24 hours in a contaminated environment, and for 30 days of continuous wear in an uncontaminated environment. This does not mean personnel will be able to remain in their suit for 24 hours as the operator's manual points out the protective capabilities of the suit are "dangerously" degraded by exposure to urine, feces, fuel, oil, hydraulic fluids, and many common insect repellents. Dangerously degraded in this case means chemical agents will penetrate a wet suit much more rapidly than a dry suit worn for 24 hours. Hence, the wearer will have to exchange a chemically contaminated JSLIST whenever it becomes exposed to one of the liquids previously mentioned. Likewise, the suit's protective life will be shortened if exposed to water. To help eliminate contamination, the policy is a suit other than the JSLIST will be cut off of personnel at CCAs; note: the JSLIST uses VELCRO to facilitate easier donning and doffing. Up to 27 percent of personnel contaminate themselves while removing the suit. There is a tendency to attempt to speed up this process to achieve efficiency. This notion seems to be misplaced energy given the potential for harm to personnel.

The JSLIST, as with most other IPE provided for military applications, is not intended for use in industrial clean-up operations. Rather, these suits are provided for field/at-sea applications. The effectiveness of masks will vary with the workload of the individual concerned, as well as the psychological stain experienced, air temperature and humidity. Personnel must complete clothing and replacement filter exchanges as directed in order to achieve the best chances for survival.

WARNING

IPE is not effective against most toxic industrial chemicals (TICs), specialized suits are required.

3.6.1 Disposal of Protective Ensembles

Uncontaminated suits that become a non-operational unit should be used for training; transfer suits not suitable for training to the Defense Reutilization Marketing Office for demilitarization. Guidance for disposal of uncontaminated suits, gloves, boots and masks is generally provided in annual messages to operational units.

Individual protective equipment contaminated with infectious biological agents must be treated as infectious substances (i.e., medical waste) and treated in accordance with the guidance in OPNAV P-45-113-3-99, *Afloat Medical Waste Management Guide*, prepared by Chief of Naval Operations Environmental Protection, Safety and Occupational Health Division, of 1 June 1999. Suits that have only been in a chemically contaminated environment may be treated as hazardous waste. Guidelines for decontaminating masks, boots, and gloves is provided in Chapter 4 as well as in NTRP 3-20.31.470, *Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasures (NSTM CHAPTER 470).* Items too heavily contaminated must be bagged for disposal as discussed below.

3.6.1.1 Guidance for Forces Operating Ashore or in Port

For shore-based units and ships in port, double-bag contaminated suits for turn-in to shore based disaster preparedness/hazardous material (HAZMAT) teams for disposal. Bags must be a minimum of three millimeters (mil) thick. Stock numbers for bags and drums is available in OPNAVINST 5090.1B (Rev A) with change 2 as of 09 September 1999. Any container containing medical bio-hazards should be red in color and must be marked with the universal bio-hazard label. For ships or expeditionary forces in a non-Navy or foreign port, airfield or facility, solicit guidance from U.S. and/or host nation authorities regarding handling of hazardous waste.

3.6.1.2 Guidance for Ships at Sea

For ships at sea, as discussed in Chapter 2 and per the guidance of OPNAVINST 5090.1B (Rev A) with change 2 as of 09 September 1999 and OPNAVINST 5100.19 Vol. II Chg 1 of 30 August 2001, personnel are prohibited from dumping hazardous waste overboard, except under emergency conditions or if failure to discharge the material would endanger the health and safety of shipboard personnel. Therefore, if at all possible, contaminated IPE should be double-bagged in minimum 3-mil thick bags and stored in the weather for later transfer to a shore facility HAZMAT team. Prior to bagging, IPE may be treated with a decontaminating solution of nine-percent calcium hypochlorite if the operational situation permits, see Chapter 4 for details for mixing solutions. Other decontaminants such as chlorine bleach and super-tropical bleach are also acceptable. The location selected for stowage must be away from ventilation intakes and in an area with little or no personnel traffic. If external stowage is not possible, containers must be kept in cool, dry, well-ventilated and unoccupied spaces well separated from all sources of ignition, acids and acid vapors, caustics, and oxidizers to minimize additional chemical reactions and off-gassing.

Segregated stowage areas are to be marked off following the guidance of OPNAVINST 5100.19 Vol. II Chg 1 of 30 August 2001. OPNAVINST 5090.1B (Rev A) provides guidance for segregation, handling and labeling

HAZMAT. Clear labeling of bagged IPE will minimize the chance that the bags will be re-opened later, and reduce the potential for spreading contamination. Labels should include the following:

1. Type of items in the bag (e.g., JSLIST, mask, etc…)

2. Type of agent contamination (e.g., GD nerve agent), if known

3. Time and date of exposure, if known

4. Time and date bagged

5. Any treatment performed (e.g. decontamination with calcium hypochlorite).

Records of bagged and disposed-of, or off-loaded, equipment are to be maintained for future reference as possible interest to the Secretary of Defense or other national agency.

Note

If emergency conditions exist, the CESG, CATF, CLF or commanding officer/master of the ship may authorize overboard discharge beyond 50 nautical miles from shore. Contaminated items must be properly packaged and weighted for negative buoyancy. The ship shall also ensure that a Deck Log entry is made indicating the reason for disposal, the amount of waste, the ship's position, and time of disposal. The ship's commanding officer or master must specifically approve all disposal of infectious medical waste at sea.

CHAPTER 4

Decontamination Procedures

4.1 INTRODUCTION

This chapter addresses decontamination procedures required to support retrograding forces, to include their equipment, Department of Defense (DoD) essential civilians and contractors, and/or civilians under the protection of an expeditionary force. It does not discuss decontamination procedures associated with a shipboard or ground attack, though many of the precepts remain the same. Paramount to discussions of recovery operations in a chemical, biological, radiological and nuclear (CBRN) environment is an understanding that these operations will place extreme demands on a ship's fresh water system to support the effort. Accordingly, commanders at all levels shall institute procedures to conserve water as well as order excess water to be produced in advance of known or suspected CBRN operations. In completing the requirements for decontaminating personnel and equipment, commanders are not authorized to alter a ship's basic design to re-configure a space or create accesses; conversely, they may modify the use of a space, e.g., establish an isolation ward.

Decontamination consists of the removal, destruction, or neutralization of contamination**.** Its effectiveness is largely dependent upon the degree of contamination, the difficulty of deactivating the agent, the protection provided to the carrier agent, and actions taken by personnel to minimize exposure (e.g., avoidance and donning individual protective equipment (IPE)). However, even after thorough decontamination, commanders must remain cognizant of the possibility that some personnel or equipment may remain contaminated as detection devices test only to the state-of-the-art for equipment sensitivity. Hence, the possibility exists that minute quantities can go undetected. Accordingly, all forces or equipment exposed to contamination shall be regarded as containing some level of residual contamination that is defined as: post attack or incident contamination not currently detectable by standard field detectors and contamination remaining on equipment after thorough decontamination. Commanders will periodically monitor personnel for physiological signs during and following any possible agent exposure. Anyone exhibiting signs of agent exposure shall receive immediate and appropriate medical attention. Documentation shall be maintained on all personnel known to have or suspected to have been exposed to contamination per the requirements set forth in the Chairman of the Joint Chiefs of Staff Memorandum MCM 0006-02; similarly, records shall be maintained on all decontaminated equipment and marked using standard NATO nuclear, biological and chemical (NBC) symbology. Equipment being transported to the United States or an intermediate location shall be accompanied by annotated maintenance records and have appropriate warning signs affixed.

As noted in FM 3-11.34/ MCWP 3.37.5/ NTTP 3-11.23/ AFTTP (I) 3-2.33 *Multi-Service Procedures for Nuclear, Biological, and Chemical (NBC) Defense of Theater Fixed Sites, Ports, and Airfields* and elsewhere throughout this document, procedures to mitigate biological and radiological residual hazards are primarily functions of removal and "death" of the agent as defined by nuclear and biological decay rates, except for spores. For residual radiation, if the particles cannot be removed, the time required for natural decay is a function of the isotope's half-life that cannot be hurried. In these situations, distance, limiting exposure time, and shielding between personnel and the contaminated equipment become the only means of reducing exposure risks. Advances in chemical and biological agent research and development are adding complications for the shipboard and battlefield decontamination response. While most biological agents generally "die" within hours after dissemination and exposure to ultraviolet (UV) light (e.g., sunlight), many of the emerging biological warfare (BW) agents will require new decontamination techniques. Standard bleach, either at full strength or diluted to 0.5-percent concentration, is still not an acceptable decontaminant for personnel; and soap and water, while stated as the standard decontaminant by the Centers for Disease Control, might likewise not be enough. As a result, bactericidal soaps and detergents are being developed to meet this challenge; similarly, new techniques and reagents are being developed to address the evolving chemical warfare threats. As an interim guide and in general, for the more robust BW agents, thorough decontamination and preparation of equipment to US Department of Agriculture (USDA) import standards will suffice and eliminate most health hazards; even so, continuing precautions are warranted. Consult intelligence sources for information regarding emerging and existing toxins, and associated vulnerabilities.

4.2 BACKGROUND

The principles of decontamination are:

1. Decontaminate as soon as possible. The most important principle that is considered before any other is to decontaminate as soon as possible. Contamination hazards can force personnel into higher levels of mission oriented protective posture (MOPP) and immediately begin to degrade operational ability. The sooner contamination is removed, the sooner a unit can reduce MOPP levels and begin restoring effectiveness.

2. Decontaminate only what is necessary to continue the mission.

3. Decontaminate as far forward as possible (i.e., off the ship if possible). Safety and security are important considerations for contaminated units. To avoid introducing contamination into other operational areas, commanders should attempt to establish a permissive environment to permit decontamination. Within the permissive environment, units should establish decontamination sites ashore.

4. Decontaminate by priority. Clean important items of equipment first and less important last. This maximizes the benefit of decontamination assets and quickly restores their operational use.

The four types of decontamination are immediate, operational, thorough, and clearance, which are defined as follows. Some references only cite three types (i.e., immediate, operational and thorough) while others may refer to force reconstitution which eliminates contamination to restore mission critical resources in order to permit unrestricted use. It is accomplished on equipment, material, and work areas after hostile actions have terminated or as directed by higher authority. Reconstitution is beyond a ship's normal capabilities and requires outside assistance (e.g., a shipyard). Similarly, there may also be Service-specific variations for their titles.

1. Immediate – Minimizes casualties, saves lives, and limits the spread of contamination. Immediate decontamination is applied individually to skin, personal clothing and equipment.

2. Operational – Minimizes contact or transfer hazards and sustains operations. Individuals, crews, teams, or units perform operational decontamination on specific parts of essential equipment, material, or work areas, and only when operations require such action.

3. Thorough – Reduces contamination to the lowest possible detectable level. This is accomplished by units, with or without external support for personnel, equipment, and material or work areas when operations, manning, and resources permit.

4. Clearance Decontamination – Decontaminates equipment and/or personnel to a standard sufficient to allow unrestricted transportation, maintenance, employment and disposal.

4.3 DECONTAMINATION CONSIDERATIONS

4.3.1 Decontamination Factors

The same systems, material and procedures used in decontamination of chemical agents are also effective against most biological contaminants and addressing radiation concerns. As already noted, it is possible that a biological attack may not be recognized as such and the agent will be gone from the environment before its presence is known. In such cases, there may be no occasion to use active decontamination measures; still, heat, drying, starvation and exposure to sunlight will kill these pathogens. Technically, decontamination is most effective when it is performed within a short period of time after the contamination occurs. For example, when helicopters or landing craft return to a ship from a chemical warfare (CW) environment and a risk of contamination exists, taking action to eliminate the agent before it has a chance to penetrate into the craft's paint or the deck's non-skid will reduce future decontamination requirements. As the mission continues and the ship is waiting for additional craft to return, it will be beneficial to regularly perform operational decontamination. Performing a thorough decontamination is not recommended if the mission is expected to continue over an extended period of time as it will consume valuable supplies of decontamination agents and the effort will likely have to be repeated. If on the other hand the intention is to allow personnel to work on deck in a reduced MOPP-level to perform mission essential tasks, commanders will need to direct that a thorough decontamination be conducted. Some factors to consider in deciding when to conduct shipboard decontamination include:

1. The level of decontamination required. For example, was the landing forces in a contaminated environment, did the landing forces perform decontamination procedures ashore?

2. The lethality of agents when planning decontamination. Some highly toxic agents can kill or incapacitate if they contact exposed skin for only a few minutes.

3. The types of equipment that must be decontaminated. The ship may not have the capability to decontaminate certain equipment; particularly, sensitive equipment. Figure 4-1 provides a partial listing of selected items that have been assessed by the United States Marine Corps for their ability to be decontaminated. This list is not all-inclusive and the effectiveness and utility will be situational dependent.

Decontaminable	Non-Decontaminable
Weapons	Cameras
Radios (sensitive)	Explosives (situational)
Canteens	Clothing (situational)
Web Belts	Shoe Laces
Boots	Computers
NVG (sensitive)	Personal Effects (e.g., pictures, money, etc…)
Binoculars (sensitive)	
Eye Glasses	
Helmets	
Backpacks	
Vests (body armor)	
Sleeping Gear (bags, ground cloth)	

Figure 4-1. Equipment Decontamination List

4. The degradations that are being experienced through increased levels of MOPP. Use of tools and weapons become awkward while wearing IPE. The protective mask reduces fields of view and increases the difficulty associated with using optical sights and night vision devices. Extended operations can physically tire and mentally discourage personnel as they cannot eat while wearing a protective mask, and urinating and defecating are potentially hazardous tasks. Likewise, resting and sleeping are difficult. The trapping of body heat becomes a major consideration; medical representatives and supervisors must consult appropriate safe stay time charts (i.e., physiological exposure limit (PHEL) charts).

4.3.2 Decontamination Standards and Requirements

It must be understood that currently established standards reflect a level that represents the lowest detectable level with presently available equipment. Accordingly, decontamination procedures may eliminate all contaminants, but likewise may only remove such contaminants to the lowest detectable level and thus some residual contamination may remain.

4.3.2.1 Joint Standards

The Chairman of the Joint Chiefs of Staff has issued guidance for acceptable standards of decontamination for chemical contamination. This information is stated in memorandum MCM-0026-02, dated 29 April 2002 and reflected in Appendix D. Standards for biological and radiological contamination have not been so defined; however, the U.S. Army, the executive agent for DoD CBRN issues, has identified a set of decontamination standards. When standards are determined for biological agents an amendment to this document will be issued.

4.3.2.2 Navy Standards

The decontamination of personnel in any situation will remain the highest priority. A specific Navy standard has not yet been established, and remains under review. Pending further review, commanders will use the standards stated herein. When standards are determined for biological agents an amendment to this document will be issued.

4.3.2.3 Army Standards

The U.S. Army operates using a principle of "Negligible Risk." Decontamination procedures must be considered if the levels of contamination exceed negligible risk as follows:

1. Chemical and Biological Standard. Negligible risk levels for biological and chemical contamination are those that will cause mild incapacitation among no more than 5-percent of unprotected personnel who operate for 12 continuous hours within one meter of contaminated surfaces. Measurements that determine safe levels are made with detection equipment held one inch away from the surface. For example, a one bar reading displayed on the chemical agent monitor (CAM) indicates a hazard level that is at or has been reduced to an acceptable level and should be considered as a negligible risk level; though the acceptable standard is no bars. In a biological scenario, following U.S. Army Regulation (AR) 70-75 *NBC Survivability of Army Personnel and Materiel,* the contamination density must be reduced to no more that 500 spores/m^2 remaining. Note: CAMs have been shown to not operate properly onboard ships.

2. Nuclear/Radiological. Negligible risk levels for radiological contamination are measurements of 0.33 centigray (cGy) or less. This level of radiation will cause no more than 2.5-percent of unprotected personnel to experience mild incapacitation.

4.3.3 Managing Heat Stress Limits of Decontamination Personnel

Personnel may easily become heat stress casualties when wearing individual protective suits in moderate to warm temperatures; and the need for decontamination workers to don foul weather gear over their IPE to keep them dry will only exacerbate the situation. Accordingly, supervisors and personnel will actively manage work activity to keep heat stress within tolerable limits. Commanders and medical department personnel shall monitor and define all requirements, as it will be necessary to adopt strict work/rest schedules. A particular concern will be for personnel working on deck in warm to high temperatures. Commands should establish re-hydration plans and allow for adequate numbers of canteens to be available for decontamination team members as well as for those personnel returning to the ship.

Individual protective suits greatly reduce one's ability to cool off. In the shipboard environment it may be possible to help personnel recover more rapidly by bringing them into an air-conditioned space; however, the space can become contaminated and individuals will not be able to reduce their MOPP level as chemical vapors emitted by the suits of contaminated workers in interior spaces can enter a ship's ventilation system. This option would only be practicable when the entire ship or craft is operating in MOPP gear; e.g., for the deck force of a landing craft utility (LCU) transiting from a contaminated beach. In such cases, the interior of the craft would already be contaminated with vapors ingested by the heating, ventilation and air conditioning (HVAC) system and everyone would be required to be in elevated MOPP levels.

4.4 DECONTAMINATION PROCEDURES

4.4.1 General

Decontamination procedures are generally personnel and labor intensive operations. They are largely dependent upon the use of chemical solutions to rid surfaces of contaminants and time to complete weathering and/or decay in order to achieve a state of cleanliness that enables personnel to perform their assigned duties without the added burden of wearing individual protective equipment. The amount of space available to complete the procedures will generally be a function of the class of ship. Commanders of cruisers, destroyers, frigates and smaller-sized classes of ships should anticipate using their flight deck or fantail areas to support decontamination procedures completed in support of recovery operations in a CBRN environment.

A solution of calcium hypochlorite and detergent or other soap is used in scrubbing and swabbing. Normally, a nine-percent solution in seawater is used, but a three or five-percent solution can be mixed if calcium hypochlorite is in short supply. Directions for mixing solutions of various strengths are provided in Table 470-7-2 of NTRP 3-20.31.470, formerly NAVSEA Technical Manual Chapter 470. If calcium hypochlorite is unavailable, laundry bleach can be used as a substitute. The pattern of swabbing is top to bottom, forward to aft. The minimum amount of decontamination solution that will adequately cleanse the area should be used. Brisk rubbing and scrubbing should be used to mix the agent thoroughly with the oxidizer so chemical neutralization can proceed more quickly. After an area is scrubbed and swabbed with calcium hypochlorite solution or a detergent solution, the area shall be rinsed with seawater or fresh water, all the while continuing to scrub and swab as necessary to remove any residue.

CAUTION

> Attention must be given when mixing the solution. The tendency is to make a ten-percent solution. Above nine-percent the solution becomes caustic and it can degrade or destroy equipment and materials.

If calcium hypochlorite is unavailable and detergent must be used alone, scrubbing and swabbing will only result in physical removal of the agent, not detoxification. The detergent assists in bringing the agent into solution. The resulting solution contains toxic agents and shall be washed overboard by fire hosing. In areas where fire hosing is not possible, rinse the area with buckets of clean fresh or seawater, and scrub and swab as necessary to remove the toxic solutions.

WARNING

> Decontaminating Solution Number 2 (DS2), an oxidizer used by the other armed Services for decontamination, shall not be substituted for calcium hypochlorite in shipboard decontamination. Its use is prohibited aboard ship and it shall not be brought and stored onboard a ship.

Harsh detergents and oxidizers cannot be used to decontaminate electronic systems and aircraft without risking damage to the equipment. Instead, only the materials normally used in maintenance and corrosion control on such systems and aircraft shall be used: materials authorized in appropriate maintenance publications. Care shall be exercised to avoid contact with the runoff or other residue as the toxic properties of the agent are not changed by physical removal methods: the residue or runoff is still toxic.

4.4.2 Decontamination Coordination

Forces retrograding to a ship or who are directing the movement of contaminated personnel and equipment to a ship shall attempt to reduce the extent of contamination to the lowest possible amount, consistent with the threat and nature of the operation, before embarking in the ship. They shall also make every effort to inform and update the receiving platform of the nature of any known or suspected contamination and the degree of decontamination procedures accomplished. Commands should establish memorandums of understanding (MOUs) that include the previously stated requirements as well as discuss decontamination team composition and responsibilities. Note: the guidance contained herein constitutes notification to embarked units of their mutual responsibility to support shipboard CBRN recovery operations. Operational priorities may preclude clearly identifying names and/or numbers of personnel to be assigned to such details; though every effort will be made to obtain such information. When possible, embarked commands will provide designated personnel to participate in training evolutions with the ship. Embarked commands will likewise, prior to dispatching forces ashore for known or suspected CBRN operations, report their ability to provide decontamination supplies to be used in conjunction with the recovery effort.

Ships' commanding officers support and assist in the decontamination of ground forces by ensuring suitable locations, equipment and properly trained decontamination teams are on station. Furthermore, they are ultimately responsible for ensuring recovered personnel have completed required decontamination procedures before allowing them access to interior spaces. They have the authority to decide what equipment shall be jettisoned, however they will coordinate with the commander of troops (COT) to determine the final disposition of recovered landing force (LF) vehicles, supplies and equipment. It is virtually impossible to detail every scenario, including those that provide multiple challenges to ship decontamination teams, and provide a predefined set of solutions. In addressing decontamination priorities, commanders will be guided by the principle that the highest priority shall be the safety of assigned and embarked personnel. In responding to complex scenarios, commanders will attempt to establish a cadre of "clean" personnel who will serve as the nucleus for expanding the effort. Once a team of people exists the effort should then turn to creating a "clean" area within the ship, gradually increasing the number of personnel that will support the effort and expanding the area to meet the size of the decontaminated population.

If the ship is basically clear of contaminants and only the flight deck or well deck are contaminated, and operations must continue, commanders will work forward to aft in clearing the hazard and establish a pool of decontaminated craft to assume transport duties for unaffected personnel and equipment. In some instances, it may be advisable to transfer unaffected or decontaminated craft to a clean ship to maintain the ability to move both unaffected and contaminated personnel and equipment. In order to minimize the need to repeat decontamination procedures, as long as a need exists to move contaminated personnel, then contaminated or previously contaminated craft will be used to move these individuals and their equipment.

4.4.3 Contamination Control Area

Critical to the effectiveness of any decontamination effort is the establishment of contamination control areas (CCAs). As discussed in Chapter 3, the CCA serves as the focal and initial entry point for any effort to bring personnel into the interior of the ship. In well decks, the CCA should be set up as far aft as possible; to include on the stern gate if sea states permit and the effort is to support solely personnel returning in combat rubber raiding craft (CRRCs) or like craft. Similarly, CCAs that are established in hangar bays should be positioned as near to an elevator as possible. Containment pits should be set out to capture contaminated water which will help reduce decontamination efforts that will be required for the deck. The collected water is drained through fire hoses rigged to discharge overboard.

Note

> Since the hoses will become contaminated and require disposal, ships should maintain a pool of old fire hoses that can be expended under such circumstances.

4.4.3.1 Decontamination Showers

Aside from the obvious advantage showers afford for removing contaminants from personnel, showers provide two added benefits: they give cooling to individuals suffering from the effects of heat stress and they offer a psychological boost from the feeling of removing the contamination. When finished showering personnel should be advised to keep previously exposed portions of their body uncovered as long as possible since clothing will block or reduce the weathering effect. Additionally, wearing clothing on previously exposed skin can drive any residue further into the skin. Ships have the five basic options described in the following paragraphs for providing showers for personnel.

4.4.3.1.1 Established Decontamination Showers

Showers offer the best facility to complete personal decontamination. Ship's decontamination teams can monitor personnel through view-ports and contaminated personnel can be guided in completing the required procedures. However, their location within the ship is not always conducive to providing returning forces an area close to their entry point onto the ship and/or CCA which in turn can lead to increased chances for spreading contaminants or offer challenges for providing safety and privacy. Likewise, there generally are insufficient numbers of installed decontamination stations to handle, in a timely manner, the large volume of personnel expected to recovery to a ship as either part of a tactical withdrawal, maneuvering force or when supporting a non-combatant evacuation operation.

4.4.3.1.2 Locally Manufactured Showers

Locally manufactured showers offer the flexibility to meet the design variations within classes of ships and assist in overcoming shortfalls in decontamination station locations and quantities, as well as complement locally developed plans to process individuals with varying needs. However, these showers are largely dependent upon the skills of ship's force personnel to design and erect as presently there is no prescribed design. Similarly, they are dependent upon an undefined quantity of stock material that may or may not be available on the ship to complete such a structure (e.g., spare shower heads, various sized piping and fittings, flexible hose, and fabric to cover the structure to create some semblance of privacy and control the contaminated water residue/spray). Accordingly, locally manufactured showers should be planned in advance. Efforts should be made prior to deploying or entering a CBRN contaminated area to procure needed supplies so that multiple units can be manufactured and contingency operations properly supported.

4.4.3.1.3 Portable Shower Tents

Portable shower tents offer flexibility for decontaminating a large-sized force or group of civilians. Easy to erect (i.e., 15 minutes or less), these portable and self-contained units include all the piping and wastewater containment capability required to complement a CCA. Ships would need to rig a source of fresh or salt water and a drainage hose over the side; and consider if the water should be heated and how to heat it if no access to hot fresh water exists. These systems can be made available through requesting an increase in the ship's allowance equipage lists (AELs).

4.4.3.1.4 Field Showers from Embarked Units

Field showers, designed and utilized by forces ashore offer yet another option to meet the challenge of decontaminating a large number of personnel. However, though clearly designed to support such operations, they may not be available to ship decontamination teams. This equipment would most likely be sent to the field in support of the landing force or naval support elements and would be an essential part of their effort to complete their decontamination prior to retrograding to the ship. Ship's use of such equipment would require a MOU to be established in advance of such operations.

4.4.3.1.5 Fire Hoses

Rigging fire hoses to create a makeshift shower could serve as a minimal resource for providing a shower to retrograding personnel. Like the field and portable showers, some consideration would have to be made for heating the water. Likewise, personnel manning such stations could be jeopardized by experiencing hypothermia or increased incidences of dehydration and heat stress from wearing wet weather gear to protect their CBRN suits.

4.4.3.2 Wash and Gear Removal Stations

As discussed in Chapter 3, ships may rig any number of CCAs to enable personnel to ready themselves for being certified safe for entering the interior of the ship. Stations will range from areas where individuals can initially attempt to decontaminate their personal gear and small arms, or serve as collection point for these items, to ultimately providing sites where they can doff their IPE before proceeding to the shower. If a ship establishes a CCA in either the well deck or hangar bay and does not have either a portable decontamination shower or locally manufactured shower in close proximity, a process shall be adopted for moving personnel from the CCA to the shower wherein the personnel are afforded some measure of privacy; e.g., ships can rig screening curtains along the route or provide individuals with disposable garments. The principal decontamination solution for personal gear/equipment will be calcium hypochlorite. Calcium hypochlorite solutions, and the synonymous HTH (i.e., high-test hypochlorite) solution, are prepared in accordance with NTRP 3-20.31.470 as follows by personnel wearing facial shielding, aprons, rubber gloves and CBR protective gear:

1. Shuffle pit (i.e., Boot wash). Fill a 2-foot by 2-foot by 10-inch tray with approximately four inches of sea water, about ten gallons. Add twenty-two six-ounce bottles of calcium hypochlorite to produce a 9-percent solution, and stir. Add nine ounces of detergent and stir again. Tray location: outside of the CCA entrance, directly in front of the door for interior CCAs, or just outside the containment pit for well deck and hangar bay CCAs.

Note

Bottles of calcium hypochlorite cited throughout for making solutions of various strengths are presumed to be pre-packaged and contain 100-percent calcium hypochlorite.

Note

Some calcium hypochlorite will settle to the bottom, especially in the 9-percent solution. These solutions remain effective for processing approximately 100 personnel, or for about six hours of continuous personnel processing. If fewer personnel are processed, the solution remains effective longer.

CAUTION

Improperly prepared solution will place the purpose for decontamination at risk: solutions that are prepared too strong will produce caustic effects while solutions that are too weak may not adequately reduce the contamination threat.

2. Mask lens wash. Fill a five-gallon pail with approximately two gallons of fresh water. Add approximately three ounces (i.e., half of a six-ounce bottle) of calcium hypochlorite, to make a 1-percent solution, and stir. Provide three sponges for personnel to use. Container location: at CCA entrance.

CAUTION

Do not use salt water for mask lens wash as it may scratch the mask lens.

2. Scissors wash. Fill a five-gallon pail with 2 1/2 gallons of seawater. Add five 6-ounce bottles of calcium hypochlorite to make a 9-percent solution, and stir. Add two ounces of detergent. Transfer a portion of this to a shallow pan that is provided for ease in storing, rinsing and recovering scissors. Pan location: inside CCA.

3. Cleaning station. Fill a five-gallon pail with four gallons of water. Add nine six-ounce bottles of calcium hypochlorite to make a 9-percent solution, and stir. If calcium hypochlorite is in short supply, add only five six-ounce bottles of calcium hypochlorite to make a 5-percent solution. Add four ounces of detergent. Pail location: inside CCA.

4. Foot wash station. Fill a 2-foot by 2-foot by 10-inch tray with approximately four inches of seawater, approximately ten gallons. Create a 9-percent solution, stir; add nine ounces of detergent and stir again. Tray location: inside CCA, directly before shower area. Note: in some interior CCAs this station may not be used.

5. Trash Cans. Trash cans as necessary with double-bag liners to be used for depositing contaminated clothing and gear that will be jettisoned. Items that may eventually be returned to individuals will have property tags coupled with the items and be triple-bagged. Location: outside CCA for gear to be confiscated and/or processed separately or inside at various locations as required.

6. Chairs. As required to permit personnel doffing IPE to sit down. Location: inside CCA.

4.4.4 Shipboard Decontamination of Personnel

The decontamination of retrograding personnel shall follow established procedures for decontaminating shipboard personnel. Personnel shall be routed to a CCA where initial decontamination procedures are conducted. Upon completion of the tasks directed at the CCA, personnel shall be routed to a decontamination shower facility. Contaminated personnel should be given step-by-step procedures, read aloud to them where possible, by members of the ship's decontamination station teams.

For situations in which escort ships within an expeditionary strike group (ESG) or carrier strike group (CSG) (e.g., DDG or CG) are tasked to support receiving contaminated personnel, e.g., force reconnaissance (Force RECON) or SEALS, ships shall follow established procedures consistent with decontaminating "scrubber" or survey teams. However, in order to support their embarkation it is necessary to establish a CCA in the vicinity of the fantail for personnel retrograding by small craft and/or a CCA in the vicinity of the flight deck if the movement is by helicopter. Personnel will not retrograde to a submarine (SSN) or ballistic missile nuclear submarine (SSBN).

4.4.5 Decontamination of Other Forces/ Special Decontamination Personnel

Some modifications to the shipboard personnel decontamination process may be necessary to accommodate the differences between shipboard protective clothing and equipment and the corresponding items used by other organizations. Shipboard decontamination station personnel need to be aware of the differences. NWP-3.11.27/MCWP 3-37.2/FM 3-4, *NBC Protection*, describes Army protective clothing and equipment that may also be worn by Marine Corps, and Navy Beachmasters and construction personnel. The following items differ from the shipboard counterparts as indicated:

1. The battledress overgarment (BDO) is a two-piece ensemble with slide fastener closures used by ground forces. It cannot be decontaminated. The newer Saratoga suit is similar.

2. The Army M-40 series masks are worn by ground forces with a hood that extends downward over the shoulders. The hood is not part of the overgarment.

3. Green or black vinyl overshoes (GVO/BVO) are used with the BDO. They are worn over combat boots for chemical protection and can be decontaminated and recovered.

4. The Army has a Contamination Avoidance and Liquid Protection Suit (SCALP) that may be worn over the BDO for up to one hour for protection from gross liquid decontamination. The SCALP is a lightweight, disposable suit consisting of a jacket, trousers and footwear covers.

5. Army aircrew members may wear the aircrew uniform integrated battlefield (AUIB), a two-piece uniform with hook-and-pile closures. In addition to providing CBRN protection, it also provides flame protection, so it replaces both the standard flight suit and the BDO.

6. The chemical protective gloves used by these personnel are similar to the shipboard item.

The features that differentiate the protective equipment and ALSS used by Navy and Marine Corps air crews are specifically detailed in NAVAIR 00-80T-121 and include the following:

1. The A/P22-14 (V)1-4 and A/P23-14(V) series protective masks are designed to be compatible with the standard aircrew helmet.

2. Blown, filtered air is provided to the mask by a battery powered tactical ventilator on a shoulder strap. The ventilator contains a filter and fan.
3. The MK-1 chemical protective under coverall is a one-piece, impregnated garment with a charcoal layer; it is worn under the flight suit and cannot be decontaminated. It is presently being phased out; the CMU-34/P Chemical Protective Undershirt and the CMU-35/P Chemical Protective Drawers are replacing it.

4. A disposable plastic cape can be worn over the flight suit for protection from liquid agent.

5. Chemical protective socks are worn under the standard aircrew flight boot; disposable plastic over-boots may be worn over them.

WARNING

Hasty decontamination procedures for contaminated ground force personnel are not adequate to allow them entry into the ship. Personnel must complete standard approved decontamination procedures before being permitted to enter interior spaces.

4.5 FLIGHT DECK OPERATIONS

In general, aviation operations in a contaminated environment create challenges for a ship's aviation department. In consonance with their respective commanders and commanding officers, the aviation department head and commanding officer of the embarking aviation unit shall establish MOUs early in the pre-deployment work-up cycle to set policies for such contingencies, and agree that frequent training to attain mission essential task list standards will be necessary. Plans must be developed for being able to conduct extended flight operations, thus necessitating a possible requirement for additional personnel trained to support flight deck operations. General statements such as "personnel are not transported after dark" will be negated by operational and tactical requirements; such approval being authorized to be granted by the Marine Air Ground Task Force (MAGTF) commander. One option to meeting these challenges may be to reduce the number of aircraft operated, with a corresponding reduction in the number of flight deck spots used. Still, supervisors will need to anticipate a requirement for additional flight deck "colored" shirts, vests and cranials, as well as an increase in the amount of IPE and foul weather gear. Some items may be capable of being laundered, but personnel may be required to don contaminated equipment in the interest of following recognized safety procedures and to limit contamination of clean equipment. Additionally, recovery operations will require considerable space to be allocated to support the collection, segregation, and weathering and off-gassing of equipment, weapons, and flight deck jerseys and float coats, ordnance, etc…. Likewise, depending upon environmental conditions, added restrictions may be enacted that limit work periods to correspond with heat stress work restrictions.

WARNING

Commands shall not attempt to minimize contamination to aircraft by stationing personnel with energized fire hoses on the flight deck and directing the aircraft to hover or pass through a "wall of water," even if it is only fresh water that is streamed toward the craft. The combination of rotorwash and potential for aircraft ingesting water into the air intakes or damage by too strong a stream of water striking the aircraft present too great a risk for personal injury or damage to the craft.

Because flight operations are normally conducted with winds off the bow, commanding officers should endeavor to maintain a wind off the starboard bow to reduce the area potentially contaminated by a CBRN hazard. Ships should anticipate using their "high reach" equipment and cranes as parts of plans to detect and clean contaminated areas. Use of the mechanical deck scrubber is not recommended as its ability to be decontaminated is highly suspect.

4.5.1 Moving Aircrews

Because of the difficulty of decontaminating the interior of aircraft, care must be exercised when moving pilots and aircrew from the interior of the ship to their aircraft without contaminating the exterior of their individual protective suits or boots. This can be accomplished though the use of temporary boot covers and the assistance of flight deck support personnel. Personnel must remain mindful of the possibility of contaminants being kicked up by jet exhaust and helicopter rotorwash. Flight crews disembarking from their aircraft will be processed in a manner consistent with troops moving from aircraft.

4.5.2 Moving Troops

Members of the Combat Cargo division or flight deck crew will guide retrograding forces from helicopters to the appropriate CCA. If possible, personnel will remain in the helicopter until the rotor blades have ceased turning. Once the blades have stopped turning, personnel will be led in a single file to the designated CCA. If rotor blades must remain engaged, personnel will be directed to move as expeditiously as possible to clear the helicopter while being led to the appropriate CCA; maintaining a single file. The use of lights or other markers should be used to identify the path personnel should attempt to remain within; such lights or markings being of an approved flight deck designation. For personnel departing the ship on a clean helicopter, but else wise in a contaminated environment, there is a similar concern as for the aircrew. These personnel would generally have to be encapsulated in their individual protective suits and masks before they can move from the ship's interior to embark their assigned helicopter. Ideally, it would be helpful if these troops could cross the contaminated flight deck and board their externally contaminated helicopter without contaminating their boots or suits. This would in turn require the use of temporary coverings for their boots as they crossed the contaminated deck. The use of large numbers of temporary boot coverings raises concerns about FOD (i.e., foreign object debris) damage to engines. For this reason, the on-load might also need to be done prior to engine startup, giving time to recover stray boot covers. Alternatively, troops could walk across the deck contaminating their boots, and then don temporary boot covers as they enter the transport helicopters. This would leave the boots of vertical assault troops contaminated, which is less than ideal, but would use temporary covers to protect the floor of the helicopter. It would be best to protect both the troops and the transport helicopter from becoming contaminated. This may require that a pathway be decontaminated on the deck from catwalks to helicopter spotting areas if temporary boot covers are not used. Still another option to consider is the use of a plastic covering to line the floor of the helicopter. Again, completing such action will require due regard for FOD and a review of all requirements.

4.5.3 Loading and Unloading Aviation Ordnance on Aircraft

Aviation ordnance and ammunition is treated similar to personnel and cargo, with due regard for minimizing the spread of contaminants. Returned munitions should not be struck below to magazines until certified as having been decontaminated.

4.5.4 Aircraft Decontamination

If air and ground crews are careful when operating in a contaminated environment, cross-contamination from the exterior to the interior can be minimized. In-flight airflow over the aircraft's smooth skin at typical flight speeds facilitates a higher rate of evaporation. Still, some agents will migrate to crevices, rivet heads, and joints, and continue to be a hazard; a common area of contamination will also be on the aircraft's tires. Thickened agents evaporate slowly and may remain a hazard even after prolonged flights. If the interior is determined to be contaminated, flying the aircraft with the doors open can help reduce the hazard. Procedures for decontamination of naval aircraft, aircrews and aviation support personnel are provided in NAVAIR-00-80T-121 dated 31 July 2003 and information on emergency reclamation requirements can be found in NAVAIR-01-1A-509, *Aircraft Weapons Systems Cleaning and Corrosion Control* and NAVAIR-16-1-540, *Avionics Cleaning and Corrosion Prevention/Control*. If time is available, and flight operations are secured, aircraft should be moved forward to a washdown spot consisting of a containment pit, if on hand, and a decontamination team. Ships are cautioned that improperly sealed flight deck deck-lighting can contribute to contaminants seeping into interior spaces of the ship.

Note

Ships should try to maintain at least one landing spot of separation between recovery landing spots and washdown sites.

CAUTION

Do not use steam to decontaminate aircraft per NAVAIR-01-1A-509. Damage to composite materials used in construction of aircraft may result.

An aircraft washdown, i.e., operational decontamination, should be conducted within 6 hours of becoming contaminated and is most effective if conducted within 1 hour; though some amount of chemical contamination may remain after the aircraft washdown. The aircrew shall continue to wear, as a minimum, its protective masks and rubber gloves for protection until a thorough decontamination is conducted.

CAUTION

Most of the field-expedient decontaminants are corrosive and could cause damage to aircraft materials.

While it is possible to perform a detailed decontamination of individual aircraft, this can be a tedious and time-consuming activity that will require a considerable amount of manpower to accomplish; manpower that will likely be in short supply during large-scale expeditionary operations especially if they must work in heat stress conditions exacerbated by MOPP requirements.

4.6 WELL DECK OPERATIONS

The requirements for well deck and small boat operations in a CBRN environment are similar in nature to those experienced by flight deck crews. The ship's first lieutenant and damage control assistant (DCA), working in conjunction with the ship's combat cargo officer when assigned, coordinates policies for manning requirements and decontamination procedures with embarked element commanders. Once such operations are directed to occur, the DCA and ship's first lieutenant briefs assigned personnel on the plan of action for survey and decontamination procedures, recovery of equipment and personnel, and any offload requirements. All well deck personnel will require IPE consistent with the threat and their duties. As with troops moving on the flight deck, once cleared to disembark their craft, personnel will be led to a CCA to initiate decontamination procedures. Craftmasters shall be advised to maintain loads wet during transits to the ship if contamination is known or suspected to exist. It is the responsibility of the craftmasters, coxswains and/or drivers to keep the CBRN defense cell and Well Deck Control Officer (WDCO) advised of the craft's contamination condition. Depending on a variety of factors, e.g., tactical situation, sea state, and craft capabilities, craftmasters, coxswains and drivers will attempt to decontaminate any known hot spots prior to recovery. They shall also attempt to complete a survey to verify that the decontamination is complete. If the craft are unable to be given a washdown, they may be brought into the ship and be soaked using the ship's firefighting sprinklers with aqueous film forming foam (AFFF) secured. Similarly, the craft can be positioned in close proximity to the ship's quarter and be sprayed by personnel with saltwater fire hoses. Once completed, a report to the ship shall be made citing the craft is ready to enter the well. If environmental conditions permit, and procedures exist and can be authorized, a sterngate or sill marriage is preferred. If sea state conditions do not permit, or a final recovery of the craft is expected, craft should be brought in using the steepest possible wedge, and then be grounded out. All craft and loads will be rinsed from top to bottom, forward to aft. Following decontamination operations, and when the landing craft can be directed to exit the well, the ship will flood the well deck to further eliminate any hazards. For LPD-4 class ships, energizing the water curtain can be used to isolate the vehicle storage area from landing craft air cushion (LCAC) spray and to rinse loads. The recovery and decontamination procedures described in the following paragraphs will be completed for craft as applicable.

4.6.1 Landing Craft Air Cushion (LCAC)

In accordance with SEAOPS, the craftmasters shall maneuver their craft to maximize exposure to sea spray. Propeller reversal, with the craft proceeding downwind and across the wind, is recommended as a minimum. If the craftmaster's survey confirms the craft is clean, direct the craft to proceed into the well. Conversely, if still contaminated, and the tactical situation and sea state permit, direct the LCAC to go off-cushion astern or alongside the ship. Have the ship's well deck crew hose down the craft with saltwater from the stern or catwalks; avoid hitting the LCAC propellers with a solid stream of water.

WARNING

> Spraying water into moving propellers could produce catastrophic blade failures with resultant personnel hazards. Spraying solid streams of water at stopped propeller blades could result in damage to the propellers and should be avoided.

If the LCAC is still contaminated and the operational situation permits, bring the LCAC in using the emergency recovery rig and spot it as far aft as possible to reduce the likelihood of spreading any contamination within the well deck. With the crew and any troops remaining within the craft, well deck teams will survey the LCAC and decontaminate any hot spots. If the LCAC went overland to recover or deliver its load, contaminants will have been absorbed into permeable material, presenting a long-lasting contact and vapor hazard. At-risk material includes non-skid coverings and the rubber skirt; thorough decontamination will likely result in their removal and replacement. It is possible that the emergency recovery line might become contaminated through contact with the craft. Following the last evolution, discard the line over the side, ensuring it does not create a hazard to navigation. If a replacement line is not available, cut off the affected portions and reconstruct the line's features as necessary.

When bringing a contaminated LCAC into the well deck, every effort should be taken to clear the well deck and wingwalls of all porous materials (e.g., lines, fire hoses); porous materials exposed to contamination should be jettisoned. Personnel who are exposed to LCAC-generated wind and spray shall don their JSLIST and wet weather gear. The WDCO shall ensure good ventilation flow from forward to aft in the well. All well deck and vehicle storage supply ventilation shall be on high speed; all exhaust ventilation secured; and all vent exhaust intake covers shall be covered to ensure air is forced towards the aft part of the ship and exits through the stern gate opening. Sea state and weather permitting, it may be necessary to deviate from the ship's normal recovery ballast condition in order to minimize the spraying action of contamination throughout the well deck and wingwalls. In such cases, it will then be necessary to complete an emergency recovery of the LCAC using the towing rig with the propellers secured. Ballast the ship to the steepest wedge possible with water level at the sill to a minimum of five feet. Recover and shut down the LCAC engines. Activate the well deck sprinkler system with the AFFF in re-circulating mode and operate the system for two minutes to wash down any contaminated spray from the craft. Firemain pressure should be at the maximum and all nozzles operational to ensure complete designed coverage. Survey and decontamination teams will then conduct established checks and cleaning procedures consistent with the ship's CBRN Defense Bill.

4.6.2 Landing Craft Utility (LCU)

The LCU initiates active decontamination during transit to the ship and activate its counter measure washdown system (CMWDS). Upon nearing the ship, the LCU should be directed to take and maintain station alongside ship at the slowest and safest possible speed. Once along side, the ship's force uses additional fire hoses from the catwalks to concentrate on those areas not fully covered by the LCU's system. The LCU crew is then directed to survey their exterior and report results to the ship; any hot spots will be further decontaminated. If agents have been left on the craft for over an hour, the epoxy-based paint may have absorbed them. A thorough decontamination may be required. Ship's force and LCU crews should pay particular attention to the crew cabin ventilation and air conditioning systems and the large filter units for the engine air intake system. The crew cabin ventilation system can create a serious vapor hazard by blowing agent vapor into an otherwise sealed compartment. When retrieving an LCU, a stern gate or sill marriage is preferred whenever possible to minimize contamination of the ship. Alternatively, bring the LCU in and ground it out without fully de-ballasting. With the ramp down, the ship's survey team checks the craft for any residual agents and, working with the craft crew, complete the decontamination. Direct disembarking personnel to proceed to the CCA to commence personal decontamination and receive medical attention if required. Complete decontaminating the craft as the well is de-ballasted, flushing out the well deck in the process. Note: there is a possibility the steadying lines will be contaminated. Following the last evolution, discard the lines over the side ensuring they do not become a hazard to navigation. If replacement lines are not available, cut off the section which came in contact with the craft and re-splice the line's eye.

4.6.3 Amphibious Assault Vehicle (AAV)

AAVs essentially complete an external decontamination as a function of their transit to the ship; to further decontaminate the craft, position personnel in the vicinity of the stern and direct them to hose down the AAV with salt water prior to signaling it to enter the well. Once in the well, keep the hatches closed with the crew and troops still inside, direct it to stop in the center of the well and hose it down again with saltwater from fire hoses on both wing walls. Turn the AAV 180º and hose it again before backing it to a parked position. Keep planking wet before and during recovery to avoid and reduce the likelihood of any agent saturating the wood. The AAV Platoon Commander will initiate internal decontamination procedures. After a survey and any additional decontamination, permit the crew and troops to exit the vehicle, directing them to the CCA to complete their decontamination and medical assistance before allowing them into the interior of the ship. Setting Circle WILLIAM hinders the ship's ability to ventilate the heavy AAV fumes from some well decks and could contribute to a build up of fumes in the well deck and contribute to reduced visibility.

4.6.4 Landing Craft, Mechanized (LCM-8)

Same as LCU, except the craft has no CMWDS and does not use a sill or stern gate marriage.

4.6.5 Combat Rubber Raiding Craft (CRRC)

Contaminated CRRCs should be recovered one at a time. Environmental conditions permitting, CRRCs and their crews should remain in the aft section of the well deck during their survey and decontamination. The decontamination team uses portable showers on the crews. Once an initial rinsing has been completed, personnel are directed to proceed to the CCA for decontamination and medical attention if required.

4.6.6 Other Small Craft

For davit and crane-hoisted small craft (e.g., motor whaleboats (MWBs), rigid hull inflatable boats (RHIBs), landing craft personnel (LCPLs), etc…), call craft alongside for initial decontamination by shipboard fire hose teams; take care not to injure personnel or swamp the boat. Once the craft is at the rail, personnel disembark and are surveyed, and directed to the CCA for decontamination and any required first aid. The craft receives a thorough survey and decontamination prior to being hoisted aboard and secured. If a determination cannot be made that the craft is decontaminated, then, weather permitting, it may be left at the rail until further decontamination can be accomplished. Eyes on all the steadying lines and the sea painter are dipped in an HTH solution, and then cut off and disposed of over the side; make new eyes on the lines.

4.7 VEHICLE AND EQUIPMENT DECONTAMINATION PROCEDURES

Ships generally lack sufficient equipment to conduct a thorough decontamination of vehicles; specifically, they do not carry wash racks to facilitate easy access to the under-carriage of vehicles. Any effort to embark contaminated vehicles and cargo into previously uncontaminated amphibious shipping requires a thorough review of all options available to complete the assigned mission, to include a review of the follow-on mission responsibilities. If the ESG has the option to consolidate clean cargo and vehicles before loading contaminated items, such a course of action shall be pursued. If wash ramps are not available, ships with a "false beach" offer the best option for receiving contaminated vehicles; e.g., LPDs, LHDs, LHAs and Cargo Variant LSDs (i.e., LSDs 49-52).

In order to accomplish the cleaning, ships should ballast and create a steep wedge; avoiding submerging the false beach. Sea state and wave action in the well deck permitting, create a three to five-foot basin of water in the well deck; attach fording gear to the vehicles and slowly drive them for five to ten minutes in the saltwater. Spray with fire hoses and use scrubbing teams as necessary to decontaminate un-submerged areas. Once determined to be free of contaminants, the vehicle will be directed to move further up on the false beach and receive a fresh water wash down to minimize the corrosion potential. Finally, maintenance personnel should perform post-saltwater emersion maintenance tasks.

Steam cleaning may also be considered as an option for decontaminating vehicles and cargo, but such evolutions are likely to be extremely dangerous and difficult to accomplish. Steam lancing can produce injuries similar to surgical incisions and the risks may far outweigh the potential gains that might be made over attempting to complete the decontamination procedure by creating a pool of water as described above.

4.8 FORCE RECONSTITUTION

Reconstitution is generally beyond the capabilities of an ESG; however, reconstituting and expeditiously returning the force to a full mission readiness standard is the ultimate goal of any decontamination effort. In some instances this will not be possible until a considerable period of time has elapsed; e.g., following a nuclear warfare attack. Should the force be unable to restore itself to a full operational readiness standard, assistance from outside commands or agencies will be sought, to include replacing contaminated personnel and equipment with assets obtained from rear area commands. Similarly, in situations where forces are being maneuvered (i.e., transported) from one landing force objective to another, forces may only be capable of accomplishing limited operational decontamination. If forces are unable to complete a thorough decontamination, commanders will make every effort is taken to ensure personnel are afforded the maximum level of support in assuring their comfort. For example, landing forces may be required to remain in the well deck or sequestered on the flight deck, but every effort will be made to afford them with adequate shelter and meals. Commanders may likewise find it more practical to take advantage of consolidating forces along the lines of their level of contamination and have one or more ships serve as contaminated ships and the remainder as clean ships; thus modifying the landing plan to align with the modified force disposition. The procedures discussed throughout this document will be used to determine risk assessments and possible courses of action.

Commanders may reduce protective postures and allow unprotected military personnel, DoD essential civilians and contractors to operate in proximity of formerly contaminated material or equipment only after using currently fielded and available technologies to validate that either decontamination procedures or weathering have reduced hazards from material and equipment to non-detectable levels; one or more detectors cited in Appendices E and F will be used in this process. Commanders will ensure equipment and personnel are periodically monitored to determine if any signs of a return of contamination is detected. Should a hazard be identified, commanders will direct appropriate action be taken to safeguard affected personnel.

WARNING

> Risks to personnel safety increase as residually contaminated equipment is consolidated and personnel work around this equipment for prolonged periods, particularly in areas with limited air circulation.

Before initiating action to recovery potentially contaminated equipment to the Continental United States (CONUS) for repair, etc, commanders should coordinate with the Joint Rear Area Coordinator (JRAC) to determine if an emergency condition exists and warrants the risks associated with such action. Generally, equipment will not be returned to CONUS until it has been determined to be clear of contamination, even if such action results in a requirement for an extended period of time for weathering. If the equipment cannot be decontaminated, destruction may be required.

CAUTION

> Civil aircraft will not normally be used to transport contaminated equipment due to safety and legal concerns.

CHAPTER 5

Logistics

5.1 INTRODUCTION

The ability of a force to sustain itself throughout the course of an operation is often viewed as the critical linchpin to achieving mission success; and the onus for planning such support rests largely with unit logisticians. By the very nature of expeditionary operations the complexity of such planning is magnified; however, because these forces generally begin to integrate their planning at an early stage in a deployment cycle many of the impediments that can be encountered are minimized. Still, the difficulty of these operations will be intensified by the introduction of chemical, biological, nuclear and radiological (CBRN) weapons which, through either their threatened use or actual employment, will dramatically influence the course of events. Additionally, because of the unique nature of some CBRN weapons or agents, and the current state-of-the-art for detecting certain pathogens or levels of contamination (i.e., total detection cannot be assured), their presence may sometimes remain undetected until days, weeks or even months have passed and only be manifested in increased incidences of certain illnesses. Clearly, the use of CBRN weapons, or in operations stemming from humanitarian or other support for directed operations in which toxic industrial materials are encountered, will result in a higher demand for essential CBRN defense and decontamination items. Nonetheless, logistical planning will need to take into account the many challenges of CBRN defense and apply the principles discussed throughout this chapter to each phase of an operation, including during recovery operations.

Teamwork between a ship's supply officer and a unit's logistics officer and staffs within an expeditionary strike group (ESG) is essential. Logistics and combat service support (CSS) planners must respond accordingly and consider the distinctive support requirements, the timely re-supply of consumable supplies, and the potential for mass casualties and elevated death counts. These imperatives can have a crippling effect on a force if they are ignored, unplanned for and/or become emergent needs if not considered early in the planning process, to include accounting for the anticipated and/or expected lead-times associated with requisitioning, shipment, and the arrival and delivery of supplies into the area of operations (AO). Similarly, historical trends of reduced deliveries during the final phases of operations must be taken into account as well. Other factors include, but are not limited to:

1. Requirements, priorities and procedures for decontamination and evacuation of materials and supplies, and maintenance and administrative sites.

2. Disposal of contaminated clothing, medical waste and unserviceable contaminated equipment.

3. Re-supply of expended CBRN protective clothing, decontaminants, and medical supplies.

4. Evacuation priorities, decontamination, treatment and isolation of CBRN casualties or conventional patients who have been contaminated with CBRN hazards.

5. Decontamination of food and water sources for human consumption.

6. Mortuary affairs (see JP 4-06, *Joint Tactics, Techniques and Procedures for Mortuary Affairs in Joint Operations*), and the procedures for moving, decontaminating, and marking contaminated remains.

7. Measures to reduce the impact of a CBRN environment on civil-military cooperation (CIMIC).

8. Readily available sources of potable and non-potable water.

9. The provision of showers or baths and a change of clothes at least once a week for all force personnel to help maintain a high standard of force hygiene.

The importance of accurately reporting the status of a command or unit's CBRN readiness through the monthly Ship's Operational Readiness and Training Status (SORTS) Report and the annual CBRN inventory of equipment cannot be understated. There may be instances when units not in-theater will be required to support forward-deployed units. If unit reports are accurate, the redistribution of material will be simplified. Additionally, pre-staging additional materiel during the planning phase should be considered and implemented when possible.

5.2 LOGISTIC PRINCIPLES FOR OPERATIONS IN A CBRN ENVIRONMENT

The rigors of operating in a CBRN environment tax logisticians in preparing for and supporting evolutions throughout the course of the operation, and in particular during those phases when personnel are being moved to amphibious shipping -- most notably during the recovery phase. The following principles will guide logistic planners in preparing for their duties:

1. Foresight - A high consumption rate of decontaminants, consumables, water, protective equipment, vaccines and/or other medical countermeasures are a feature of CBRN defense operations. There is a need to achieve the appropriate balance between providing adequate stocks of CBRN defense equipment without compromising the logistic requirements of the overall mission of the force.

2. Economy - The future demand for CBRN defense equipment and logistic support may be difficult to assess, particularly if there is a need to provide support to allies and other organizations. As a result, resources must be used effectively, efficiently, and economically, making best use of any additional or local host nation support (HNS) that is available.

3. Coordination - The CBRN defense requirements of the force need to be reconciled with the overall logistic needs and close coordination is necessary at all levels. Although force components need to anticipate their own logistic support, some mutual support may be necessary, particularly where there may be disparities in CBRN defense capabilities. The demand for CBRN protective equipment and materials may extend beyond the force to other allies, non-military organizations and non-combatants.

4. Flexibility - In a CBRN environment, the logistic system needs to be versatile and able to react rapidly to unforeseen circumstances. The hazards and potential damage caused by a CBRN attack may necessitate the relocation of advanced or intermediate staging bases, redirection of supply flow, re-allocation of transports and/or the short-notice transfer of assets. Work schedules may need to be altered if CBRN conditions degrade logistic operations. Plans will be needed for the prompt supply of CBRN related equipment to regions where the use of CBRN weapons release is anticipated.

5.3 LOGISTICAL OPERATIONAL CONSIDERATIONS IN A CBRN ENVIRONMENT

The threat and/or possible use of CBRN weapons requires logistic personnel to initiate action to protect themselves, their patients, equipment, and supplies throughout the operational area. Logisticians must plan to protect all personnel and supplies for which they are responsible, including:

1. Logistic support units

2. Supplies during shipment and storage

3. Storage and distribution areas

4. Vehicles, to include maintaining and enhancing their survivability

5. Medical personnel and their equipment, as well as provide for the decontamination of their equipment.

After any CBRN exposure, each affected unit must establish an inspection and decontamination point in accordance with the ship's CBRN Defense Bill and/or the unit's operations plan.

5.4 CBRN LOGISTIC READINESS

Adequate logistic support, which must be maintained under all conditions, is vital to operations in CBRN environments. The key considerations to ensure adequate CBRN equipment stocks, interoperability, and training are the application of the following logistic principles:

1. Sustainability - Sustainability is the measure of the ability to maintain logistic support to all users throughout the theater for the duration of the operation. In CBRN environments, constant, long-term consumption of CBRN defense supplies requires careful planning and anticipation of future requirements.

2. Survivability - Theater logistic nodes and units present an adversary with lucrative and often static high value targets for attack with CBRN weapons. Logistic planners must plan for both active and passive measures to minimize the risks of CBRN weapons attack while satisfying the needs of the force for uninterrupted logistic support.

3. Responsiveness - The hazards and potential damage caused by CBRN attack may require relocating bases and health service support (HSS) facilities, major redirection of supply flow, re-allocation of transportation and engineering services, and short-notice transfer of replacement personnel or units from one part of the theater to another. Force plans should allow for surges in logistic requirements for CBRN defense consumables and equipment items to appropriate units.

4. Flexibility - Maintaining logistic flexibility in CBRN environments requires logistic units to be capable of rapid alteration of work schedules. CBRN attacks can cause degradation of logistic operations due to operating in protective clothing and the requirement to handle and decontaminate supplies and equipment. Logistic planners will plan for deliberate and expedient covers and shelters to protect essential items from contamination.

5.4.1 CBRN Equipment Stocks

Logistic support for CBRN readiness requires adequate supplies and transportation of chemical and biological defense equipment, as well as sustaining and supporting CBRN defense organizations responsible for carrying out reconnaissance, decontamination, and support tasks. High consumption rates, for both military and possibly civilian personnel, of decontaminates, consumables, water, protective equipment, vaccines and/or other medical countermeasures are features of CBRN defense operations. In rendering assistance to non-organic forces or personnel, a need to achieve an appropriate balance between providing adequate stocks of CBRN defense equipment without compromising the logistic requirements of the overall mission of the force must be considered and maintained. Appendix E provides a listing of the various materials and equipment that are generally used to perform decontamination operations.

5.4.2 Civilian CBRN Equipment and Supply Support

Additional supplies and equipment must be planned for the possible recovery of civilians contaminated during non-combatant evacuation operation (NEO) or civil support (CS) operations. Support for these operations can best be achieved by promptly identifying potential requirements before arriving in the AO and making requests to appropriate headquarters to transfer the equipment for pick up either en route to the AO or to a facility within the AO. Equipment and supplies can also be prepositioned aboard ESG shipping, at overseas advanced or intermediate staging bases, or in contingency packages in the continental United States (CONUS) that can be shipped quickly on short notice.

5.5 PACKAGING AND TRANSPORTING HAZARDOUS MATERIALS

Packaging and transport of hazardous materials by qualified Navy personnel occurs daily on board U.S. Naval vessels and at installations worldwide, with the supply department or combat service support element (CSSE) typically being responsible for certifying and coordinating the shipment of hazardous materials. Depending upon the size and nature of the command, most supply departments have personnel exclusively trained in the packaging and transport of hazardous materials, e.g., materials ranging from ammunition and explosives to biomedical waste and compressed gases. Infectious substances, formally called etiologic agents, are a special type or class of hazardous materials (i.e., Class 6.2) that include “microorganisms or toxins that cause or may cause severe, disabling or fatal disease.” BW agents are considered “Class 6.2 Infectious Substances” and can be safely shipped by trained Navy personnel. Numerous Federal and international agencies such as the Department of Transportation (DOT) and the International Air Transport Association (IATA) regulate the packaging and shipment of hazardous materials. Air Force Inter-Service Manual 24-204/NAVSUP Pub 505/Marine Corps Order (MCO) P4030.19H, *Preparing Hazardous Materials for Military Air Shipments*, is the key reference for the packaging and transport of all hazardous materials, including BW samples, by DoD personnel. It is available digitally on the Air Force Departmental Publishing Office (AFDPO) website at http://www.e-publishing.af.mil/. To find it quickly, first select 'Electronic Publications', then type "24-204" in the "Short Title Search" text box.

5.5.1 Shipping Regulations

The Code of Federal Regulations, Title 49, (i.e., 49 CFR) contains current DOT rules for transporting hazardous materials and governs actions. Other regulations governing the international transportation of hazardous materials include the United Nations’ "Orange" book, the IATA *Dangerous Goods Regulations*, and the International Civil Aviation Organization (ICAO) *Technical Instructions for the Safe Transport of Dangerous Goods by Air*, and the International Maritime Dangerous Goods (IMDG) Code. Specific agency regulations such as the *U.S. Postal Service Domestic Mail Manual* should also be referenced when transporting hazardous material.

DoD regulations specify that all personnel involved in packaging, certifying, and shipping hazardous materials should be formally trained and certified. In the event formally trained personnel are not onboard, personnel tasked with packaging and shipping suspect material should use the guidance provided at paragraph 5.5.3 below. This guidance, although sufficient to safely guide one through the task, is by no means a replacement for attending a DoD-sanctioned hazardous material packaging and transport class. When possible, commands should seek out and request the assistance of a DoD certified packer and shipper. Additionally, commands should attempt to receive the DOD-sponsored various training prior to deployment. The information contained herein should be used in conjunction with other standing shipboard or unit guidance related to shipboard chemical, biological, radiological and nuclear defense (e.g., the CBRN Defense Bill). In order for individuals tasked with shipping contaminated materials to be able to perform their required responsibilities, commands should acquire the following reference documents:

1. Air Force Inter-service Manual 24-204, *Preparing Hazardous Materials for Military Air Shipments*, (also called NAVSUP Pub 505, TM 38-250, MCO P4030.19H, and DLAI 4145.3), 11 December 2001.

2. NTTP 3-20.31.470, *Shipboard Biological Warfare/Chemical Warfare Defense and Countermeasures/Naval Ships Technical Manual, Chapter 470* (specifically sections 470-4.6.1 and 470-4.4.6.1.9).

3. Defense Transportation Regulations, DoD Regulation 4500.9-R.

4. Code of Federal Regulations Title 49 (Part 173).

5. *Policies and Procedures Governing the Air Transportation of Dangerous Cargo,* NATO STANAG 3854.

6. Commander Fleet Forces Command, Norfolk, Virginia message, date time group, 142055Z MAR 03 (Note: this message has been quoted and is available at Appendix I).

5.5.2 Packaging and Transporting Suspected BW Samples (i.e., Class 6.2 Infectious Substances)

All personnel involved in shipping Class 6.2 Infectious Substances should review NAVSUP Pub 505 Attachment 10.9, pp. 263 and 264, for a detailed review of the steps required to perform such tasks. The following preliminary packaging and transport guidance has been adapted from material developed by personnel at the Navy Medical Research Center – Biological Defense Research Directorate (NMRC-BDRD) in consultation with specialists at the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) and the Navy Supply Corps School. The guidance of NAVSUP Pub 505/Marine Corps Order (MCO) P4030.19H Attachment 10.9, pp. 263 and 264 has been condensed and is presented in the following step-by-step and more user-friendly format, but it is not intended to replace the information contained in the actual publication:

1. Place the sample in a primary watertight receptacle with a leak-proof seal (e.g., a Ziploc or self-sealing plastic bag, or a plastic jar, 50-ml conical tube or sterile urine cup). NTRP 3-20.31.470, Table 470-4-2, contains a list of possible BW collection tools, including suggestions for primary watertight receptacles. Do not use glass receptacles that may break in transport. Do not collect more than 50-ml or 50-g of a sample.

Note

The use of a name of any specific manufacturer, commercial product, commodity or service in this publication does not imply endorsement by the military services.

2. Seal the primary receptacle and initiate the chain of custody procedure discussed in the note below. Initiate a standard, Department of the Navy "Evidence/Property Custody Document" at this point to ensure that all access to the sample is properly documented from the point where the sample is taken to the point where the final definitive identification is completed. Mark each sample container in such a way that the initial marking will not be removed during decontamination. The requirement is that any individual who initially or subsequently gains custody of a sample must legibly annotate the date, time, location and condition of the sample/container at the point they obtained custody of the sample. Consult with the ship's security or legal officer for additional guidance on chain of custody procedures.

Note

After sealing the primary watertight receptacle (i.e., Step 2), take additional steps to provide additional packaging safety. Specifically, place the primary watertight container sealed in Step 2 into a plastic Ziploc bag and then spray the primary watertight receptacle with a 10-percent bleach solution. This step provides a third layer of containment as well as the benefit of providing a built in decontamination zone around the sample. Seal the Ziploc bag and proceed to Step 3 below.

3. Wrap the primary watertight receptacle with an absorbent material. Use a thick paper towel or equivalent. Use enough absorbent material to absorb the entire contents of the primary receptacle should it leak.

4. Place the wrapped primary watertight receptacle in a strong watertight secondary outer packaging approved by the DOT for transport of hazardous materials/infectious substances. One possible source for shipping containers is the SAF-T-PAK 100, SAF-T-PAK, INC (http://www.saftpak.com/; 1-800-814-7484). The SAF-T-PAK 100 meets or exceeds all DOT, DoD and United Nations (UN) requirements described in NAVSUP Pub 505 (i.e., dimension and structural integrity requirements) and comes with all required labels, markings, and shipping documents.

5. Seal the secondary outer container (i.e., the SAF-T-PAK 100).

6. Place the secondary container into sturdy outer container (i.e., the cardboard box that comes with the SAF-T-PAK 100).

7. Place an itemized list of the samples being transported in a conspicuous location inside the box/container.

8. Affix the DOT "Class 6.2 Infectious Substances" warning label on the box. NAVSUP Pub 505, Attachment 14.4.5, p. 325, and Attachment 15.1/15.3, p. 327 covers marking and labeling requirements for Class 6.2 Infectious Substances.

9. Before sealing the package, the command's HAZMAT certifying official MUST certify that the sample is properly packed and ready for transport. NAVSUP Pub 505 Attachment 17, pp. 332 through 343, covers this requirement in detail. If a certifying official is not available, seal the package and transport. Although typically required, there are situations when transport can take place without certification. Such situations include:

   a. Transport under Combat Situations. As detailed in NAVSUP Pub 505 Attachment 25, p. 365, "an aircraft commander (or representative designated by the commander) may accept a HAZMAT shipment under a combat situation without regard to the above training." In simple terms, this means that an aircraft commander has the authority to transport any sample during combat conditions whether or not certified by a DoD-trained certifying official.

   b. Intelligence or Criminal Investigations. As detailed in NAVSUP Pub 505 Chapter 2.3.5, page 11: "Variations to DOT/DoD packaging and transport requirements as outlined in this manual (NAVSUP Pub 505) are authorized for airlift of HAZMAT involved in intelligence or criminal investigations. Qualified personnel of those agencies responsible for the cargo must ensure compliance with as many requirements of this manual (NAVSUP Pub 505) as possible. This authorization is valid only for movement out of an austere environment. At the first secure en route airfield, the cargo must be prepared according to this manual (*sic* NAVSUP Pub 505)."

10. Dispatch of Class 6.2 materials should not take place before advance arrangements are made for transport and arrival (i.e., persons shipping and receiving samples have made arrangements prior to transporting sample). Liquid samples should be kept cool (e.g.. approximately 4 °C/39 °F) whenever possible. Refrigeration of powdered samples is not required.

11. Proper documentation must accompany shipments of infectious substances. Besides the itemized list contained within the package, the shipper must complete the Shipper's Declaration for Dangerous Goods form. NAVSUP Pub 505 Attachment 17, pp. 332 through 343 (Figure A17.1), provides an excellent set of step-by-step instructions for completing this form.

5.5.3 Escorts Services

NAVSUP Pub 505 Attachments 10.9, pp. 263 and 264 and 24.3, pp. 361 and 362, provide guidance regarding the use of escorts. Commands shipping hazardous materials can request a technical escort, security escort, military guard, other technically qualified personnel, or a knowledgeable representative to accompany the shipment. If a knowledgeable representative of the shipper or recipient is used, the Surgeon General, US Department of Health and Human Services, or the Administrator of the Agricultural Research Service, US Department of Agriculture, must authorize them. The commander may make this request if in their opinion inherent factors of public relations, security, economics, or expeditious handling indicates this to be in the best interest of the DoD. The United States Army fields a unit called "Tech Escort" that, among other things, specializes in the identification, packaging, and armed escort of chemical, biological, and radiological weapons of mass destruction. They are the DoD unit-of-choice for packaging and transporting such items; however, as with other CONUS or shore-based specialty units, it takes time for Tech Escort to arrive on the scene. In the case of a BW threat on a forward deployed underway ship, the lag time required to muster Tech Escort to the scene may not be operationally acceptable. In these cases, the commander should designate an escort team consisting of one to two masters-at-arms and an individual from the damage control or medical department who has knowledge about the sample (e.g., a member of the BW response team that originally collected and packaged the sample). As per the above stated requirement, the commander requesting the technical escort should seek authorization from the sources listed in NAVSUP Pub 505, Attachment 10.9.

5.6 CHAIN OF CUSTODY RESPONSIBILITIES

Strict chain of custody must be maintained for every sample/specimen collected; use Department of the Army (DA) Form 4137 (i.e., Evidence/Property Custody Document) or Department of Defense (DD) Form 1911 (i.e., Material Courier Receipt) for each sample/specimen collected. The DA Form 4137 or DD Form 1911 must accompany the sample/specimen during transport from the point of collection to the final receiving laboratory. Each time the sample/specimen is transferred to another individual, the receiving person must sign the document to show they received the sample/specimen. When a DA Form 4137 or DD Form 1911 is not available, the information must be recorded in such a manner that a clear chain of custody can be verified. Regardless of whether DA Form 4137, the DD Form 1911, or another record document is used, the document will answer the following questions:

1. When was the sample/specimen collected?

2. Who has maintained custody of the sample/specimen?

3. What has been done with the sample/specimen at each change of custody?

Note

Each change of custody must be recorded with date and time of change.

The samples/specimens must be appropriately packaged, labeled, and evacuated to the designated laboratory for confirmation of a BW attack. The standard chain of custody for sample/specimen evacuation is as follows:

1. Sampling unit

2. Medical operations officer, or other designated individual

3. Technical escort units or other command-designated escort personnel

4. In-theater supporting medical laboratory, if in operation

5. CONUS laboratory.

5.7 MORTUARY AFFAIRS AND CONTAMINATED HUMAN REMAINS

Mortuary Affairs begins at the unit level, with each Service being responsible for their respective personnel's remains. Higher headquarters maintain the ability to provide support during operations, with the U.S. Army being tasked to provide back up and general support. When individuals die in a contaminated environment every effort will be made to recover the remains, determine where the decontamination occurred and conduct field verification – with movement to a quality control point for second verification of the decontamination procedure before departing the theater with a final verification. Appendix D to Joint Publication 4-06, *Joint Tactics, Techniques and Procedures for Mortuary Affairs in Joint Operations*, outlines the procedures for decontaminating human remains and personal effects, and provides precautions to protect personnel involved in recovering and processing contaminated remains. It also provides the procedures required to establish and operate a mortuary affairs decontamination collection point (MADCP).

The handling of contaminated human remains is a logistic function and there may be a requirement for in-theatre emergency burial procedures in accordance with JP 4-06. Where the capabilities exist, human remains will need to be decontaminated and handled in a conventional manner, and with all due reverence, care, and dignity befitting them and the circumstances. However, if they cannot be decontaminated, they will need to be buried at the site of recovery and the site clearly and properly marked; temporary internment is a last resort to protect unit health, safety and sanitation. Preservation of remains will be given the highest priority.

When decontaminating remains, a reception station, wash and rinse station, and a detection and quality control station should be established. Additionally, holding stations and release points may also need to be established. When handling remains every effort will be made to ensure a personal protective posture is maintained, as well as allowing for work/rest cycles and proper operational procedures. Wash stations should spray the remains with soapy water and scrub the remains with a sponge – ensuring to clean between the legs, under arms, hair, eyes, mouth and ears. Use moderate pressure when scrubbing and spray the mouth, wounds and nostrils. Remains should remain in contact with sodium hypochlorite for at least five minutes before rinsing.

Note

> The personal effects of the individual will also require decontamination. Refer to Joint Publication 4-06, *Joint Tactics, Techniques and Procedures for Mortuary Affairs in Joint Operations*, for details for the conduct of decontamination procedures and requirements.

CHAPTER 6

Naval Health Service Support (HSS) Operations

6.1 INTRODUCTION

Naval HSS encompasses the three main pillars of force health protection strategy: casualty management, casualty prevention, and maintaining a healthy, fit force. The goal in planning operational HSS in a chemical, biological, radiological, and nuclear (CBRN) environment is to ensure that the use or threat of use of CBRN weapons or agents will not be a decisive factor in the outcome of any naval operation.

This chapter sets forth medical principles and concepts for the conduct of recovery operations in a hostile or potentially hostile CBRN environment. It is not intended to supplant the guidance contained in various medical publications and physician guides. This chapter should be used as a general planning tool for casualty management. It will provide a general overview of the various hazards, with particular emphasis on the medical protocols of CBRN warfare. Additional discussions may be found in Appendix A as well as other publications cited in the bibliography or elsewhere.

6.2 CLINICAL OVERVIEW OF CHEMICAL AND BIOLOGICAL AGENTS AND RADIATION EFFECTS

CBRN weapons and agents represent diverse threats to the warfighter in the operational environment and can significantly impact HSS operations. This section provides a basic clinical overview of many of the various CBRN agents and contaminants to provide a context for other sections concerning healthcare planning, operations, and logistics support during expeditionary operations in a CBRN environment.

6.2.1 Chemical Agents

Chemical agents can be classified into two broad categories: chemical warfare agents (CWAs) and toxic industrial chemicals (TICs) – and a number of specific categories (e.g., nerve and blister). There are over 650,000 chemicals, which, in sufficient quantity, may prove harmful to humans; however, only a small number of these chemicals have the characteristics to be used by belligerent nations in a warfare environment. Additionally, an even smaller number have actually been developed or weaponized for this use. Chemical agents may affect personnel, plant life, animals, or equipment and pose both immediate threats to the warfighter and, in certain circumstances, continued environmental hazards.

6.2.1.1 Chemical Warfare Agents

CWAs are usually classified by symptoms or organ systems affected; often attacking the central nervous system (CNS). The following paragraphs describe the types of agents and their symptoms.

6.2.1.1.1 Nerve Agents

Nerve agents are compounds closely related to organophosphate pesticides, and include GA (Tabun), GB (Sarin), GD (Soman), GF, and VX. As a class, these agents pose vapor, aerosol, and liquid hazards, and some are considered persistent (i.e., remain in the environment for prolonged periods). Nerve agents affect an enzyme (i.e., acetylcholine esterase) that is responsible for the degradation of acetylcholine, a major neurotransmitter. Inhibition of the enzyme results in excessive accumulation of acetylcholine at neuronal synapses, neuromuscular junctions, and between axonal endplates and target exocrine glands. Nerve agents may be inhaled, ingested, or absorbed through intact skin and mucus membranes. Depending on the route of entry and the dosage to which exposed, nerve agents may produce physical effects ranging from mydriatic blindness, rhinorrhea, and muscle twitching to noncardiogenic pulmonary edema, paralysis, seizures, respiratory arrest, and death. Treatment consists of removal from the exposed areas, rapid decontamination, administration of the antidotes atropine (e.g., 2-Pralidoxime Chloride (2-PAM Cl)), and diazepam for seizures, and supportive care as necessary that may include intubation and mechanical ventilation. Pyridostigmine bromide is an approved pre-treatment for exposure to nerve agents, which partially protects acetylcholine esterase from the inhibitory effects of the nerve agents. Mission-oriented protective posture (MOPP) Level IV is fully protective against all nerve agents.

6.2.1.1.2 Blister Agents

Vesicants (i.e., blister agents) cause blistering to skin or mucous membranes, and, as a class, may contaminate personnel, equipment, or the environment. They pose a liquid, aerosol, or vapor hazard, and may be inhaled, absorbed through intact skin, or ingested. Principal vesicants are nitrogen mustard (H), sulfur mustard (HD), Lewisite (L), and phosgene oxime (CX) – actually an urticant (i.e., produces itching). The severity of damage of vesicants is directly related to the concentration of the agent and the duration of contact. With the exception of Lewisite, symptoms are delayed from 4 to 12 hours after exposure. Symptoms vary from mild erythema and burning of the eyes and respiratory tract, to severe bullae and chemical pneumonitis. Fatalities are due to either respiratory failure acutely, or as the result of secondary infection or immunocompromise from bone marrow suppression. Treatment consists of removal from exposed areas, rapid decontamination, and supportive care as necessary, which may include intubation, mechanical ventilation, and burn therapy. Unlike traditional burns, fluid loss is not a predominant sequella. Only Lewisite has an antidote, British Anti-Lewisite (BAL), which is a heavy metal chelator. MOPP Level IV is fully protective against all vesicants.

6.2.1.1.3 Choking Agents

Choking agents (i.e., pulmonary agents) as a class affect primarily the respiratory system, primarily causing non-cardiogenic pulmonary edema; they include phosgene (CG), diphosgene (DP), chlorine (Cl), and chloropicrin (PS). Pulmonary agents are gases under ambient conditions and pose primarily an inhalation hazard, although conjunctiva irritation may occur. Irritation of the bronchi, trachea, larynx, pharynx, and nose may occur and, with pulmonary edema, contribute to the sensation of choking. In most fatal cases, pulmonary edema reaches a maximum in 12 hours, followed by death in 24 to 48 hours. Treatment consists of removal from the area of exposure, decontamination, and supportive care as necessary. Steroids may be of benefit. Post exposure exercise can greatly exacerbate symptoms and may cause intractable and ultimately fatal pulmonary edema, and should be avoided if at all possible until symptoms have resolved. MOPP Level IV is fully protective against all pulmonary agents.

6.2.1.1.4 Blood Agents

Blood agents produce their effects by interfering with oxygen utilization at the cellular level. Inhalation is the usual route of entry. Hydrogen cyanide (AC) and cyanogen chloride (CK) are the important agents in this group. Blood agents pose an inhalation or ingestion hazard. They are not persistent and will rapidly dissipate from the environment. There is a very narrow threshold between symptoms and death. Symptoms may include nausea, vomiting, blurred vision, and headache, shortly followed thereafter by seizure, loss of consciousness and respiratory arrest. Treatment consists of rapid removal from the area of exposure, decontamination to remove residual entrapped gases in clothing, vigorous supportive care that may include intubation and assisted ventilation, and the administration of antidotes. Nitrates (e.g.,, amyl nitrate or sodium nitrate) in conjunction with sodium nitroprusside are effective antidotes if given early, but in general, victims who survive to be decontaminated will likely survive without antidotes. Military MOPP IV is fully protective against blood agents.

6.2.1.1.5 Incapacitants/Psychochemicals and Irritants

Incapacitants/Psychochemicals and irritants are designed to temporarily incapacitate without causing long-term disability or death, and are described as follows:

1. Incapacitants usually are considered central nervous system stimulants, depressants, or hallucinogens, and may include diverse chemicals such as anticholinergics, indoles, or cannibinols. They are non-lethal agents that pose an ingestion or inhalation threat. Treatment includes removal from exposed areas, decontamination, and symptomatic treatment until symptoms resolve, which may be from hours to several days. Military chemical masks are protective against incapacitants.

2. Irritants include the chemicals O-chlorobenzylidene malononitrile (CS), chloroacetophenone (CN), chloroacetophenone in chloroform (CNC), bromobenzylcyanide (CA), and dibenz(b,f)-1:4-oxazepine (CR). They are primarily used as training agents or in law enforcement. Most agents are crystalline solids, and pose a hazard to the eyes or mucus membranes of the respiratory tract. Symptoms include intense burning and tearing of the eyes, profuse rhinorrhea, coughing, and vomiting. Treatment includes removal from the exposure area, decontamination, and symptomatic treatment. Symptoms usually resolve within one hour after removal of exposure. Under very rare circumstances, these agents may cause death either through anaphylaxis, or exacerbation of underlying respiratory disease. Military chemical masks are protective against irritants.

6.2.1.2 TICs

Toxic industrial chemicals are ubiquitous in civilized and developing nations, and military personnel may be exposed to these chemicals through accidental environmental contamination, release other than attack (ROTA), or as the result of accidents or intentional releases. Those chemicals of greatest concern acutely produce inhalational injuries, and to a lesser extent mucus membrane or skin injuries due to caustic burning. Sulfuric acid, oxides of nitrogen, and ammonia are a few of the more prominent TICs. Forces assigned to complete duties at or near petro-chemical companies, or where gas and oil is being intentionally destroyed, should anticipate injuries from hydrogen sulfide (H2S). Additionally, few fielded chemical detectors used by the military services are sensitive to many of these chemicals. Treatment after removal from the exposure area and decontamination is primarily supportive. Although chemically resistant overgarments offer some protection from these agents, many may penetrate military masks.

WARNING

Individual Protective Equipment (IPE) is not effective against most TICs; specialized suits are required.

6.2.2 Biological Agents

Biological agents are viruses, bacteria, and toxins derived from living organisms that cause death or disease in humans, animals, or plants; when used as a weapon, they are classified as biological warfare (BW). As with TICs, biological agents may likewise present themselves in industrial applications and, in some instances, result in casualties from the accidental or deliberate release of toxic industrial biologicals (TIBs). Certain unique aspects of medical defense against BW attack make treatment easier than in other mass casualty scenarios. Individuals who become ill do not all become casualties at the same time as dosage variations and host resistance may cause the onset of illness to be spread over a number of hours or days. An exception is an attack with biological toxins that might create an immediate and dramatic mass onset of illness. Casualty treatment in BW operations does not differ basically from that required for patients who suffer from the same disease contracted by natural means. Once the first patients report symptoms, little time is available. Medical procedures, equipment and medications must be in place and ready, with trained personnel available for immediate response. If biological weapons use is suspected, medical care specialists must immediately collect appropriate clinical samples and forward them for analysis and identification. The sooner the cause of the disease is identified and its antidote determined, the sooner appropriate therapy can be administered. Medical personnel also play a critical role in allaying panic. Unfortunately, this can only be done completely when personnel can be assured that the cause of illness is known, the course of the disease described accurately, and the outcome predicted. The medical staff must assure patients that they are receiving the best treatment available. If this assurance is not provided, the reaction of personnel may create an even greater problem than the disease itself.

6.2.2.1 Biological Warfare Agents

Biological warfare agents are most effectively delivered as aerosolized particles one to five microns in diameter in order to target the alveoli or air sacs of the lungs. Larger particles either settle onto environmental surfaces, or are deposited in the upper respiratory tract and are eliminated by normal mucociliary clearance. Due to the aerodynamics of particle flow through the respiratory tract, most particles smaller than one micron in diameter are exhaled and result in inefficient delivery to the lung. Biological agents may also be used to contaminate food or water systems and supplies. The clinical syndromes of many BW agents are similar during the early stages of disease development; classic disease-specific syndromes may not present themselves until later in the clinical course. Intact skin provides an effective barrier against most BW agents, except mycotoxins. However, traumatic wounds or superficial abrasions and simple cuts can provide the necessary portals of entry. In most instances, the disease produced by a BW attack mimics the naturally occurring infectious disease caused by the same pathogen.

Because most biological agents have incubation periods, a BW attack may not be apparent until days or even weeks after the attack has occurred. Therefore, the first indication that a BW attack has occurred may be the large numbers of patients simultaneously presenting with a similar disease. Early identification of a BW attack may be further confounded by difficulties in early clinical diagnosis. Many BW-related diseases can result in vague, nonspecific symptoms during the early stages of illness and will be difficult to differentiate from numerous naturally occurring diseases. Classic, fully differentiated syndromes may not be apparent until late in the clinical course. Other potential confounding factors include lack of clinical experience with potential BW agents, and possible difference in clinical presentations from a naturally acquired disease versus an aerosolized agent. Ongoing disease surveillance and analysis of endemic and epidemic disease trends is critical in the event of covert use of biological agents. Early recognition of the first few cases of disease will enable commanders and medical personnel to implement BW defensive measures. Disease surveillance and analysis must include all military units in the area of operations (AO) to differentiate naturally occurring diseases from intentionally induced disease. The first military members to become ill serve as the benchmark for all other military units. An epidemiological investigation of any disease outbreak is the key to the prompt start of countermeasures. Clinical detection should be accomplished by monitoring daily disease and non-battle injury (DNBI) statistics. Health care providers should log all diagnoses. BW agents are generally classified as bacterial agents, viral agents, and toxins.

6.2.2.1.1 Bacterial Agents

Bacterial agents produce disease through direct tissue invasion, release of factors or toxins harmful to metabolic processes, or both. Agents of greatest concern include the causative organisms of anthrax, plague, brucellosis, tularemia, meloidosis, glanders, and Q fever. Bacterial agents, even weaponized, have incubation periods, and usually mimic, at least initially, common medical maladies. Intact skin resists bacterial invasion and military chemical masks provide respiratory protection. Of the agents of concern, clinicians consider only pneumonic plague transmissible. A food and drug administration (FDA) approved vaccine exists against anthrax. Post exposure prophylaxis also exists against anthrax, plague, and tularemia. Most of the diseases produced by weaponized bacterial agents will have both septic and respiratory components, and treatment includes vigorous supportive care and appropriate antibiotics. Few bacterial agents survive in the open environment for prolonged periods. *Bacillus anthracis (i.e., B. anthracis)* and *Yersinia pestis (i.e., Y. pestis)* are exceptions. *B. anthracis* forms spores under harsh environmental conditions, and has been known to survive for decades. *Y. pestis* may become endemic in the animal population, especially in rodents. Thus, both represent potential continual environmental hazards. Although there is little scientific evidence concerning re-aerosolization of settled bacterial agents, experiences in Russia and the United States suggest that under extraordinary conditions this may occur with *B. anthracis*. Standard infection control precautions are adequate for healthcare workers treating victims of these agents, except that droplet precautions and isolation procedures should be added in the case of victims of pneumonic plague. Victims of pneumonic plague should be quarantined together, and separate ventilations systems from other patients and the crew at large should be used.

6.2.2.1.2 Viral Agents

Viruses of concern include smallpox, encephalitis producing viruses, and viral hemorrhagic fever (VHF) viruses. Viruses are obligate intracellular parasites and multiply within host cells. Few antiviral medications have proven effective against these agents. With the exception of Yellow Fever (i.e., a viral hemorrhagic fever) and smallpox, no vaccines exist. Smallpox produces a generalized progressive skin eruption that progresses from macules to pustules and begins approximately 12 to 14 days after exposure. Massive dehydration, viral sepsis, and a propensity to secondary infections can be expected. The overall mortality amongst those who acquire the disease is 30 percent. Treatment is supportive. Venezuelan Equine Encephalitis (VEE), Western Equine Encephalitis (WEE), and Eastern Equine Encephalitis (EEE) are the principle viruses of the encephalitis-producing viruses. Fatalities are rare, but the diseases result in prolonged hospitalization and recovery. Of the viral hemorrhagic fever viruses, Ebola and Marburg are of greatest concern because mortality, even with treatment, approaches 100 percent. These viruses produce their affects primarily through disruption of the vascular integrity with resultant severe hemorrhaging. Depending on the specific virus, the lung, liver or kidneys may be a target organ of greatest susceptibility. The incidence of disseminated intravascular coagulation is variable and not all VHFs produce marked bleeding disorders. Military chemical masks are protective. Healthcare providers and others in close contact with smallpox victims should use respiratory precautions in addition to standard infection control precautions. Because of the risk of pulmonary hemorrhage and droplet transmission, providers taking care of those with VHFs should use droplet precautions. Patients with smallpox or VHFs should be quarantined together, and ventilation systems should be separate from other patients and the crew at large.

6.2.2.1.3 Toxins

Toxins include the botulinum toxins, ricin, staphylococcus enterotoxin B (SEB), and trichothecene mycotoxins. Botulism produces a progressive descending flaccid paralysis with prominent cranial nerve paralysis. In the most severe cases, the diaphragm and intercostal muscles become paralyzed, resulting in respiratory arrest without mechanical ventilation. Symptoms of ricin intoxication vary with concentration and route of entry, e.g., victims of inhalation intoxication suffer a progressive pneumonitis with myocardial suppression. SEB is the same toxin that produces one form of food poisoning. Inhaled, it produces a pulmonary pneumonitis that is usually acutely debilitating, but rarely fatal. Trichothecene mycotoxins are the only biological agents that are dermally active, and produce the equivalent of a burn of the skin. Treatment consists of removal from the affected area, decontamination, and supportive treatment. An antitoxin exists that may reduce the effects of the botulinum toxin, but limited supplies make the likelihood of its availability during operations unlikely. With the exception of mycotoxins, the military chemical mask will provide sufficient protection.

6.2.3 Radiological and Nuclear Threat

Appendix A provides a general discussion of radiological and nuclear threats and weapons. Information presented in this chapter is intended to provide personnel tasked with providing medical life-saving support general information regarding these threats as applicable to their duties. For a more thorough discussion, personnel should refer to NTTP 3-20.31.79/S9086-CN-STM-020/CH-079V2R2, *Practical Damage Control* (NSTM CHAPTER 079, VOLUME 2).

6.2.3.1 Radiological Weapons

Although personnel may come in contact with ionizing radiation in several different ways, the most likely threat from radiological weapons, also known as radiological dispersal devices or RDDs, will be from conventional explosives in combination with radioactive contaminants. Ionizing radiation may be particulate (i.e., alpha or beta particles or high energy neutrons) or electromagnetic (e.g., gamma radiation). One of the most important principles of protection against radioactive materials is the principle of time, distance and shielding. To significantly reduce the radiological impact on personnel, increase the distance of personnel from the source of the radiation, minimize the time spent near the source of the radiation, and shield personnel through the use of barrier materials such as concrete or soil while in the field or seek deep shelter within the ship. Intact skin is protective against alpha particles. Beta particles in general cannot penetrate clothing. The principle risks from these forms of radiation are through ingestion or inhalation. MOPP IV is protective against both alpha and beta radiation; whereas only a lead apron or the like can protect against gamma radiation.

High-energy neutrons can penetrate military overgarments, and require substances with great energy absorption, such as concrete, water, or paraffin to protect against them. Gamma radiation likewise can penetrate clothing, including MOPP garments. Lead shielding will absorb most gamma radiation except in high concentrations. Excessive exposure to radioactivity acutely produces Acute Radiation Syndrome (ARS), in a dose-dependent fashion. ARS requires large doses of penetrating whole body radiation over a relatively short period of time. The three classic ARS syndromes are hematopoetic, gastrointestinal, and cardiovascular or central nervous system. At lower doses (e.g., 70 to 1000 rads), bone marrow suppression occurs, which results several days after exposure in immunocompromise and increased susceptibility to infection. At larger doses (e.g., 1000 to 10,000 rads), sloughing of the lining of the gastrointestinal tract also occurs, with subsequent fluid loss, nausea and vomiting, and infection. At highest doses (e.g., ~5000 rads), death occurs within three days due to cardiovascular collapse or cerebral edema. Depending on the dose, four phases of ARS may be seen – prodrome, latent, manifests illness, and recovery or death. Treatment includes removal from the area of exposure, emergency stabilization, decontamination, and supportive therapy. Medical personnel must clearly understand that radiologically exposed or contaminated patients are not a hazard to providers and that medical treatment for life-threatening injuries is their highest priority. In civilian radiation accidents, no responder has ever been injured as the result of exposure to radiation from a contaminated individual, i.e., second-hand radiation. Care providers must remember to always treat life-threatening injuries, e.g., severe trauma, shock, hemorrhage, and respiratory distress, first. Adequate decontamination of personnel can be accomplished using clothing removal and soap and water. For further information regarding the initial management of irradiated or radioactively contaminated personnel, see Bureau of Medicine Instruction (BUMEDINST) 6470.10 series.

6.2.3.2 Nuclear Weapons

Radiological contamination and exposure resulting from detonation of a nuclear weapon is a secondary weapons effect; the primary effects are blast injuries (e.g., blast wave effects, shrapnel, thermal injuries, blunt trauma and shock). The same principles of radiation protection and treatment apply to radiation from nuclear weapon exposure as to exposure from radiological weapons and sources. Nuclear detonations also release into the atmosphere particulate radiation, or “fall-out” which may result in environmental hazards. During nuclear reactions, radioactive isotopes may be released that may chemically react and incorporate into the body substituting for their non-radioactive counterparts. The most significant of these are radioactive Iodine, Cesium, and Thorium. For example, radioactive iodine is usually released in reactor criticality accidents and may be taken up by the thyroid gland, thus increasing the risk of subsequent thyroid cancer among certain age groups. Potassium Iodine (KI) if taken immediately is protective against the release of radioactive iodine. However it has no protective effect against other radioisotopes.

6.3 APPROACHES TO CBRN CASUALTIES

Because of the unique properties of CBRN agents and weapons, medical personnel require a firm understanding of the pathogenesis, methods of transmission (i.e., biological) or contamination (i.e., radiological/chemical), diagnostic modalities, and available treatment options for each of the potential agents. Acquisition of such an understanding is relatively straightforward once the identity of the agent is known; however evaluation and management of a casualty before identification of the causative agent may be complex and problematic. A detailed discussion of the various aspects of the treatment of CBRN casualties can be found in FM 4-02.283/NTRP 4-02.21/AFMAN 44-161(I)/MCRP 4-11.1B *Treatment of Nuclear and Radiological Casualties*, FM 8-284/NAVMED P-5042/ NTRP 4-02.23/ AFMAN (I) 44-156/MCRP 4-11.1C *Treatment of Biological Warfare Agent Casualties*, and FM 8-285/ NAVMED P-5041/ AFMAN 44-149/ FMFM 11-11, *Treatment of Chemical Casualties and Conventional Military Chemical Injuries*. The following general procedures should be considered and are recommended:

1. Maintain an index of suspicion. Regardless of the agent employed, a common denominator in all such events will be a similarity in symptoms among a large number of casualties. Awareness of an increasing number of victims with similar syndromes, or a single casualty with unique or worsening symptoms unexpected in the theater of operations, should prompt caregivers to initiate a more thorough investigation.

2. Ensure personal protection. Certain diseases caused by BW agents are highly communicable. Contaminated casualties may spread the hazardous material to responders and providers who are not adequately protected. Appropriate use of medical countermeasures; whether it is pre- or post-event prophylaxis or personal protective equipment will ensure that medical providers do not themselves become victims.

3. Perform patient assessment. Initial assessment and triage should always be performed in CBRN mass casualty events. Minimal but life saving treatment may be instituted even prior to decontamination. Victims of radiation exposure pose little risk to providers even before decontamination, if the delay in decontamination is kept to a minimum.

4. Decontaminate as appropriate. The single most important therapeutic and protective event is decontamination of victims. Decontamination will stop victims from further exposure and prevent healthcare providers from being exposed as well. Casualties of BW agents most likely will not require decontamination if a delay exists between exposure and onset of symptoms. However, if in doubt, decontamination should be performed as soon as possible. Today's multi-threat environment of potential binary weapons (i.e., chemical and biological agents in a single weapon) should lead decontamination teams and initial responders to error on the side of safety.

5. Establish a presumptive diagnosis. Although initial symptoms of biological agent attacks may mimic more benign conditions, in a situation in which many victims present with similar symptoms, at some point a pattern will be identified, and this pattern will significantly limit the differential diagnosis if a CBRN event is suspected. In most cases, an error in presumptive diagnosis may delay more appropriate treatment, but such a course of action may be preferable to no diagnosis with subsequent worsening of victims' conditions. Definitive laboratory analysis may take undue time, or may be totally unavailable in certain conditions. Figure 6-1 provides guidance in initial diagnosis of undifferentiated chemical and biological casualties.

6. Render prompt treatment. Appropriate treatment based on presumptive diagnosis should be instituted as soon as possible. In almost all cases of disease caused by CBRN agents, supportive care is a major part of treatment. A relatively select group of antibiotics works against most biological agents. With the exception of nerve agent exposure, no antidotes exist for chemical agents. Newer medications for ARS

primarily target immunosuppression, which is a delayed consequence of radiation exposure. Thus, initial treatment is again supportive.

7. Practice good infection control. Regardless of the CBRN agent, the casualty will be more susceptible to secondary infections. Primary routes of entry will be through damaged skin by such agents as vesicants, smallpox, trichothecene mycotoxins; gastrointestinal tract vesicants; radiation; or the respiratory system. In the case of communicable diseases caused by biological pathogens, infection control is also necessary to prevent spreading the disease to unaffected crewmembers.

CASUALTY	SYMTOM ONSET	LIKELY CAUSE
Respiratory	Rapid	Nerve Agents
		Cyanide
		Mustard
		Lewisite
		Phosgene
		SEB Inhalation
	Delayed	Inhalational Anthrax
		Pneumonic Plague
		Pneumonic Tularemia
		Q fever
		SEB Inhalation
		Ricin Inhalation
		Mustard
		Lewisite
		Phosgene
Neurological	Rapid	Nerve Agents
		Cyanide
	Delayed	Botulism-peripheral symptoms
		VEE-CNS symptoms

Figure 6-1 Diagnostic Matrix for Chemical and Biological Casualties

8. Alert the Chain of Command. If at any time a casualty is suspected of being caused by a CBRN agent, higher authority should be notified at once. This is important in that it may allow mobilization of supporting resources, such as Theater Army Medical Laboratory or Forward Deployable Preventive Medicine Unit personnel, to assist in diagnosis and investigation. It will also allow commanders to re-evaluate the intelligence and threat assessment, and corresponding MOPP-level being enforced.

9. Assist in the Epidemiological Investigation. All health care providers require a basic understanding of epidemiological principles. Even under austere conditions, a rudimentary epidemiological investigation may assist in diagnosis and in the discovery of additional victims. Clinicians should query patients about potential exposures, other sick unit members, food/water sources, unusual munitions or spray devices, vector exposures, and develop a line listing of potential cases. Outside the expeditionary strike group (ESG)/amphibious ready group (ARG)/carrier strike group (CSG), preventive medicine officers, field sanitation personnel, epidemiology technicians, environmental science officers, and veterinary officers can be made available to assist the clinician in conducting an epidemiological investigation.

10. Maintain Proficiency. Although the threat of a CBRN event occurring may be a low probability, it has a tremendously high impact. Failure to practice casualty management can lead to a rapid loss of skills and knowledge. Providers must therefore maintain proficiency in dealing with this particular type of threat.

6.3.1 Medical Surveillance

Medical surveillance plays a critical role in the early identification of maladies and in particular a biological attack. Any unusual occurrence of multiple simultaneous cases of illnesses with similar presenting symptoms, especially within regions with higher likelihood of biological attack should prompt the medical staff to consider biological agents as a potential source.

The US Army Medical Research Institute for Infectious Disease (USAMRIID), Medical Management of Biological Casualties Handbook, provides a detailed description of the clinical signs that occur with each of the biological agents. Medical surveillance can only be effective if the system responds quickly and decisively to medical trends. Although it may be too late for medical countermeasures to help individuals who already show symptoms, the trend can alert the medical system to initiate protective measures such as vaccines or antibiotics, for those who are exposed but not yet sick. Medical personnel will:

1. Separate and report promptly any items that are unusual by nature or appearance and report their existence through command channels. BUMEDINST 6220.12 series provides instructions for preparing and submitting Medical Event Reports (MERs) and applies to all ships, stations, and units of the Navy, Marine Corps, and Military Sealift Command providing outpatient or inpatient medical care. An OPREP-3 (i.e., Operational Report-3) NAVY BLUE report and message are also required with any medical event of high level Navy interest or affecting operational readiness. Naval Disease Reporting System (NDRS) software for efficiently making MERs is available from the Navy Environmental Health Center (NEHC) website at http://www-nehc.med.navy.mil/prevmed/epi/ndrs.htm.

2. Alert the commanding officer any time the unit sick rate doubles within a 48-hour period, or if any other unusual event related to personnel health takes place.

6.3.2 Prevention

Most morbidity and mortality due to CBRN agents are generally preventable. As discussed in Chapter 3, methods of prevention include personal or collective protection and medical countermeasures. The medical countermeasures may include immunizations, pre-exposure prophylaxis, and post-exposure prophylaxis.

6.3.2.1 Immunizations

Personnel will be directed to have all required immunizations administered prior to entering an AO where BW agent employment is a threat. Some immunizations are used in conjunction with pre-exposure chemoprophylaxis or post-exposure chemoprophylaxis to provide protection.

All immunizations should be administered in sufficient time to provide the initial protection before personnel are deployed to the AO; when administration prior to deployment is impossible, personnel must receive the immunizations as soon as the mission permits in the AO. Supporting (i.e., preventative health services/preventative medicine (PHS/PVNTMED)) units/staffs can assist commanders in determining which specific immunizations and chemoprophylaxis are required for the AO. The commander expeditionary strike group (CESG) and/or commander amphibious task force (CATF) and commander landing force (CLF) will decide whether to begin, continue, or discontinue the administration of chemoprophylaxis based on the BW threat. The intelligence officer, chemical officer, and surgeon advise the commander on appropriate courses of action. Vaccines are currently available against smallpox and anthrax.

The smallpox vaccine consists of reconstituted live vaccinia virus. The vaccine is administered percutaneously by scarification with a bifurcated needle. Immunity against smallpox is identified by a successful “take,” indicated by the formation of a local pustule followed by a pitted scar at the site of inoculation. Contraindications to the vaccine include known hypersensitivity to bacteriostatic antimicrobials contained in the diluents; history of psoriasis, eczema, or certain other skin disorders; pregnancy; history of heart conditions; immuno-compromised states; and use of steroids. Vaccinia Immune Globulin (VIG) may be used in conjunction to counter many sequelae of vaccination but availability is currently very limited. Vaccinia may be transmitted person-to-person by contact or may be implanted at other sites (e.g., eyes, genitalia) through autoinoculation. Immunity may be conferred for decades, but re-vaccination every three years is recommended by the Centers for Disease Control and Prevention.

The anthrax vaccine stimulates immunity by triggering antibodies to one of the three toxic protein factors (e.g., Protective Antigen (PA)), derived from a culture filtrate of an avirulent (i.e., non-disease causing) strain of *B. anthracis*, the causative organism of anthrax. The vaccine contains no live microorganisms. Six doses are required to confer immunity, although partial immunity may occur prior to completion of the schedule. The schedule for vaccine administration is shown in Figure 6-2. An annual booster is required to maintain immunity thereafter.

Dose	Time
Initial	Initial
Second	2 weeks
Third	4 weeks
Fourth	6 months
Fifth	12 months
Sixth	18 months

Figure 6-2 Anthrax Vaccine Schedule

6.3.2.2 Pre-Exposure Prophylaxis

Pre-exposure administration of antimicrobials is effective in the prevention of diseases caused by certain biological warfare bacterial pathogens. No antivirals currently exist with efficacy against viral pathogens. Pre-exposure antibiotic usage may be preventive against anthrax, plague, and tularemia with the latter based on in vitro studies.

6.3.2.3 Post-Exposure Prophylaxis

While vaccination before exposure provides a high standard of medical protection from a specific biological agent, vaccination after exposure can be an effective medical alternative for some agents. General treatments are available for many agents after a BW attack, but in most cases, treatments must be applied before the onset of symptoms. Treatments administered after exposure but before the onset of symptoms are referred to as post-exposure prophylaxis or preventive treatment. Medical planning, training, organization, infrastructure and equipment/supplies must be in place in advance for any medical countermeasure responses to be effective. In most cases, preventive treatments will only be initiated if the attack is detected before the onset of symptoms. This is problematic in a threat environment where covert attacks are possible. Attacks using toxins are more difficult to address because toxins generally act more quickly than pathogens, leaving less time for detection, identification and evaluation before large segments of the population fall ill. Appendix H, Figure H-1, developed by the U.S. Centers for Disease Control and Prevention (CDC), lists critical bioagents and associated post-exposure chemoprophylaxis.

6.3.3 Levels of Care

Consistent with Joint Publication 4-02, *Doctrine for Health Service Support in Joint Operations*, five levels of care are recognized:

1. Level I care includes buddy aid and first aid, the latter normally provided in battle dressing stations or within the ship's medical department spaces. Basic life support procedures and the administration of antidotes should be available at Level I locations.

2. Level II care includes physician-directed resuscitation and stabilization and may include advanced trauma management, emergency medical procedures, and forward resuscitative surgery. Supporting capabilities include basic laboratory, limited x-ray, pharmacy, and temporary holding facilities. Patients are treated and returned to duty, or are stabilized for movement to a facility capable of providing a higher level of care. All amphibious ships have this as a minimum capability.

3. Level III care is administered that requires clinical capabilities normally found in a facility that is typically located in a reduced-level enemy threat environment. The facility is staffed and equipped to provide resuscitation, initial wound surgery, and postoperative treatment; LHAs and LHDs may have this capability. Hospitals ships and Fleet Hospitals are classified as Level III facilities.

4. Level IV care in addition to providing surgical capabilities found at Level III, provides rehabilitative and recovery therapy for those who can return to duty (RTD) within the theater patient movement policy. This level of care may only be available in mature theaters, either through Host Nation hospitals or military communications zone facilities.

5. Level V care includes the full range of acute convalescent, restorative, and rehabilitative care and is normally provided in CONUS by military and Department of Veterans Affairs hospitals, or civilian hospitals that have committed beds for casualty treatment as part of the National Defense Medical System.

6.3.4 Public Health Emergencies and Quarantine Regulations

A Public Health Emergency may be declared with the occurrence or imminent threat of illness or health condition, caused by biological warfare or terrorism, epidemic or pandemic disease, or highly fatal infectious agent or biological toxin, that poses a substantial risk of a significant number of human fatalities or severe disabilities. During a declared Public Health Emergency the ESG/ARG (i.e., amphibious ready group) commander and commanding officer of a ship will comply with sanitary measures prescribed by the health authorities in the port of departure or arrival to prevent the embarking or disembarking personnel infected with a quarantineable disease or the introduction on board the ship or ashore of possible agents of infection or vectors of a quarantineable disease. The quarantineable diseases are cholera, plague, and yellow fever. The U. S. Public Health Service, under the authority of an Executive Order signed by the President of the United States (i.e., E.O. 12453 of December 22, 1983) and Code of Federal Regulations (CFR) Part 71, has the authority to detain, isolate, or place under surveillance individuals believed to be infected with the afore stated diseases as well as diphtheria, infectious tuberculosis, suspected smallpox, and suspected viral hemorrhagic fevers (i.e., Lassa fever and Marburg, Ebola, Congo-Crimean, and other not yet isolated or named fevers). During a declared Public Health Emergency restriction of movement of personnel may be instituted to prevent the spread of communicable diseases. Consultation with the regional cognizant Navy Environmental and Preventive Medicine Unit or Navy Environmental Health Center is highly recommended. In addition, public health quarantine procedures are required for ships which, in the last 15 days prior to arrival in the United States or since departure from the last U.S. port (whichever period is shorter) have or have had any embarked personnel or crewmember exhibit any of the following conditions or illnesses:

1. Have a temperature of 100°F (38°C) or greater accompanied by a rash, glandular swelling, or jaundice, or which persisted for more than 48 hours.

2. Has diarrhea, defined as the occurrence in a 24-hour period of three or more loose stools or of a greater than normal (for the person) amount of loose stool.

3. Death due to illness other than battle casualties or physical injuries.

When one or more of the above conditions exist, the ESG/ARG commander or commanding officer of the ship will, between 12 and 72 hours prior to arrival, forward a radio report or message of conditions to the senior naval officer in command at the port of arrival. For ships of other Armed Forces, the report will be sent to such authority as appropriate and to the local port authority. Send information copies to the military quarantine inspector and to the responsible preventive medicine service in the port area. A reply confirming receipt of the radio message or report will be made if circumstances indicate and will contain applicable quarantine instructions. Unless otherwise indicated in the reply, a ship may proceed directly to berth and begin normal business activity. This quarantine procedure does not exempt a ship from control measures or public health inspection subsequently deemed necessary, or from the requirements of other government agencies. When illness is reported or if the ship has been in a plague-infected country, appropriate inspections may be required. For further guidance refer to Secretary of the Navy Instruction (SECNAVINST) 6210.2 series and DoD Directive 6200.3 series.

6.4 MEDICAL PLANNING

Prudent medical planning assists operational commanders in determining the risk to mission capability from the use or threatened use of CBRN weapons. The presence of chemical or biological agents or radiological contamination, or just the threat of exposure to one of these hazardous environments forces an activity, whether afloat or ashore, into a protective posture that will eventually degrade its capability to accomplish its mission. Contamination avoidance is the preferred method of prevention. The CESG, CATF and CLF will plan, train, equip, and organize for the possibility of operating in a contaminated battlespace. The key to minimizing the impact is to use defensive equipment and countermeasures that are appropriate for each type of hazard. Employing protective measures that are unnecessary or exceed the appropriate MOPP level are costly, waste valuable manpower and should be avoided as much as possible.

6.4.1 Casualty Management vs. Threat Assessment

Careful and accurate assessment of the potential of attack with CBRN agents is essential to develop a plan for casualty management. Obtaining medical and operational intelligence from various sources will provide information regarding possible agents that could be encountered, potential for use and casualty estimates based on the type of operations that are planned. Threat assessments concerning CBRN use in amphibious or expeditionary operations must not only evaluate use against forces afloat or deployed ashore, but must include the vulnerabilities and risks of introduction of these hazards to afloat forces through inadvertent return of contaminated or exposed personnel or equipment. The consequences of such an introduction must be clearly articulated to the CESG and/or CATF and CLF to assist them in making effective operational risk management decisions to either minimize the probability of such an introduction or reduce the ramifications should this occur. Inclusion of medical intelligence personnel in all phases of Intelligence Preparation of the Battle space (IPB) and planning for recovery operations will ensure CBRN agents have marginal effects on amphibious or expeditionary operations.

6.4.2 Material Resources

Resource requirements and availability determination must be part of the planning process and the following items should be considered:

1. The ship's authorized minimum medical allowance list (AMMAL) is based on anticipated requirements, which may not include sufficient supplies in the event of a CBRN incident affecting ship's company personnel. Similarly, a ship's AMMAL is not designed to support embarked forces. Medical departments should attempt to obtain, based upon anticipated operations and medical intelligence, additional supplies or supplies not included in the AMMAL.

2. A complete inventory of available antidotes, pretreatments, and antibiotics that may be required in the event of a CBRN incident should be conducted early in the pre-deployment work-up cycle. The CESG/CATF Surgeon or senior medical officer should develop a force-wide database of available supplies.

3. Deliberate planning for expeditionary operations in a potential CBRN environment may reveal gaps in required supplies. These gaps will depend on the anticipated threat agents, the theater medical evacuation policy, and the availability of supporting levels of care in proximity to the operations area and medical evacuation resources. Gaps should be addressed to the theater surgeon through appropriate channels.

6.5 HEALTHCARE OPERATIONS

Recovery operations in a CBRN environment are likely to produce the need to activate mass casualty procedures. Usually the primary casualty receiving ship is the recipient of patients, however in the situation where there are split ESG operations or an overwhelming situation, other ships may be called upon to assist; accordingly, all ships need to have plans in place to accept patients. Regardless of the platform selected to receive casualties during a mass casualty situation complicated by exposure to CBRN, the management of the patient flow remains supportable if the basic principles practiced during regular medical casualties are applied. In general, units can expect that there will be some changes in operations because of the number of personnel that may be available to assist, or differences brought about by ship-specific locations and layout of decontamination versus the location of treatment space, and/or areas for staging patients before and after treatment. In order to support these operations, the CATF Surgeon and senior medical department personnel, working in conjunction with staff planners and the CBRN management cell, will advise the commanders of a prioritized plan for patient movement; having assessed each ship's capabilities. In summation, before receiving casualties, each ship must develop specific decontamination and treatment plans that draw upon efforts practiced during training.

6.5.1 Patient Flow and Management

Patient flow and management is essential to ensuring injured personnel receive prompt and appropriate medical attention; without risking those personnel tasked with providing life saving support or routine operational duties in support of the unit's mission. It is a process that can be broken down into five stages: Arrival, Decontamination, Triage, Treatment, and Disposition. The underlying goal of this process is to ensure that no contaminated patient who arrives on the flight deck or in the well deck is knowingly taken into interior spaces without action being initiated to minimize the potential for spreading contamination. Coordination by several departments and embarked units in the ship is necessary to accomplish all of the components of each stage.

6.5.1.1 Arrival

Patients who are received from a known CBRN environment must be considered contaminated upon their arrival at a ship. Although current doctrine dictates they will be decontaminated while ashore, the operational situation and battlefield conditions may not always allow this to occur. Hence, a steady flow of information to the ship from medical personnel ashore is vital in determining the nature of the casualties being transported and to where are they being sent. However, it must be realized that sometimes communications may not occur and patients could arrive unannounced and contaminated. To ensure the safety of personnel, security forces should be positioned at arrival points.

6.5.1.1.1 Flight Deck

When receiving casualties that arrive by helicopter, it is best to utilize the aft portion of the flight deck with the ship steering into the wind in order to minimize the risk to the ship and crew. Often it will be necessary to move equipment forward to allow adequate room for the initial decontamination to occur. Personnel on the flight deck should be in MOPP gear and precautions made to contain contamination as much as possible. Two lines of decontamination should be made if space allows; one for "walking wounded" and minimally injured patients and another for patients on litters.

6.5.1.1.2 Well Deck

Casualties arriving in the well deck will need to be decontaminated as soon as possible and prior to transferring them to medical spaces. A hot line will need to be established on the ramp or "steel beach" and stations for decontamination set up with showers or hoses. Special methods specific to each platform must be considered to prevent further contamination created by engine exhaust and/or propeller wash.

Note

> Security personnel should be in MOPP gear and are responsible for removing weapons, military gear, and ordnance from casualties prior to decontamination. They are also required to contain and monitor any Enemy Prisoners of War (EPW) or civilians.

6.5.1.2 Decontamination

The separation of walking wounded from litter patients is the first step in the proper control of decontaminating personnel. Contaminated ambulatory patients can be decontaminated without medical intervention thus preventing unnecessary contamination of medical facilities. CBRN casualties received at a medical treatment facility (MTF) may also have traumatic wounds or illnesses due to other causes. Management of these patients must focus on minimizing the CBRN agent injuries without aggravating traumatic wounds or illnesses. For contaminated casualties who have traumatic injuries or other illnesses, decontamination should be accomplished as soon as the situation permits. Lifesaving measures for a traumatic injury or some illnesses must be given priority over immediate decontamination, may increase the CBRN agent illness or injury. Figure 6-3 provides a suggested flow path of patients for an LHD flight deck and well deck; note, flow paths can be replicated on most other classes of ships.

6.5.1.3 Triage

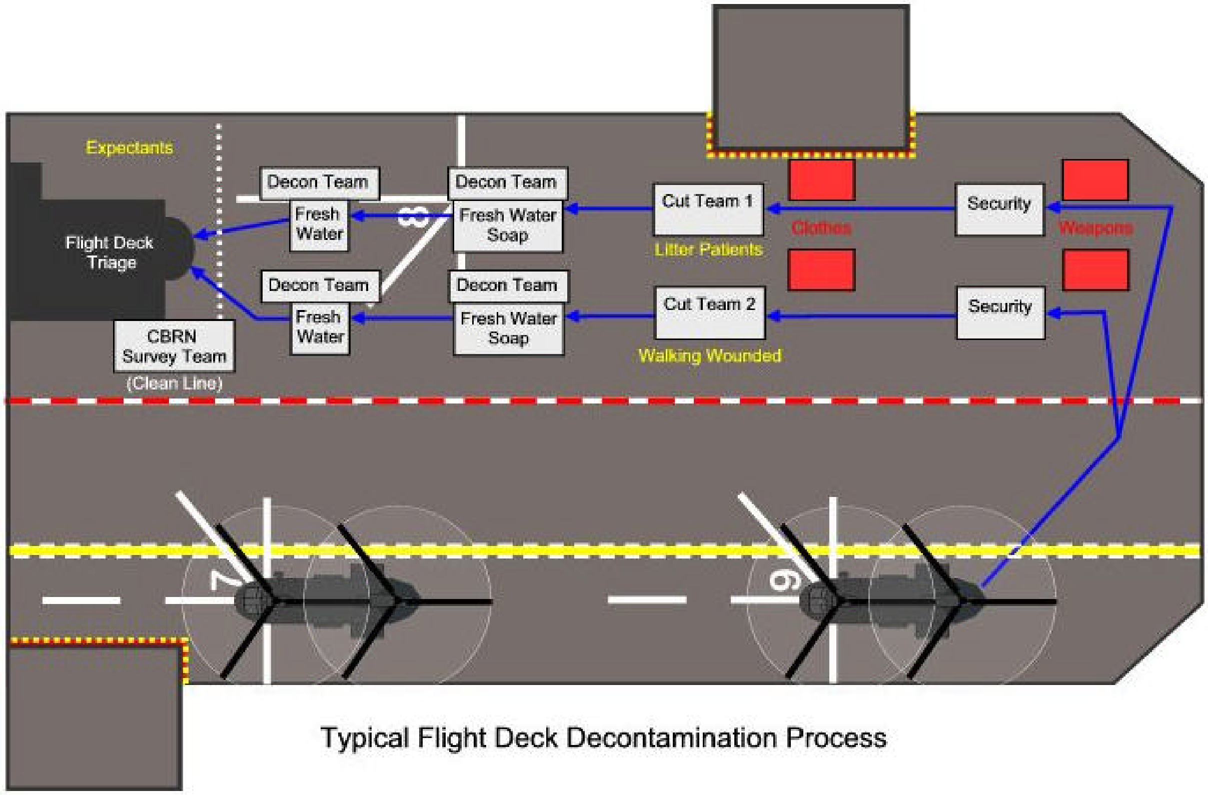
Triage of arriving casualties is extremely important. A decision is made whether emergency medical treatment (EMT) or decontamination of the casualty requires priority. Airway management and/or control of hemorrhage may be equal to or more urgent than treatment for CBRN exposure. Therefore, EMT measures may have to be performed in rapid sequence with decontamination or by simultaneous team actions. Again, for life threatening situations, an important concept is to triage dirty and provide lifesaving intervention during decontamination.

6.5.1.4 Treatment

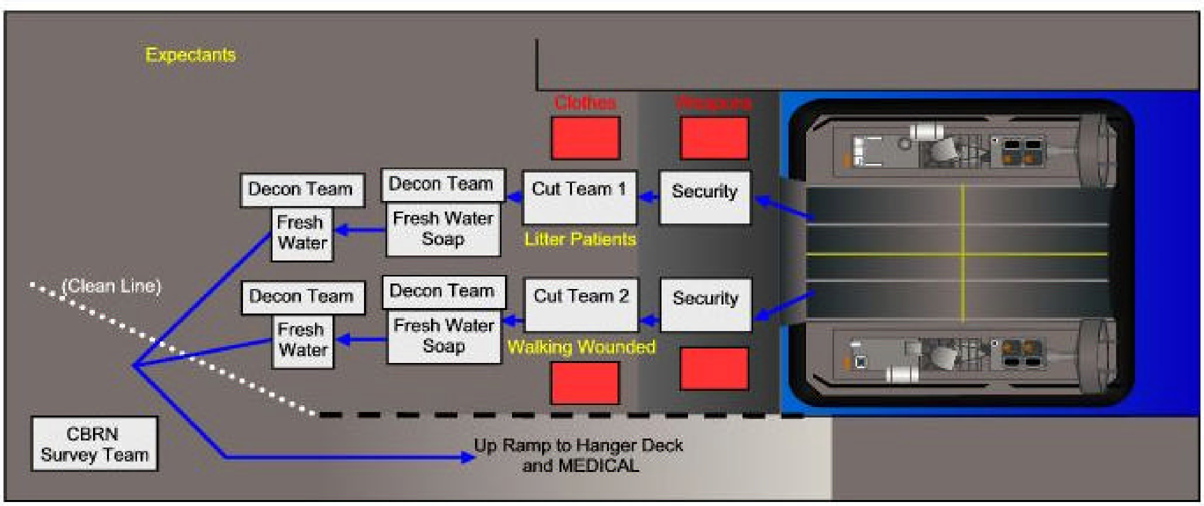
When a contaminated casualty has another injury or illness resulting in respiratory difficulty, hemorrhage, or shock, the order of priority for emergency action is to control respiratory failure (i.e., provide assisted ventilation) and/or massive hemorrhage, decontaminate the casualty, and then administer additional EMT for shock, wounds, and illnesses so severe that delay may be life or limb threatening.

6.5.1.5 Disposition.

Casualties unable to continue wearing protective equipment should be supported within a collective protection system or held and/or transported within patient protective wraps designed to protect the patient against further chemical-biological agent exposure as well as protection from hypothermia. For disposal of contaminated clothing from patients, refer to Chapter 3. Evacuate the casualty as soon as possible, if necessary.



Typical Flight Deck Decontamination Process



Typical Well Deck Decontamination Process

Figure 6-3 LHD Flight and Well Deck Decontamination Processes

6.6 SAMPLING REQUIREMENTS

Rapid collection and processing of specimens are essential in establishing a definitive diagnosis after a CBRN attack. These specimens will confirm or deny clinical suspicions and guide medical treatment from empiric to specific regimens. Attempts to perform early diagnosis based on clinical manifestations and rapid laboratory diagnostic tests serve to provide medical evacuation personnel additional information in order to protect themselves and patients from possible exposure to contagious diseases. Specimens must be handled in a careful, standardized manner to ensure accuracy of diagnosis as well as an association with the patient affected.

6.6.1 Specimen Collection

The proper collection of specimens is dependent on the time frame following exposure. Specimen collection is described for "early post-exposure, clinical, and convalescent/terminal/postmortem" time frames. These times are not rigid and will vary according to the concentration of the agent used, the agent strain, and predisposing health factors of the patient. For example, a blood culture with routine media will readily detect many bacterial agents, although specialized media may be required for some. Both aerobic and anaerobic cultures should be obtained. Cultures and impression smears should be taken from involved lymph nodes, sputum, pleural fluid, cerebrospinal fluid (CSF), tissues, or body fluids as clinically indicated.

All serum samples should be completely labeled with patient's name, numerical identifier, unit, date, originating medical facility, and medical treatment facility (MTF) to receive results – if different from submitting facility. Routine laboratory slips should be included with each sample. Data on laboratory slips should include the number of days since the onset of symptoms and the reason the samples were obtained. Clinical and operational data should be included for all samples, together with a form to establish chain of custody. This requirement must be strongly and clearly delineated since evidence may well be politically or militarily sensitive.

6.6.2 Specimen Handling and Shipment

All specimens from suspected casualties should be submitted through the designated laboratory chain for processing. Specimens must be clearly marked for special testing and the chain of custody procedures maintained. Each sample/specimen will be prepared and packaged as outlined in Chapter 5. Serum specimens will be placed individually in a second plastic vial or zip-top bag to prevent leakage. Absorbent material (e.g., vermiculite) sufficient to absorb the entire content of the primary receptacle is to be placed between the primary and secondary packaging; for serum specimens placed in a plastic vial, the absorbent material will be placed between the plastic vial and another secondary packaging material. The secondary packaging should be of a material that prevents leakage. The entire contents should be placed in an insulated shipping container with cold packs or dry ice. When ice is used, the outer package must be leak proof. When dry ice is used, the outer container must permit release of carbon dioxide gas. For transportation out of theater, the samples/specimens must be packaged in an International Air Transportation Association (IATA) or Department of Transportation 49, Code of Federal Regulation 173 approved container.

It is the responsibility of the physician at forward MTFs or the laboratory officer, in concert with a physician at a hospital, to ensure suspect specimens are submitted correctly and expeditiously to a diagnostic laboratory. Specimens sent rapidly (i.e., less than 24 hours) to analytical laboratories require only wet ice or refrigeration at 2° to 8° Celsius. However, if the time span increases beyond 24 hours, contact the USAMRIID; telephone hot line at 1-888-USA-RIID for other shipping requirements such as shipment on dry ice or in liquid nitrogen. Chapter 5 provides additional guidance on handling and shipment procedures, as well as chain of custody requirements.

Note

Blood specimens: Several choices are offered based on availability of the blood collection tubes. Do not send blood in all the tubes listed, but merely choose one. Tiger-top tubes that have been centrifuged are preferred over red-top clot tubes with serum removed from the clot, but the latter will suffice. Blood culture bottles are preferred over citrated blood for BW cultures.

6.7 MORTUARY AFFAIRS

Mortuary affairs are a logistics function, but it is important for HSS personnel to be familiar with the procedures related to the handling and movement of human remains as well. In war and operations other than war, geographic combatant commanders will determine if and when operational constraints necessitate a transition to a program of temporary interment in the area of responsibility. When military necessity or other factors prevent the evacuation of the remains of US military and civilian personnel, friendly, third country, or enemy dead, the remains will be temporarily interred according to established procedures; and as directed by the geographic combatant commander. All interments performed within the scope of such a program are temporary, except for at-sea disposition. The CESG and/or CATF, CLF, or the ship's captain, when at sea, may authorize burial only when the preservation capability is unavailable aboard ship or when transfer to shore is not timely or operationally possible. Disinterment may commence when evacuation of the remains is operationally acceptable. Cremation is not considered an option unless specifically directed by higher authority. The recovery, evacuation, tentative identification, and final disposition of deceased military and civilian personnel under the jurisdiction of the Armed Forces of the United States are command responsibilities. For humanitarian, health, and morale reasons, this policy may be extended to the local populace fatalities. Additional guidance can be found in Chapter 5 and in DoD Directive 1300.22 of February 2000 and Joint Pub 4-06, *JTTP Mortuary Affairs in Joint Operations*, 28 Aug 1996.

6.8 MEDICAL EVACUATION (MEDEVAC)

During recovery operations, the need to move injured personnel who may be or who are contaminated will most likely begin with the operations ashore. As discussed in Chapter 3, guidance regarding contaminating assets should be sought and received prior to the outset of any operation; still, situations may occur when such contamination and conditions were not anticipated. Thus, once casualties occur in a CBRN environment, the decision to evacuate such personnel will always be made against a review of the capabilities that might be found in the forces ashore versus that which can be provided afloat. When the capabilities or the situation dictates that personnel will need to be evacuated to a shipboard medical treatment facility, the process to assess the potential contamination of assets will be activated. Medical planners and CBRN management cells should consider such factors as where the forces are relative to the coastline and the nature of the injuries versus the speed of transport required. Additionally, when contaminated casualties are embarked, situations are certain to develop where the shipboard medical facilities' capabilities within an ESG/ARG or CSG will be exceeded by the symptoms or conditions manifested in the CBRN casualties. In such cases, it will be necessary to consider and complete a MEDEVAC to an outside facility.

Before attempting any movement of casualties, unit and medical personnel will act to prepare these personnel for transfer. Contaminated or potentially contaminated casualties should be decontaminated prior to medical evacuation; however, instances may occur when patients will need to be evacuated that have not been completely decontaminated. In such cases, measures must be taken to prevent contamination of vehicles and air and surface borne evacuation assets. Loadmasters should always keep rotor wash of helicopters in mind when evacuating patients, especially in a contaminated environment. Intense winds will undoubtedly disturb the contaminants causing increased vapor hazards. Commanders must evaluate the situation and make a determination as to which assets they will commit in the contaminated environment. Once patients are decontaminated, further MEDEVAC decisions should be based on the actual or suspected clinical diagnosis as well as the patient's condition. When BW agents are suspected, it will be necessary to remain mindful that the incubation times are variable; and all patients should be considered potentially communicable during transport. As a minimum, universal precautions outlined in the CDC "*Guidelines for Isolation Precautions in Hospitals*" will be followed. If plague, smallpox, and viral hemorrhagic fevers can be reasonably excluded on the basis of analysis of clinical specimens and environmental samples, patients may be evacuated using standard precautions.

6.8.1 Special Considerations

Biological warfare attacks may occur with multiple agents with short and prolonged incubation times (e.g., botulinum toxin, 12 to 36 hours and smallpox, 7 to 17 days). Multiple agents can lead to the presence of co-infection, e.g., acute illness with short incubation and incubating smallpox that may declare itself after patients have been evacuated for evaluation/treatment of the short incubating disease. Therefore, consideration should be given to quarantining patients for 17 days after MEDEVAC from the BW area if plague or smallpox cannot be excluded. Re-evaluate patients carefully for recurrent fever or other changes in clinical status. If clinical or laboratory findings suggest prodromal or syndromic smallpox, plague, or VHFs, institute appropriate isolation until the diagnosis is clarified.

Many BW agent casualties may be safely evacuated using basic infection control guidelines. Plague, smallpox, and the hemorrhagic fevers pose significant challenges. These patient movements will require approval of the destination country, over-flight privileges, and approval of any country where the aircraft will land for servicing or where patients will remain overnight. Countries from which approval is sought are bound by Article 37 of the Geneva Conventions for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field of 12 August 1949 to ensure humanitarian treatment to wounded and sick. That should include approval under most circumstances of transit of those injured by exposure to biological agents. Additionally, some countries, notably Germany, have already developed procedures for expedited approval of transit of dangerous/hazardous goods in their air space. That information is contained in the DoD Foreign Clearance Guide. Coordination between the theater or U.S. Transportation Command (USTRANSCOM) commander/surgeon and the Department of State is required for such movements. Specific control measures must be applied as presented for the following diseases/BW agent casualties:

1. Plague is an internationally quarantineable disease (IQD). Do not evacuate across international borders unless authorized by the theater surgeon. Evacuate in cohorts of plague patients only on dedicated aeromedical evacuation (AE) aircraft; treat in theater. Pneumonic plague is highly transmissible person-to-person. Droplet precautions are added to standard precautions for patients with pneumonic plague until sputum cultures are negative.

2. Smallpox is no longer listed as an IQD; it is currently considered to be eradicated. However, samples exist in some laboratories that could be compromised. Accordingly, if suspected, immediately notify the operational and administrative chains of command as well as the medical chain of command upon diagnosis. Do not evacuate across international borders unless authorized by the theater surgeon. Evacuate in cohorts of smallpox patients only on dedicated AE aircraft; treat in theater. Smallpox is transmissible person-to-person. Strict quarantine is required. Standard, contact, and airborne isolation precautions are to be observed. All contacts should be vaccinated and quarantined/grouped together for at least 17 days following the most recent exposure.

3. Viral hemorrhagic fevers are not required to be quarantined by the World Health Organization (WHO), with the exception of yellow fever. However, due to international concerns, do not evacuate hemorrhagic fever patients across international borders unless authorized by the theater surgeon. Evacuate in cohorts of hemorrhagic fever patients only on dedicated AE aircraft. Medical evacuation may result in increased morbidity and mortality for patients with hemorrhagic fever; treatment at a local facility is preferred. Person-to-person transmission is possible for the duration of illness. If necessary, patients may be evacuated using standard, contact, plus respiratory droplet isolation precautions.

4. Person-to-person infectious disease of unknown etiology will provide a situation where it will be necessary to evaluate the patient evacuation risk based on the patients' signs/symptoms complex and theater threat list. Assume infection with the agent requiring the most stringent infection control procedures (i.e., as based on the possible threats in the theater and the clinical picture). Ensure that appropriate patient care is performed while providing the crew and aircraft with the highest level of protection.

6.9 HEAT STRESS MANAGEMENT

Heat stress management is largely a departmental/unit concern. Still, medical department representatives will act in conjunction with ship's company and embarked units to monitor and provide necessary guidance for the safe implementation of heat stress management protocols. Regular testing for heat stress conditions shall be conducted at work/rest cycles and water replenishment regimens will be established. As discussed in Chapter 4, duties performed while in various MOPP levels will present increased possibilities for heat stress and battle fatigue casualties.

APPENDIX A

Introduction To CBRN Contamination

A.1 BACKGROUND

Depending upon the branch of Service and/or convention, the issue can be viewed in the various permutations of the acronyms in use. For example, the Army and NATO use “NBC” (Nuclear, Biological and Chemical) in their doctrine while the Navy is establishing a norm that “CBRN” (Chemical, Biological, Radiological, and Nuclear) refers to actions to be used for defense and “CBRNE” (Chemical, Biological, Radiological, Nuclear and Explosive) to discuss Consequence Management related matters. Likewise, in some doctrine, “CBRD” is used to present Chemical, Biological and Radiological Defense. Note: Nuclear and radiological are addressed as separate entities to highlight the distinction between weapons that combine a radiological source with conventional munitions with the intent of dispersing radiation (i.e., radiological dispersal device (RDD)) and those weapons (i.e., nuclear weapons) that, in their intended ultimate configuration, can upon completion of the prescribed arming, fusing and firing sequence, be capable of producing the intended nuclear reaction and release of energy. In situations involving the release of radiation due to either a made-made or natural accident, the circumstances will be treated in a manner similar to a humanitarian operation where radiation must be dealt with and decontamination procedures, to include recovery operations following completion of the operation, will be applied. Regardless of these differences, paramount to any discussion of the various facets of CBRNE is an understanding that, while the letters can be interchanged and presented in a number of combinations, the consequences and actions associated with each element must never be confused to state that the effects and response to each will be the same. Contaminants will not disperse evenly nor will they always be visible as the proverbial misty cloud. Thus, while some actions taken in response to CBRN scenarios will be similar in nature (e.g., establishing a decontamination station), there is often little commonality when one proceeds further and examines such items as the physical effects that will be experienced from exposure to a particular toxin or pathogen or the speed with which detection of the source and consequences will be ascertained. Similarly, the time available to react will often differ significantly: a chemical or nuclear attack may be readily detected by visual observation or the response of detection equipment; conversely, in a biological attack, knowledge of an attack may, in some cases, only come about after days or weeks have elapsed, even with some of the existing or forthcoming detection equipment. This document will not discuss the “high yield explosive” weapons of CBRNE as such weapons are generally regarded as those weapons that use various commercial materials to produce an explosion with an attendant high number of casualties (i.e., mass casualty scenario), e.g., the Edward R. Murrah Federal Building in Oklahoma, and have little or no direct contamination residue.

A.2 CHEMICAL WARFARE (CW) OVERVIEW

NTRP 3-20.31.470, formerly Naval Ship’s Technical Manual (NSTM), Chapter 470, *Shipboard BW/CW Defense and Countermeasures*, is the primary technical reference for shipboard chemical defense equipment and its use. Naval Medicine (NAVMED) P5041, *Management of Chemical Casualties and Conventional Injuries*, is the primary technical reference for first aid and medical treatment of chemical warfare casualties. Biological Warfare and Chemical Warfare (BW/CW) is the use of lethal and incapacitating munitions or agents of either chemical or biological origin. Regardless of the method of dissemination, liquid agent droplets in excess of 20 microns travel a relatively short distance and fall out of the vapor cloud within minutes of release. For example: under certain conditions, a CW warhead with a height of burst of 1,200m containing 792 lbs of liquid agent will result in a downwind liquid disposition zone 400 meters wide by 4 km in length, with all droplets hitting the surface within two minutes. The detailed plan for the phased implementation of a CW response and countermeasures is the command’s CBRN Defense Bill. This hull-specific plan applies doctrinal concepts and procedures and specifies responsibilities, functions, locations, equipment and systems integral to countermeasures activity. This document, as well as NAVAIR-00-80T-121, *Preliminary CBD NATOPS Chemical Biological Defense*, and other publications identified throughout the document or in the bibliography, are intended to aid in the development of a ship's CBRN Defense Bill. The rapid technological changes in the CBRN countermeasures program mandate that all departments maintain an on-going review of their responsibilities and insert appropriate changes as implemented.

One of the most difficult aspects of CW is that the chemical agents may persist in the environment for extended periods of time. This is especially true of agents such as VX, the mustards, thickened GB, or GD which may remain as contact hazards for hours or days. Complete decontamination of such an environment may be difficult or impossible. However, it may be possible to achieve sufficient decontamination, particularly in small areas, to create a "vapor only" hazard area. Thus, it may be possible to decontaminate equipment so that no further surface contact hazard exists, even though chemical agent vapors may continue to be off-gassed from agents adsorbed onto, or absorbed into, the surface. In such environments, it may be possible to work without the full protective clothing ensemble, although respiratory and eye protection would still be required. This is because most agents in a vapor state penetrate through the skin very slowly. However, mustard at high vapor concentrations may still cause skin injury, particularly if the skin surface is wet or moist as may be the case in a warm environment. Where a liquid hazard exists, decontamination of skin and eyes must be accomplished quickly if it is to be effective. Chemical agents may penetrate or react with the skin and eyes within minutes, so successful decontamination must be carried out immediately after exposure. Once an agent is decontaminated, or has been absorbed within the body, no further risk of contamination exists. The casualty's body fluids, urine, or feces do not constitute a CW hazard. Individual and collective protection systems are the first line of defense against chemical agent contamination. Individual protection comprises the respirator and protective clothing, including gloves and boots. Full protective clothing is particularly important for persistent agents and agents that pose significant skin injury or skin penetration effects. For agents posing a respiratory or eye injury threat exclusively, the respirator would suffice. Individual protection imposes physiological and psychological stress on the individual, impairs communication, and reduces performance to a certain degree, depending on the individual's job performance requirements.

A.21.1 Chemical Agent Categories

There are four general categories of chemical agents: nerve, blister, blood and choking; though some experts contend there are six with psychochemical and irritant being the additional categories. Chemical agents can also be classified according to persistency: agents that dissipate within 20 minutes are typically called non-persistent and are usually in the form of a volatile liquid or gas, while persistent agents are usually in the form of a thickened agent that evaporates very slowly. Consequently, a persistent agent can contaminate a surface for a number of hours or days. Four basic methods of employment are: splash-on weapons (i.e., weapons that contaminate a large portion of a ship's decks, land areas, or equipment with a massive quantity of persistent agent), penetrating rounds, airburst munitions, and aircraft spray.

A.2.1.1 Nerve Agents

Nerve agents interfere with the normal termination of electrical impulses in the nervous system. This results in massive over-stimulation of the body and a condition known as "rigid paralysis." Death results from an inability to breathe. Nerve agents most commonly used are: Tabun (GA), Sarin (GB), Soman (GD), Thickened Soman (TGD), and no name (VX).

A.2.1.2 Blister Agents

Blister agents, also termed vesicants, produce chemical burns that result in severe inflammation, blistering and general destruction of the skin and tissues. Secondary bacterial infection of wounds and respiratory complications are the primary cause of blister agent fatalities. The blister agents include: H series Mustards (e.g., H, HD, HN1, HN2 and HN3), Lewisite (L) which is an arsenic compound, and Phosgene Oxime (CX), an urticant (i.e., produces itching).

A.2.1.3 Blood Agents

Blood agents are cyanide compounds that enter the body through inhalation. They interfere with the normal transfer of oxygen from the red blood cells into the individual cells of the body, which results in cellular suffocation or anoxia (i.e., severe oxygen deficiency). The two primary blood agents are hydrogen cyanide (AC) and cyanogen chloride (CK).

A.2.1.4 Choking Agents

Choking agents are vapors or gases that irritate and burn the entire respiratory system when inhaled. The gases damage tissue from the inside of the nose and throat down to the smallest recesses in the lungs. The more severe exposure symptoms result in destruction of lung membranes, causing the lungs to fill with an abnormal excess of fluid (i.e., pulmonary edema) and systemic anoxia. The gases are also highly irritating to the eyes. Choking agents include phosgene (CG) and diphosgene (DP).

A.2.1.5 Incapacitants/Psychochemicals

These agents temporarily interfere with the normal mental processes and result in an inability to engage in concerted effort or participate in collective activity. BZ is the code name for the only type of agent in this category. A subset of these agents would include physio-chemicals. The physio-active agents are synthetic analogs of chemicals normally secreted by the central nervous system in response to a strong emotional stimulus. These agents are designed to initiate a temporary physiological over-response similar to "violent rage" or "paralyzing fear" and thus interfere with tactical judgment and control.

A.2.1.6 Irritants

Irritants generally consist of either vomiting agents or tear agents:

1. Vomiting agents are temporarily acting compounds that initially irritate the eyes and respiratory system, then progress to inducing severe nausea and vomiting. Adamsite (DM) is the primary agent in this class.

2. Tear agents cause a temporary irritation of the eyes and respiratory system that result in a copious flow of tears and nasal secretions. They may cause moderate irritation or even burns to the skin and mucosal membranes in high concentrations; agents include: o-chlorobenzlmalonitrile (CS), chloroacetophenone (CN) and liquid CN (CNC).

A.2.2 Shipboard Persistency of CW Agents

Chemical agents designed for surface contamination are generally a viscous (i.e., thick) liquid that markedly reduces the evaporation rate and increases persistency. Persistent agents may penetrate paint, deck coatings, exposed synthetics, and plastic components; and are extremely difficult to decontaminate without stripping and removing the contaminated coverings and components. Porous materials easily absorb all liquid agents. The temperature of the contaminated surface is the primary factor that influences the rate of evaporation and relative persistency; i.e., the higher the surface temperature the faster the evaporation rate. Note: Wind may contribute directly to increasing the evaporation rate; however, the wind's cooling effect may offset any increase, or result in a net decrease, of evaporation rate.

A.2.3 Chemical Agent Volatility

Volatility is a measure of the concentration of vapor that would exist in equilibrium with a liquid at a given temperature and provides an indication of the tendency of a liquid to evaporate. Volatility is the primary measure of persistency. Figure A-1 presents a view of the most common chemical agents side by side. The three choking and "blood" agents at the left of the figure are highly volatile and exist as gases in all field situations. The four agents at the far right of the figure exist almost exclusively as liquids or solids in the field with little or no vapor emitted. The volatility of the agents shown spans a very wide range of values, e.g., phosgene is almost a million times more volatile than VX 2. The histogram is plotted on a logarithmic scale to capture this wide range of values. Each increment on the vertical scale corresponds to a factor of 10 in volatility. In combat applications, non-persistent and persistent agents have very different uses. Persistent agents do not evaporate readily.

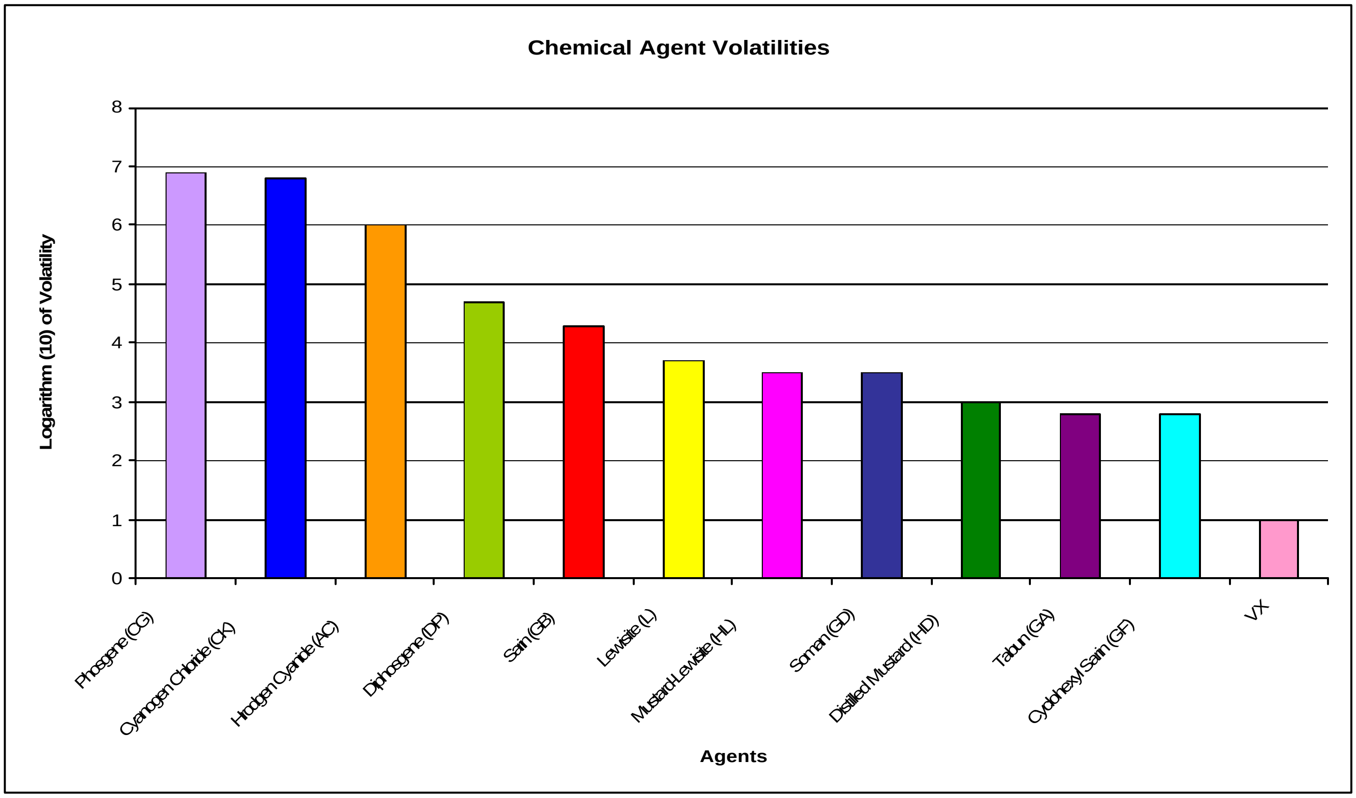


Figure A-1. Chemical Agent Volatilities

Hence, they remain where they are deposited and pose a long term threat to personnel, mostly dermal/skin contact. Non-persistent agents either exist in vapor form or they evaporate. Because non-persistent agents do not pose a long term threat at the deployment site, they can be used more easily in tactical situations that include a country's own ground forces. Non-persistent threats pose primarily an inhalation threat to personnel. The agents in the middle of the figure are of intermediate volatility. Sarin is normally delivered in a liquid state, but evaporates relatively quickly leaving little long term contamination behind. Soman is over five times less volatile than Sarin and tends to be used as a persistent agent, frequently being thickened to increase its persistency. Weapons are developed for specific tactical uses and weapons designers often know whether the fill should be persistent or non-persistent and agent-fills are chosen accordingly, or thickened to fit the specification. Non-persistent agents disperse very quickly, usually in a matter of minutes. Agents of intermediate and high persistency may remain on the surface for extended periods of time before they evaporate, often ranging from hours to days or even months in cold weather. Standard detection devices are the most reliable means of identifying a chemical agent, but users should remember that detection devices indicate concentrations in their immediate area only. They may not cover large areas and should not be the sole means on which to base conclusions on the presence or absence of chemical agents.

A.3 BIOLOGICAL WARFARE OVERVIEW

Biological warfare is the intentional use of viruses, bacteria, other microorganisms, or toxins derived from living organisms to cause death or disease in humans, animals, or plants. The method of exposure for most biological agents is by inhalation, whereas, the endemic disease exposure is by other means, e.g., by ingestion, arthropod bites, or other dermal contact. Figures A-2 and A-3 provide a comparison of agent deployment methods and lethality for untreated and unvaccinated personnel for inhaled bio-agents.

	ACCURACY/COVERAGE	LIMITATIONS/RISKS
Theater Ballistic Missiles	• Sufficient accuracy, large payload • Submunitions provide greater dispersion of agent • Coordinated salvos would increase chances of missile penetration	• TBMs are overt, allowing forces to defend, protect, and retaliate • Expensive, require robust support system • Depending on release type (explosive or line), agent mass could be reduced • Intercepted bulk-filled missiles do not affect the target
Ground Sprayer	• Accurate and can cover large area if mounted and released from a moving vehicle • Precise, real-time wind data can be used to select a place and time of release to optimize accuracy	• Requires deep insertion, attacker risks detection • May be lethal to attackers
Aircraft Sprayer	• Large area coverage as an airborne line source, up to several hundred kilometers long	• Difficult to penetrate air defenses, but downwind length of area coverage may allow enemy attack from own airspace • Requires detailed knowledge of patterns and surface layer stability
Artillery/ Multiple Rocket Launchers	• Well-suited to BW: shells can be used in combined attack with chemical or conventional, making a BW attack difficult to detect • Artillery can accurately deliver high concentration of agent	• Overt attack, although it may be hard to determine if BW was used • Limited ranges and coverage • Use may be precipitated by tactical warning, allowing for protective posture before exposure

Figure A-2. A Comparison of Agent Deployment Methods

DISEASE AGENT	LETHAL DOSE FOR 50% OF POPULATION	TIME TO ONSET OF SYMPTOMS	LENGTH OF SICKNESS	CONTA-GIOUS	LETHALITY FOR UNTREATED/UN-VACCINATED PERSONNEL
Bacteria:					
Anthrax	8-50K spores	1-6 days	3-5 days	No	Near 100% Inhalation 25% Cutaneous
Plague	100-500 organisms	2-3 days 2-10 days bubonic	1-6 days	Yes	90% Pneumonic 20% Bubonic
Tularemia	10-50 organisms	2-10 days	>14 days	No	35% Typhoid 5% Normal
Virus:					
Venezuelan Equine Encephalitis (VEE)	10-100 organisms	2-6 days	1-2 weeks	No	<1%
Smallpox	10-100 organisms assumed	7-17 days	4 weeks	Yes	30%
Toxins					
Botulinum toxin A	0.07 micrograms	1-5 days	24-72 hrs, months if not lethal	No	99%
Ricin	210-350 micrograms	18-24 hrs	3-6 days 10-12 days by ingestion	No	100%
Staphylococcal Enterotoxin B (SEB)	0.03 micrograms	3-12 hrs	Fever lasts 2-5 days cough persists up to 4 weeks	No	<1% lethal levels require >100-fold higher exposures
Note: Some agents are effectively disseminated by food and water. Reference: USAMRIID, Medical Management of Biological Casualties Handbook, February 2001					

Figure A-3. Lethality for Untreated and Unvaccinated Personnel for Inhaled Bio-agents

A.3.1 Definition of Biological Agents

Biological agents can be divided into two general classes: pathogens and toxins. A pathogen is a micro-organism that causes disease in humans, animals or plants. A biological toxin is an organic substance that is poisonous to humans or animals. Toxins are not living organisms. When a biological agent is used against a ship or military vehicle, the purpose is to render the crew unable to effectively conduct their mission. Pathogens, or germs, are microscopic organisms (i.e., microbes) that can cause disease in humans, animals or plants. They cause infection by entering the body, reproducing themselves and overcoming the body's self-defenses. The effects are not immediately apparent in most cases. This process takes a period of time, known as the incubation period, for the pathogens to establish themselves in the body of the host and to produce disease symptoms. For additional information on biological agents and their effects/ chemical agents and their effects, refer to Appendix C of Marine Corps Warfighting Publication (MCWP) 3-37, *Marine Air Ground Task Force Nuclear, Biological, and Chemical Defense Operations*.

A.3.2 Biological Weapons Delivery Systems

Biological warfare agents are unconventional weapons and can be delivered by unconventional means. Biological warfare has interested several foreign governments and terrorist organizations for a number of reasons, including the ease by which they can be obtained (e.g., naturally occurring viruses and bacteria can be obtained from the soil, water, animals, clinical specimens and biological research) and the relative ease and expense to produce.

Conventional explosive munitions are typically regarded as inefficient delivery systems for BW; the heat generated by the explosion will inactivate most BW agents and generally produce irregular-sized particles that will not be able to reach the lower respiratory tract. Such weapons are only about 1 to 2-percent effective. To be effectively delivered, BW agents should be dispersed by aerosol means and be of a particulate size of 1 to 5 microns in diameter. Larger particles generally are deposited on environmental surfaces while smaller-sized particles will be exhaled and result in an inefficient delivery to the lungs.

A.3.3 Impact to Food and Water Supplies

BW agents may be used to contaminate food or water systems and supplies. Heat destroys most pathogens and toxins; thus, to be efficient most agents would have to be used on food that will be served raw or added after the food is prepared and presented for serving. Improperly prepared food can similarly produce BW effects, but such act would be either an act of omission or terrorism. Dilution can reduce the concentration of pathogens and toxins below an effective level. Standard water purification methods (e.g., chlorination and filtration) inactivate most pathogens and toxins. Therefore, a successful BW attack on a water system would have to occur after treatment.

A.4 NUCLEAR WEAPONS/ RADIATION OVERVIEW

A.4.1 Nuclear Weapons and Their Effects

While the destructive action of conventional transmission of energy in the form of explosions is due almost entirely to the blast wave with resultant mechanical damage, the energy of a nuclear explosion is transferred to the surrounding medium in three distinct forms: blast, thermal radiation, and nuclear radiation. The distribution of energy among these three forms will depend on the yield of the weapon, the location of the burst, and the characteristics of the environment. For example, for a low altitude atmospheric detonation of a moderate-sized nuclear weapon in the kiloton range, the energy is distributed roughly as follows:

1. 50-percent as blast.

2. 35-percent as thermal radiation; made up of a wide range of the electromagnetic spectrum, including infrared, visible, and ultraviolet light and some soft x-ray emitted at the time of the explosion.

3. 15-percent as nuclear radiation; including 5-percent as initial ionizing radiation consisting chiefly of neutrons and gamma rays emitted within the first minute after detonation, and 10-percent as residual nuclear radiation. Residual nuclear radiation is the hazard in fallout.

Considerable variation from this distribution will occur with changes in yield or location of the detonation. This can be seen by comparing the ranges of damage due to the effects of weapons of different size yields, at an equal height of burst, as shown in Figure A-4. It is noteworthy, however, that the distribution of weapon energy yield is altered significantly by the enhanced radiation nuclear warhead. In simplest terms, an enhanced radiation warhead is designed specifically to reduce the percentage of energy that is dissipated as blast and heat with a consequent increase in the percentage yield of initial radiation. Approximate percentage energies are 30-percent blast; 20-percent thermal; 45-percent initial radiation; and 5-percent residual radiation.

During a nuclear detonation, casualties and material damage are caused by the blast wave, thermal and nuclear radiation, and light. The degree of damage depends on the type of weapon, height of the burst, distance from detonation, hardness of the target, and explosive yield of the weapon. The main burst types are air (i.e., exploded below 100,000 feet, but the fireball does not touch the earth's surface), high-altitude (i.e., above 100,000 feet), underwater, underground, and surface. Although there are these five types, there is no clear line of demarcation between them: as the explosion's height is decreased, a high-altitude burst becomes an airburst and an airburst will become a surface burst, and so forth.

NUCLEAR WEAPON YIELD Vs. EFFECT	1 KT	10KT	100 KT	1000KT
Ionizing radiation (50% immediate transient ineffectiveness)	600m	950m	1400m	2900m
Ionizing radiation (50% latent lethality)	800m	110m	1600m	3200m
Blast (50% casualties)	140m	360m	860m	3100m
Thermal radiation (50% casualties, second degree burns under fatigue uniform)	369m	1100m	3190m	8020m

Figure A-4. Radii of Effects of Nuclear Weapons

A.4.1.1 Blast Wave

At a fraction of a second after a nuclear detonation, a high pressure wave develops and moves outward from the fireball. This blast wave causes most of the destruction that accompanies a nuclear burst.

A.4.1.2 Thermal Radiation

Within less than a millionth of a second after detonation of a nuclear weapon, hot weapon residues radiate great amounts of energy. This extreme heat causes severe skin burns, even at great distances from ground zero.

A.4.1.3 Nuclear Radiation

Nuclear radiation is that particulate and electromagnetic radiation emitted from atomic nuclei in various processes. It can be classified as either initial radiation or residual radiation. The important nuclear radiations, from a weapons standpoint, are alpha and beta particles, gamma rays, and neutrons. All nuclear radiations are ionizing radiations, but the reverse is not true; e.g., x-rays are included among ionizing radiations but they are not nuclear radiations since they do not originate from atomic nuclei. Most of the neutrons and part of the gamma rays are emitted in the fission and fusion reactions, simultaneously with the explosion. The remaining gamma rays are produced in various secondary nuclear processes, including decay of the fission products. The beta particles are also emitted as the fission products decay. Some of the alpha particles result from the normal and radioactive decay of the uranium or plutonium that has escaped fission in the weapon, and others (e.g., helium nuclei) are formed in fusion reactions. The ranges of alpha and beta particles are comparatively short and they cannot reach the surface of the earth from an airburst. The range of an alpha particle depends on its initial energy, but even those from plutonium which have a moderately high energy have an average range of only 1.5 inches in air. Many of the beta particles travel a distance of about 10 feet before they are absorbed. Thus, even when the fireball touches the ground, the alpha and beta particles are not very important as the consequences from the proximity to the blast will have a far greater and immediate effect than that from exposure to radiation.

A.4.1.3.1 Initial Radiation

Initial nuclear radiation generally occurs within the first minute after detonation. The initial radiation wave travels considerable distances through the air and produces harmful effects in humans. This radiation consists of gamma rays, neutrons, beta particles, and a small proportion of alpha particles; but it is generally regarded as consisting only of gamma rays and neutrons. These penetrating rays damage tissue and blood-forming cells; and it is possible that an individual may receive a lethal or incapacitating dose of initial radiation before commencing protective measures. Gamma rays and neutrons can travel considerable distances through the air and cause significant injuries, regardless of the fact that the energy of the initial gamma rays and neutrons is only about 3-percent of the total explosion energy. This initial nuclear radiation can also affect material; especially that used in electronics such as communication systems and computers. These effects are commonly referred to as transient radiation effects (TRE). The effect on electronics is referred to as transient radiation effects on electronics (TREE). The adjective “transient” applies to the radiation since it persists for a short time; but, the damage can be temporary or permanent.

A.4.1.3.2 Residual Radiation

Radiation that lasts after the first minute and consists primarily of fallout and neutron-induced radiation is classified as residual nuclear radiation. The primary source of residual radiation is from fallout. Refer to FM 8-285/ NAVMED P-5041/ AFMAN 44-149/ FMFM 11-11, *Treatment of Chemical Casualties and Conventional Military Chemical Injuries* for details of nuclear radiation.

A.4.1.4 Light

The fireball from a nuclear detonation produces an extremely bright light. This light can cause temporary or permanent blindness. Blindness resulting from a daylight burst will probably be of a short duration while blindness occurring from a night burst lasts for a longer period because the pupils allow more light to enter the eyes at night. The light flash also can cause permanent burn injury within the eye or permanent blindness. Typically, this occurs if an individual is looking toward the fireball during detonation.

A.4.2 Blast Injuries

There are two types of blast forces that occur in a nuclear detonation blast wave: direct blast wave overpressure forces and indirect blast wind drag forces. The most important blast effects, insofar as production of casualties will be those due to the blast wind drag forces. Casualties requiring medical treatment from direct blast effects are produced by overpressures between 1.0 and 3.5 atmospheres. However, other effects (e.g., indirect blast injuries and thermal injuries) are so predominate that patients with only direct blast injuries make up a small part of the patient workload.

A.4.2.1 Direct Blast Injury

The human body is remarkably resistant to static overpressure, particularly when compared with rigid structures such as buildings. Overpressures that are sub-lethal can cause lung damage and eardrum rupture. Eardrum rupture will be the most common injury from overpressure.

A.4.2.2 Indirect Blast Wind Drag Forces

The drag forces (e.g., indirect blast) of the blast winds are proportional to the velocities and duration of the winds. The winds are relatively short in duration, but can reach velocities of several hundred kilometers per hour. Injury can result either from flying objects impacting on the body or from the physical displacement of the body against objects and structures. Because of the violence of the winds associated with even low values of overpressure, mechanical injuries due to flying objects sent into motion by the winds or to violent bodily translation will far outnumber direct blast injuries due to actual compression of the organism. For forces operating ashore, certain terrain, such as the desert, is particularly susceptible to flying objects from the effects of the winds.

A.4.3 Radiation Protection and Injuries

The Nuclear Regulatory Commission, Department of Health and Human Services, Department of Labor, Department of Transportation, and the Environmental Protection Agency issue federal regulations for radiation protection. The Department of Defense, Chief of Naval Operations, Commanders in Chief, Systems Commanders, Type Commanders, and Commanding Officers issues instructions, manuals and work procedures. Degradation in personnel performance is generally categorized as follows:

1. Combat ineffective (CI) personnel, function at less than 25-percent of their pre-irradiation performance levels. CI is manifested by shock and coma at the high-dose levels. At lower dose levels, CI is manifested by a slowed rate of performance resulting from physical inability and/or mental disorientation.

2. Performance degraded (PD) personnel, while not CI, function at between 25-percent and 75-percent of their pre-irradiation performance levels. They suffer acute radiation sickness in varying degrees of severity and at different times. Various combinations of projectile vomiting, propulsive diarrhea, hypertension, dry heaving, nausea, lethargy, depression, and mental disorientation manifest radiation sickness.

A.4.3.1. Biological Effects of Thermal Radiation

The thermal radiation emitted by a nuclear detonation causes burns in two ways: by direct absorption of the thermal energy through exposed surfaces (e.g., flash burns); or by the indirect action of fires in the environment (e.g., flame burns). Indirect flame burns can easily outnumber all other types of injury.

A.4.3.1.1 Flash Burns

Thermal radiation travels outward from the fireball in a straight line; therefore, the thermal intensity available to cause flash burns decreases rapidly with distance. Close to the fireball, all objects will be incinerated. The battle-dress uniform, mission-oriented protective posture gear or any other clothing will provide significant additional protection against flash burns. Clothing significantly impedes heat transfer and may prevent or reduce the severity of burns, depending on the magnitude of the thermal flux.

A.4.3.1.2 Eye Injuries

The initial thermal pulse can cause eye injuries in the forms of flash blindness and retinal scarring. The initial brilliant flash of light, produced by the detonation, causes flash blindness. This flash swamps the retina, bleaching out the visual pigments and producing temporary blindness. During daylight hours, this temporary effect may last for about two minutes. At night, flash blindness will affect personnel at greater ranges and for greater duration. Partial recovery can be expected in seven minutes, though it may require 30 minutes for full night adaptation recovery. Retinal scarring is the permanent damage from a retinal burn. It will occur only when the fireball is actually in the individual's field of view and should be a relatively uncommon injury. The retinal burn safe separation distance is approximately 20-km during the day and 50-km at night.

A.4.3.1.3 Indirect/Flame Burns

Indirect or flame burns result from exposure to fires caused by the thermal effects in the environment, particularly from ignition of clothing. This could be the predominant cause of burns depending on the number of and characteristics of flammable objects in an environment. This is particularly true for the large yield weapons which can cause firestorms over extensive areas.

A.4.3.2 External Personnel Contamination

An area of the body is considered to be externally contaminated if it contains in excess of 450 Pico curies of beta-gamma emitters by direct frisk or 50 Pico curies of alpha emitting contamination by direct frisk, i.e., 100 counts/minute above background of beta-gamma emitting contamination (e.g., Cobalt-60 equivalent) as measured under the area of a DT-304 probe or 50 counts/minute above background of alpha emitting contamination as measured on an AN/PDR-56 with small probe.

A.4.4 Radiological Weapons, Radiological Dispersion Devices, and Toxic Industrial Radiologicals

The effects of exposure to radiation from radiological weapons, radiological dispersion devices (RDDs), and toxic industrial radiologicals (TIRs) will be identical to those experienced from a nuclear weapon. The greatest consequence of their use will be measured in the panic created; any immediate deaths or serious injuries will likely result from the explosion itself, rather than from radiation exposure. It is unlikely that the radioactive material contained in a dirty bomb (i.e., radiological weapon or RDD) would result in direct deaths. Rather, a low-level exposure to radioactive contamination could slightly increase the long-term risk of cancer. Use of a dirty bomb could result in radioactive contamination of several city blocks to an entire city. The extent of the contamination depends upon a number of factors including the size of the explosive, the amount and type of radioactive material used, and weather conditions. Because a "dirty bomb" explosion could expose personnel to loose radioactive material in the air, which could be inhaled, personnel shall be advised to quickly move away from the immediate area and don protective masks and equipment. It should be noted that the use of potassium iodide may not necessarily be protective in such cases because radioactive iodine is not necessarily the isotope that may be used in these devices. The affected area will be cordoned off from surrounding areas.

APPENDIX B

Recommended Training

The ability to achieve successful recovery operations in a chemical, biological, radiological, and nuclear (CBRN) environment will ultimately depend on the level of individual and collective training accomplished by the units that must conduct them; and the proficiency the forces attained in completing such training. Service and joint mission essential task lists identify required individual and collective training standards for each component of the naval expeditionary force; however, these are only the basic standards of readiness, and meeting these training standards is the responsibility of the Service components. To improve on this readiness, forces should train together prior to the operation, to the extent that is possible. Training and integration should be accomplished as early as possible, to include during pre-deployment periods when forces may undergo training at Service school commands or as part of a command/unit's intermediate and advanced training. Among the various venues where personnel can receive training is the Marine Corps' Chemical Biological Incident Response Force (CBIRF) command located at Indian Head, Maryland. Among its duties, this command exists to support deploying Marine Expeditionary Unit commanders who elect to establish an enhanced nuclear, biological and chemical (E-NBC) unit as part of their task organization; E-NBC units receive training at this facility. Accordingly, when possible, select members of Navy staffs and shipboard personnel should accompany their Marine counterparts and receive this training. Regular individual and unit training in CBRN defense should continue en route to the area of operations and throughout periods of mutual operations. A primary objective should be rehearsing elements of the recovery plan, especially actions during early warning and alert, establishing collective protection, and decontamination procedures. In order to achieve a state of readiness the following training is recommended.

1. In the initial or basic phase, embarked personnel shall:

    a. Participate in shipboard CBRN drills by receiving lectures on the importance of maintaining/respecting damage control (i.e., CBRN) fittings/settings and material conditions of readiness. Such drills should focus on actions to be taken were embarked personnel not at an objective area and capable of going ashore, e.g., the ship is attacked at sea.

    b. Receive information on where their CBRN protective equipment is stored and procedures for receiving same.

    c. Practice donning protective masks.

    d. Practice protective gear removal, inspection, re-packing and stowage to ensure maintaining optimum material condition of protective equipment.

    e. Proper access/egress of collective protection system (CPS) protected zones.

    f. Rehearse establishing CBRN management cells: verify internal and external communication stations, availability of plotting boards, and personnel manning requirements.

2. Intermediate drills would include:

    a. Completing actions recommended in the basic drills.

    b. Establish decontamination stations and contamination control areas. Practice decontamination (i.e., decon) procedures by simulating return from operations and either going through flight deck and/or well deck decontamination stations consistent with their likely means of insertion or extraction.

c. Participate in "Battle Messing" in a CBRN environment.

d. Simulate personnel casualty situations and associated decontamination procedures.

e. Practice contamination control procedures by exercising flight deck, well deck, and landing craft crews, with embarked vehicle drivers, in procedures to reduce the potential for surfaces to become contaminated. Review plans for moving vehicles or aircraft into sheltered areas and/or initiate actions for covering aircraft, landing craft and vehicles, if materials are available; at a minimum, aircraft, landing craft and vehicle air intakes should be covered. In accomplishing this task, embarked forces should review local logistic procedures for drawing pre-fabricated tarps or covers, and/or initiate action to manufacture or procure such items. Note: The use of fabrics/materials used in the manufacturing of the Chemical Protective Over-Garment (CPO) is preferred; plastic wrap can also be used.

3. Advanced drills should focus on:

a. Completing actions recommended for basic and intermediate training.

b. Complex evolutions, including mixing tenets of Emergency Defense of the Amphibious Task Force (EDATF) with an expeditionary strike group/amphibious ready group CBRN Defense Plan: reviewing options for launching airborne assets and procedures for removing contaminants.

c. Rigging aircraft and landing craft for simulated transport of contaminated personnel and equipment, to include reviewing procedures for isolating the cockpit area of a helicopter from the cargo area to minimize contamination of intricate electronic equipment and wiring.

d. Landing forces testing decontamination procedures on other amphibious shipping that may be used to support their insertion or extraction (e.g., a rifle company embarked in the LHD is tasked to go ashore from the LSD, and return to the LSD for possible follow-on tasking).

e. Conduct mass casualty drills, or conduct large-scale decontamination of non-ambulatory/ ambulatory personnel.

f. Similar procedures should be reviewed as may be relevant to a non-combatant evacuation operation (NEO) or civil support (CS) mission where countless civilians could be embarked that have been received from a contaminated environment.

Commands and units lacking essential personnel, e.g., coded Navy Enlisted Classification (NEC) or military occupational specialty (MOS) billets, or those that have not completed basic CBRN training shall be assessed as being "not qualified" to complete operations where CBRN contaminants could be present. Commands or units that have completed basic and intermediate training and have all essential personnel shall be assessed as "partially qualified." Only those commands meeting the afore-stated requirements and that have completed advanced level training shall be assessed as "fully qualified."

APPENDIX C

Planning Considerations

C.1 PRE-DEPLOYMENT CONSIDERATIONS

The efforts of Expeditionary Strike Group (ESG) staffs, ship's force personnel, landing forces and Navy support elements completed prior to deploying will provide significant dividends should these forces encounter an environment contaminated with chemical, biological, radiological or nuclear (CBRN) hazards. A "team" concept should be established as early as possible. The following (not all inclusive) list of planning considerations is provided to assist commands in establishing the team concept and ensure readiness to conduct recovery operations in a CBRN environment. As with all embarkation evolutions, it will be necessary to prioritize the items and determine if sufficient space exists to embark the equipment as well as to determine who will be responsible for procuring items not routinely stocked. The threat assessment for the area of operations (AO) and any specific mission requirements will assist in completing the prioritization review. In some situations it may be sufficient to only identify where materials can be requisitioned from and where such items might be either forward staged or can be embarked from when transiting to the AO.

C.1.1 Ship or Unit Considerations

1. Are CBRN billets filled with personnel who have the required designators or specialty codes (4805/4811/5702/5711)?
2. Have personnel completed all required CBRN training and PQS (i.e., Personal Qualification Standards)?
3. Has the command completed basic and intermediate level CBRN exercises?
4. Does the unit have its authorized list of required detection devices?
5. Are the detection devices within required periodicity for certification?
6. If a device's certification expires during the deployment, are procedures in place to update the certification?
7. Does the command have sufficient quantities of test kits and sample paper, and related materials?
8. Have personnel received training on the proper operation of detection devices?
9. Does the command have its required level of decontamination reagents?
10. Does the command have its required quantities of individual protection equipment?
11. Are there means to re-supply individual protective equipment (IPE) and/or authorized medical allowance list (AMAL) items (e.g., joint service lightweight integrated suit technology (JSLIST), AMAL687/688, books, gloves, M291, M40A1, MCU2P, C2A1 Filter, etc…)?
12. Are there enough fire hoses available for saltwater washdown to support decontamination?
13. Does the ship/unit have fire-fighting fans available to assist in dissipating vapor hazards? Note: Landing Force units do not carry such fans.
14. Does the ship/unit have sufficient spare/repair parts available for decontamination apparatus?
15. Does the ship/unit have sufficient quantities of HTH (i.e., high test hypochlorite) or other bleaches on hand to conduct decontamination?
16. Does the ship/unit have sufficient quantities of shrink wrap or other plastic coverings available to support supplies being transferred?
17. Are procedures in place to dispose of any porous material that may become contaminated (lines, ropes, etc…)?
18. Based on threat, consider CBRN equipment be given appropriate priority for stowage, and the embarkation of additional CBRN decontamination support equipment and materials.
19. Have units participated together in various advanced-level training exercises?
20. Has ship's CBRN Bill been validated?

C.1.2 Medical Considerations

1. What medical protection assets are in place in the form of vaccines, pre-treatments, and/or skin protectants?
2. What plans are in effect for using them?
3. What is the immunization protocol?
4. Providing medical assistance for enemy use presents significant implications. What plans have been made to address this?
5. What levels of medical protection have been provided to the subordinate units to increase an individual's resistance to a CBRN attack, indigenous medical threat, and environmental hazards? Do they understand how to use this protection?
6. What provisions for providing military supplied medical assistance to non-military personnel are included in campaign plans?
7. What plans are in place to alleviate shortfalls caused by providing medical support to non-military personnel?
8. What steps have been taken to ensure proper medical assistance is available for combat units, US and host nation (HN) civilian workers, dependents, and enemy prisoners of war (EPWs)?
9. Are all hospitals (e.g., ship/component, HN, and coalition) equipped to care for CBRN casualties and is the casualty decontamination station available with medical position manning established?
10. What vaccines are available within the theater?
11. If sufficient vaccines are not available to inoculate all personnel, what is the protocol for determining who receives vaccinations?
12. What is the policy for decontaminating and evacuating the wounded?
13. What steps have been taken to ensure that the decontamination and evacuation policy is known and understood?
14. Are other Services' assets being considered for supporting medical evacuations (MEDEVACs)? Note: U.S. Air Force and TRANSCOM (i.e., Transportation Command) have various restrictions.
15. Has the theater Fleet Surgeon been contacted to assist in coordinating the transfer across international borders? Note: Casualties suffering from certain biological diseases are prohibited from being moved across international borders (e.g., plague).
16. What steps have been taken to ensure adequate numbers of medical personnel have received specialized training in CBRN casualty treatment and management?
17. Have plans been made for combating the indigenous medical threat within the theater?
18. What medical force structure, by sequence, is available to the theater?
19. What is the policy for determining the priority of medical attention to non-military personnel: US citizens and government authorized contractors, allies, third country nationals (TCNs), EPWs, and host nation?
20. Has the ship established a "walking blood bank"?

C.1.3 Logistics Considerations

1. What CBRN defensive procedures have commanders initiated to limit exposure of their units and facilities to CBRN attacks and to protect personnel and supplies from CBRN contamination?
2. What command and control procedures are established to ensure the effective CBRN defense of multi-service, HN, coalition, and major logistics bases, including ports and airfields?
3. What plans are in effect for ensuring that sufficient protective equipment is available for issue to U.S. civilians, HN personnel, TCNs, and allies?
4. How much equipment for protecting EPWs has been ordered? What is a reasonable amount to plan for? Where is it stored? Who is responsible for ordering and funding these requirements?
5. How do you determine if the required amount of individual protective gear and unit CBRN defense equipment is on-hand in each subordinate unit?
6. What procedures are in place to ensure that sufficient water and other supplies are on-hand in the proper location to permit effective and efficient decontamination operations?

7. What plans have been made to ensure that necessary medical supplies are kept at the level required to execute the mission?
8. What steps have been taken to ensure that sufficient alternate supply routes exist for logistical operations?
9. What plans are in place to address the re-supply of CBRN defense equipment?
10. What training has been conducted with HN police, fire, and other emergency organizations regarding CBRN defense?
11. What plans are in place to best utilize various installed systems, e.g., sprinklers, CPS, casualty decontamination, water curtains, counter measure washdown system (CMWDS), etc…?

C.1.4 Aviation Considerations

1. Consider acquiring containment pools for flight deck aircraft decontamination. Resolve ownership and fiscal issues with containment pools, e.g., whose equipment will it be: ship's or landing force's?
2. Are subject matter experts, technical manuals, and specialized equipment and tools available to support decontamination of aircraft and aircrews from other services, allied forces, etc…?
3. Pre-designate contaminated gear holding areas for aircrew aviation life support systems (ALSS), ordnance, equipment and weapons to support weathering and off-gassing.
4. Have units prepared a plan for extended on-deck support (e.g., maintenance, dirty tools)?
5. Has a plan been developed for maintenance action processing (e.g., return of non-RFI (i.e., non-ready for issue) parts due to contamination)?

C.2 DEPLOYED CONSIDERATIONS

C.2.1 Consolidation Considerations

Selection of the ship to serve as the designated receiving ship for contaminated personnel and equipment will largely be dependent upon the number of contaminated personnel and quantity and types of equipment that will be retrograded. Placing all contaminated personnel and equipment on an LHA or LHD might offer a viable solution to minimize the number of ships to be contaminated, and likewise offer an answer to concerns for medical treatment; however, using such ships will likely reduce the commander's ability to respond to follow-on commitments. Conversely, placing all personnel and their equipment on either the LSD or the LPD may facilitate the commander's ability to respond to certain tasks; but it will reduce the number of landing craft and alternate helicopter staging and landing spots available to the commander to complete such missions. Commanders shall assess all ships present, including maritime prepositioning ships (MPS) assets if assigned, as a part of any solution. If MPS assets are selected, due regard for task organizations and chains of command shall be reviewed and appropriate approval obtained; Commander, U.S. Transportation Command (COMUSTRANSCOM) shall be consulted. In the end, the commander may find it necessary to use multiple platforms to complete the assigned mission: place the ambulatory personnel and their equipment on the LSD or LPD and take only those medical casualties onto the LHA or LHD that require advanced life saving treatment and can benefit from the unique capabilities they offer with their collective protection system (CPS) and casualty decontamination stations. Once forces have been decontaminated and found to be safe to return to duty they can be transferred to a ship that will assist in returning them to their parent command/host ship.

Commanders shall consider such issues as, but not limited to, ship capabilities (e.g., extent of medical facilities and the presence or absence of a collective protection system), the ability to conduct self-decontamination or isolate the contamination, follow-on mission, and the age of the ship. As with all efforts to move contaminated personnel and their equipment, an assessment of the impact to the helicopters and landing craft will also need to be accomplished and a decision made regarding risks and what procedures can be instituted to minimize the spread of contaminates.

C.2.1.1 Checklist for Consolidation Consideration

The following checklist may assist planners during CBRN consolidation planning.

1. Is recovery guidance provided in any directive?
   a. Will additional contamination control area (CCA)/decontamination station arrangements be required?
   b. Have ship's CBRN defense actions been integrated with unique recovery operations events?
   c. Have timelines been developed.
2. Is shipping available to disperse clean equipment, aircraft, landing craft etc to facilitate special CCA/decon facilities?
   a. What duties and responsibilities can the designated "dirty" ship(s) be relieved of to optimize their ability to conduct recovery operations and decontamination operations?
   b. What is the state of CBRN readiness within the force?
   c. Have ships and embarked units trained together in the conduct of decontamination procedures?
   d. Have ships trained or attempted to support each other should the order to consolidate be given?
   e. Are personnel from another ship or ships available to augment the decontamination effort?
   f. What is the status of CPS on the ship or ships being considered?
   g. Can personnel not involved in the decontamination effort be afforded protection against becoming contaminated?
   h. Can personnel be rotated on and off the ship without becoming contaminated in order to relieve unaffected personnel manning essential watch stations?
3. What is the mission for the force?
   a. What is the current threat/combat condition?
4. What is the follow-on mission for the force?
   a. What equipment has been contaminated?
   b. Does any ship have wash racks in its load?
   c. What is the largest piece of equipment that will require decontamination?
   d. Can equipment be disposed of vice having to be decontaminated?
   e. Can the force be embarked, provided adequate protection and support, and taken to a third country to complete the decontamination procedure?
5. How many personnel must be decontaminated?
   a. Which ship or ships have enough room to conduct the decontamination?
   b. Can the effort be completed by using a landing craft utility (LCU) vice contaminating a ship?
   c. What level of casualty support will be necessary?
   d. Will isolation wards be necessary?
   e. Are any portable decontamination stations available?
6. What is the time-frame to accomplish the task?
   a. What is the fuel state of the ship or ships being considered for the task?
   b. What is the status of provisions on the ship?
   c. What is the status of the ships' evaporators and what percentage of fresh water is available?
7. What agent or agents have been used and must be decontaminated?
8. Does the ship or ships designated to conduct the decontamination have sufficient prime movers to move clean equipment around?
   a. Can any items be cross-decked to support the effort, e.g., rough terrain forklifts, deck scrubber or high reach?
9. What is the predicted weather and will it help or hinder the decontamination process?
10. Has a supply of clothing been collected to be issued to the personnel following decontamination?
    a. Will contaminated clothing be laundered or disposed of?
11. Are there any security considerations?
    a. Any EPWs?
    b. Classified or sensitive material?

12. What is the age of the ship or ships under consideration, in the event the ship may be determined to be contaminated and must be decommissioned?

C.2.2 Recovery Considerations

The following checklist may assist planners during CBRN mission planning.

C.2.2.1 Checklist for Pre-launch Considerations

1. Ensure personnel pre-hydrate prior to the start of any operation.
2. For units departing a ship, based on the threat ashore, consideration should be given to having personnel bring additional food and water for en route and return trips and possible en route delays; have personnel bring additional IPE.
3. Try to isolate a portion of the craft for the contaminated personnel and equipment. Limit personnel access to the rest of the craft. Develop a well thought-out exit and entrance plan for all contaminated individuals and equipment to limit additional contamination.
4. When possible, seal off the exposed area (e.g. lining the craft walls and floor with non-absorbent material).
5. Consider bringing clear heavy-duty plastic to line inside of cabin; this allows you to see through to working parts.
6. Inspect chemical protective suits and equipment (shelf life).
7. Consider when crew needs to don their IPE: prior to loading craft or at some later time during a mission.
8. Provide a brief on weather conditions at the site and en route effecting CBRN use – humidity (e.g., for persistent agents), wind direction, sea state, and temperature.
9. Establish primary and alternate decontamination locations.
10. Place detection devices on craft where they can be viewed by the crew.
11. Make sure atropine, decontamination kits and professional gear (e.g., vests, web gear, etc…) are accessible after donning IPE.

C.2.2.2 Checklist for Recovery Considerations

1. Is the location contaminated?
2. Can an alternate location be selected if contaminated to avoid contamination?
3. Have detectors been checked?
4. Is the team/equipment being loaded contaminated? Coordinate on-loading procedures to avoid unnecessary spread of contamination.
5. Will the threat allow an engine/rotor/prop shutdown during loading to prevent spreading of contamination? If threat allows, fly high, pressurized/un-pressurized to avoid contaminants. If possible, fly through rainstorms to clean outside of aircraft. Execute Naval Sea Systems Command sea operations (NAVSEA SEAOPS) approved decontamination maneuvers for landing craft air cushion (LCACs).
6. Will the air/ landing craft crew need to be in their chemical ensemble or similar system prior to landing or once they have landed? Note: donning protective clothing in-flight may be difficult for aircrews.
7. When possible, consider approaching landing zone/helicopter landing zone (LZ/HLZ) upwind. Coordinate recovery activities with all units arriving at same location. Note: approaching upwind will serve to reduce the amount of contaminants encountered prior to landing in the LZ/HLZ. If an LZ/HLZ is contaminated conducting the final approach upwind has little value except to assist in control of the aircraft.
8. Keep all hatches/windows/doors/ramp not required closed. Note: under certain conditions (e.g., desert) such actions may not reduce the amount of contaminants that enter a craft; however, for consistency in training and operations, such practices should be routinely enforced – or until determined to be scientifically ineffective.

9. When possible, decontaminate personnel and equipment prior to allowing them to board (note: threat may dictate otherwise).
10. Set up plastic/containment materials (floor, walls, bulkheads, and isolate deck...).
11. Take precautions to protect IPE.
12. Keep all hatches/portholes/doors/ramps not required closed.

C.2.3 CBRN Battle Management Cell Considerations

The CBRN Battle Management Cell will be responsible for coordinating efforts across a spectrum of capabilities and organizations. Once it becomes aware of the problem, the cell will face a set of decisions. Some of these are:

1. What detection and identification capability should be used, and how?
    a. What precautions are necessary during sampling and transport phases?
    b. Do the units ashore have the ability to conduct on-site analysis?
    c. Should contaminant samples be collected and carried back, and if so by whom?
    d. What precautions are necessary during taking the sample and transport phases? What precautions will be used? (e.g., precautions may be much less stringent than the precautions taken due to command need to do "everything possible.")
2. How far back up the chain of command should identification proceed?
    a. What is "timely enough"?
    b. What standard should be applied for presumptive identification, or should the agent continue to be labeled as "unknown" until a "gold standard" identification is achieved?
    c. How should continental United States (CONUS)-bound samples be transported, and can the cell arrange for the logistics?
3. What is the medical community's response?
    a. Should vaccination/prophylaxis be done as a pre-emptive measure?
    b. Are they carried and what quantity is available?
    c. To whom?
    d. For how long?
    e. Can the battle management/medical cells access crew vaccination records on a timely basis? Is this necessary?
    e. How do you differentiate psychosomatic symptoms from real symptoms and how are they treated?
    f. Are there stress and psychological problems associated with the crew believing they have been exposed, and if so, how do you treat them?
4. If law enforcement becomes involved, how does the CBRN cell facilitate access to the ship?
    a. Who's in charge?
    b. Ship master at arms?
    c. Naval Criminal Investigative Service (NCIS)?
    d. Federal Bureau of Investigation (FBI)?
    e. Can the host nation assist?
5. Who up the chain of command does the CBRN cell keep informed and how often?
    a. What are the leadership roles for the geographic commander?
    b. What are the leadership roles for the theater commander?
    c. OPNAV (i.e. Naval Operations)?
    d. Joint commanders (joint task force (JTF), joint force maritime component commander (JFMCC), etc.)?
6. What additional warnings are given and how are they decided upon?
    a. Navy-wide alert on packages?
    b. ESG hold on mail and email?
7. What responsibility does the host nation have?
    a. Who, how and when are they notified?

8. How does the intelligence community, particularly the counterterrorism (CT) community, support follow-on threat assessments?
9. How does the CBRN cell access the CT intelligence community, if applicable?

C.2.4 Flight Deck Considerations

1. Flight schedules (i.e., Air Plan) must match recovery tempo.
2. Crew flight duty cycle must be adjusted to be in accordance with aircrew IPE limitations.
3. What actions are being taken to minimize number of exposed aircraft and aircrew?
4. Is Air Department and embarked aviation unit coordinating aircraft handling and spotting?
   a. Are ships being maneuvered to remain clear of any airborne contamination and to control location of contamination on flight deck?

APPENDIX D

Current Chemical Agent Acceptable Concentration Standards

Per the guidance of the Chairman of the Joint Chiefs of Staff memorandum MCM-0026-02, dated 29 April 2002, acceptable standards of decontamination for chemical contamination are as set forth below. These standards are based upon current technology; accordingly, a potential for residual contamination may exist as a result of particulates being below the detection capability.

Detection Device	Acceptable Concentration
Chemical Agent Monitor (CAM)/ Improved CAM (ICAM)	Zero bars
M256A1 Chemical Agent Detector Kit	No detection
ABC-M8 Chemical Agent Detector Paper	No color change
M9 Chemical Agent Detector Paper	No color change
M8A1 Automatic Chemical Agent Alarm	No detection/audible alarm
M-90 Automatic Agent Detector (AMAD)	No detection/audible alarm
Chemical Agent Point Detector System (CAPDS), MK21, MOD1	No detection/audible alarm
Improved (Chemical Agent) Point Detector System (IPDS)	No detection/audible alarm
M22 Automatic Chemical Agent Detector and Alarm (ACADA)	No detection or identification of chemical agent
MK27 MOD 0 Shipboard ACADA	No detection or identification of chemical agent
Joint Chemical Agent Detector	No detection or identification of chemical agent

APPENDIX E

Decontamination Kits, Apparatuses, and Equipment

Material cited in Figures E-1 and E-2 is representative of a notional table of allowance for a deploying Marine Expeditionary Unit (Special Operations Capable) (MEU (SOC)) to use in conjunction with decontamination operations. Some are simple to use and are readily available to individual personnel; others are very complex and are available only to specially trained teams. Figure E-1, lists the decontamination equipment and materials for the different use levels; Figure E-2, lists the detection equipment and materials.

Item and Description	Use	Limitations	Reference
Individual			
Decontaminating kit, skin (SDK), M291 SDK, (national stock number (NSN) 4230-01-276-1905) (20 kits per box)	To completely decontaminate skin through physical removal, absorption, and neutralization of agents with no long-term effects. **Note:** **Use this kit for both actual combat and training purposes.**	Is for external use only. **WARNING** **Keep decon powder out of eyes, cuts, or wounds. It could slightly irritate the skin or eyes.**	TM 3-4230-229-10
Decontamination kit, individual equipment (IEDK), M295,IEDK, (NSN 6850-01-357-8456)	To decon your chemical protective gloves, mask, hood, overboots, load carrying equipment (LCE), and weapon.	**WARNING** **Do not use for skin decontamination. Keep off skin and out of eyes wounds, and mouth.**	TM 3-4230-235-10
Decontaminating apparatus, portable (DAP), M13 DAP, (3.7 gal), (NSN 4230-01-133-4124). Has a 3.7-gallon disposable DS2 container. Can be mounted to a standard 5-gallon fuel can mount on vehicles and equipment.	To spray DS2 Decontaminating Solution Number 2) on surfaces of vehicles and equipment. **WARNING** **DS2 is not authorized for use onboard ships and is prohibited from being carried or stored onboard ships.**	Cannot refill DS2 container.	TM 3-4230-214-12 and PTM 43-0001-26-1
Battalion Decontamination Crew and Chemical Company			
Decontaminating apparatus, power driven, skid mounted, multi-purpose (PDDA), integral 500 gal, M12A1 PDDA, (NSN 4230-00-926-9488), LIN F81880. Includes pump unit, tank unit, and M2 water heater (skid-mounted).	To spray decon agent, super-tropical bleach (STB) slurries, and solutions as well as hot, soapy water rinses during field decon operations. To pump water or foam to fight fires, de-ice items, wash vehicles, and pump various fluids.	Do not use with defoliants, herbicides, or insecticides.	LO 3-4230-209-12, LO 5-2805-259-12, TM 3-4230-209-20, and PTM 43-0001-26-1
Decontaminating system, lightweight (LDS), M17 LDS, (NSN 4230-01-251-8702). Has a portable pump and water-heater, produces hot water and steam. It incorporates a 1,580- to 3,000-gallon collapsible water tank, two wand assemblies, and connecting hoses.	To perform operational and thorough decon of vehicles and equipment. Can also be used for troop showers, as necessary.		TM 3-4230-228-10

Figure E-1. Decon Equipment and Materials

Item and Description	Use	Limitations	Reference
Individual			
Paper, chemical agent, detector, VGH, M8, (NSN 6665-00-050-8529). Issued in book of 25 sheets, perforated for easy removal. A color comparison bar chart is printed on the inside front cover.	To detect the presence of liquid V, G, and H chemical agents.	Cannot be used to detect vapors or chemical agents in water, DS2, or petroleum products. May cause false readings.	TM 3-6665-254-12, TM 3-6665-268-10, TM 3-6665-307-10, and PTM 43-0001-26-1
Paper, chemical agent, detector, M9, (NSN 6665-01-226-5589). Paper is issued in a 7-ounce dispenser box that contains one 30-foot roll of 2-inch-wide detector paper and plastic storage bags. The paper has an adhesive back for attaching to equipment and clothing.	To detect the presence of liquid V, G, and H chemical agents.	Cannot be used to detect vapors or chemical agents in water. Will not stick to dirty, oily, or greasy surfaces. Contamination indications cannot be read under red light or by color-blind soldier. Following can cause false readings: • Temperatures above 125°F. • Brake fluid. • Aircraft cleaning compound. • DS2. • Petroleum products. • Insect repellent.	TM 3-6665-311-10

Figure E-2. Detection Equipment and Materials (Part 1 of 2)

Item and Description	Use	Limitations	Reference
Company			
Chemical-agent alarm, automatic (ACAA), M8A1 ACAA, (NSN 6665-01-105-5623). It can be vehicle-mounted, back-packed, or ground-emplaced.	To detect chemical nerve agents in the air.	**WARNING Radiation hazard. Contains beta emitters.**	TM 3-6665-321-12
Chemical-agent alarm, automatic, M22 ACAA, (NSN 6665-01-438-6983).	To detect chemical nerve agents in the air.	**WARNING Radiation hazard. Contains Americium (AM241).**	TM 3-6665-312-12
Chemical-agent monitor system (CAM) (NSN 6665-01-199-4153).	To search out areas; to search and locate contamination on personnel, equipment, ship's structure, aircraft, land vehicles, buildings, and terrain; and to monitor for effectiveness of decontamination. Can also be used for monitoring collective protection. The CAM responds to nerve- and blister-agent vapors down to the lowest concentration that could affect personnel over a short period.	Cannot be used as a detector; it is a monitor, not a detector. It can become contaminated and overloaded (saturated). It can only report conditions at the front of the inlet probe. It is, therefore, a point monitor only and cannot give a realistic assessment of the vapor hazard over an area from one position. **WARNING Beta radiation hazard.**	TM 3-6665-331-10
Detector kit, chemical agent, M256A1 (NSN 6665-01-438-6983). Contains M8 detector paper for liquid agents and samplers/detectors for vapors.	To detect liquid G, V, and H chemical agents using M8 detector paper and to detect and determine the type of vapor (G, V, H, and AC) using samplers/detectors.		TM 3-6665-307-10
RADIAC set, AN/PDR-27 (NSN 6665-01-222-1425)	To measure gamma radiation dosage from 0.01 uGy/hr to 100 Gy/hr; detect and display level of beta particle dosage from 0.1 uGy/hr to 5 cGy/hr; and to measure, store, and display accumulated dosages from 0.01 uGy to 9.99 Gy. Instrument consists of a RADIAC with an internal sensor for obtaining dosages during mounted and dismounted operations. It has a second sensor housed in a probe and attached to the RADIAC with a cable and input connector. Used for monitoring personnel, supplies, and equipment. It uses a Pre-settable, audible, and an integral visual warning device. The system is air-transportable and organic to all units.		TM 11-6665-251-10
Computer indicator, RADIAC, CP696/PDR-75; detector, RADIAC/ DT236/PDR-75; RADIAC set, AN/PDR-75, (NSN 6665-01-211-4217)	Measure accumulated neutron and gamma radiation dose recorded by the DT236. A person who may be exposed to radiation from tactical nuclear weapons wears the DT236 on their wrist.		

Figure E-2. Detection Equipment and Materials (Part 2 of 2)

APPENDIX F

Monitoring Equipment and Confirmatory Laboratory Operation

F.1 MONITORING AND DETECTION EQUIPMENT

The following monitoring and/or detection equipment listed in Figures F-1 and F-2 is generally found in amphibious shipping. Quantities will vary according to ship class; similarly, some ships may not hold selected items.

System	Chemical	Biological	Radiological	Nuclear
Chemical Warfare Directional Detector (CWDD), i.e., AN/KAS 1	X			
Ship Automatic Chemical Agent Detector and Alarm (SACADA)	X			
Improved Point Detection System (IPDS)	X			
Chemical Agent Point Detector System (CAPDS)	X			
Chemical Agent Detector Kit M256A1	X			
M-8 / M-9 Detection Paper	X			
Dry Filter Unit (DFU) Note 1: The DFU can be considered a detector when coupled with the Hand Held Assay used to detect and identify biological particulates in a DFU sample.		X (1)		
Interim Biological Agent Detector System (IBADS)		X		
AN-PDR-27 RADIAC			X	X
AN-PDR-43 RADIAC			X	X
AN-PDR-56 RADIAC				X
AN-PDR-65 RADIAC				X
AN-PDQ-1 Universal RADIAC Note 2: This equipment will eventually replace the AN/PDR-27 and AN/PDR-43 RADIACs				X (2)

Figure F-1 Typical Shipboard Detection Equipment

System	Description	Types of Ship	Personnel Responsible	Level of Testing	Comments
Hand-Held Assays (HHA)	Rapid, immunological-based screening device for detecting BW agents in environmental samples	All	Damage Control	PRESUMPTIVE – Confirmatory lab analysis required	Used in conjunction with DFUs and IBADS and to test environmental samples and suspicious parcels, packages, liquids, and powders. Not for diagnostic use.
Dry Filter Unit	Sampling device that collect airborne particulate matter including BW agents on filters. Uses HHAs for presumptive testing of agents.	All	Damage Control	PRESUMPTIVE – Confirmatory lab analysis required	Provides routine monitoring of air (i.e., environmental sampling). Uses HHAs for presumptive detection of biological warfare (BW) agents.
Culture and Smear	Growing bacteria on plates	CV/CVN LHA/LHD T-AH	Specially Trained Advanced Lab Techs (NEC 8506)	CONFIRMATORY – Consult technical reach back*	Specimen processing conducted in bio-safety hood using Center for Disease Control (CDC) bio-safety level 2 handling techniques. Definitive results in 12-24 hours for anthrax. Only means to determine whether bacterial agent is viable.
Polymerase Chain Reaction Testing (PCR)	Rapid and highly specific test that detects presence of BW agent DNA	CV/CVN LHA/LHD T-AH	Specially Trained Advanced Lab Techs (NEC 8506)	CONFIRMATORY – Consult technical reach back* to arrange definitive lab analysis.	Requires significant training (i.e., 2-week course at Biological Defense Research Directorate (BDRD)) and monthly quality control (QC) to maintain proficiency. RAPIDS and Light Cycler PCR equipment currently deployed.

Figure F-2 Deployed Shipboard BW Agent Detection and Testing Equipment

F.2 BIOLOGICAL WARFARE CONFIRMATORY LABORATORY PROCEDURES

The following naval message from Commander, Fleet Forces Command (COMFLTFORCOM) is reprinted and quoted for commands operating confirmatory laboratories; such guidance being provided as interim guidance. Message routing indicators and section breaks have been deleted for clarity and simplicity; similarly, the text has been edited to permit the use of sentence case. Abbreviations for commands have not been spelled out nor provided in the list of abbreviations and acronyms to this document.

Quote:
"R 111949Z APR 03
FM COMFLTFORCOM NORFOLK VA//
TO COMNAVAIRFOR SAN DIEGO CA//N3/N5/N8/N01M//
COMNAVSURFOR SAN DIEGO CA//N3/N5/N7/N8/N01M//
COMSC WASHINGTON DC//N3/N35//
COMSC WASHINGTON DC//N3/N35//
USS ABRAHAM LINCOLN
USS CARL VINSON
USS CONSTELLATION
USS DWIGHT D EISENHOWER
USS ENTERPRISE
USS GEORGE WASHINGTON
USS HARRY S TRUMAN
USS JOHN C STENNIS
USS JOHN F KENNEDY
USS KITTY HAWK
USS NIMITZ
USS THEODORE ROOSEVELT
USS BATAAN
USS BELLEAU WOOD
USS BOXER
USS BONHOMME RICHARD
USS ESSEX
USS KEARSARGE
USS IWO JIMA
USS NASSAU
USS PELELIU
USS SAIPAN
USS TARAWA
USS WASP
USS BLUE RIDGE
USS CORONADO
USS LASALLE
USS MOUNT WHITNEY
USNS COMFORT
USNS MERCY
INFO CNO WASHINGTON DC//N093/N095/N31/N34/N41/N42/N44/
N45/N46/N51/N70/N75/N76/N77/N78//
CMC WASHINGTON DC//PPO//
CMC WASHINGTON DC//PPO//
COMPACFLT PEARL HARBOR HI//N3/N5/N8/N01M//
COMUSNAVEUR LONDON UK
COMUSNAVCENT

COMUSNAVCENT
COMNAVSOUTH
COMDT COGARD WASHINGTON DC//G-OPD//
COMLANTFLT NORFOLK VA//N02M/N9//
BUMED WASHINGTON DC
NAVMEDRSCHCEN SILVER SPRING MD
CBIRF
NAVENPVNTMEDU FIVE SAN DIEGO CA
NAVENPVNTMEDU FIVE SAN DIEGO CA
NAVENPVNTMEDU SEVEN SIGONELLA IT
NAVENPVNTMEDU SIX PEARL HARBOR HI
NAVENPVNTMEDU TWO NORFOLK VA
NAVDISVECTECOLCONCEN BANGOR WA
NAVDISVECTECOLCONCEN JACKSONVILLE FL
NAVDISVECTECOLCONCEN JACKSONVILLE FL
UNCLAS //N02300//
MSGID/GENADMIN/COMFLTFORCOM N8//
SUBJ/BW AGENT CONFIRMATORY LABORATORY GUIDANCE//
REF/A/MSG/COMFLTFORCOM NORFOLK VA/142055ZMAR2003//
REF/B/MSG/CINCPACFLT PEARL HARBOR/130449ZDEC2001//
REF/C/MSG/DIRNAVCRIMINVSERV WASHINGTON/151830ZOCT2001/-/-/NAVATAC//
REF/D/MSG/CINCPACFLT PEARL HARBOR HI/310240ZOCT2001//
REF/E/DOC/CDC-GUIDANCE ON MAIL HANDLING/31OCT2001//
REF/F/DOC/MILITARY POSTAL SERVICE AGENCY/26OCT2001//
REF/G/DOC/OPNAVINST 5100.19D/-//
REF/H/DOC/NAVAL SHIP TECHNICAL MANUAL/06AUG1998/CHAP 470//
REF/I/DOC/CDC GUIDANCE ON PACKAGING CRIT/-//
REF/J/DOC/BUMEDINST 6220.12A/-//
REF/K/DOC/NWP 3-20.31 SURFACE SHIP SURVIVABILITY/-//
REF/L/DOC/OPNAVINST 3100.6G/-//
REF/M/MSG/BUMED WASHINGTON DC/021615ZNOV2001//
REF/N/DOC/DOD REGULATION 4500.9-R/-//
REF/O/DOC/CDC GUIDANCE ON HAND-HELD ASSA/18OCT2001//
REF/P/MSG/BUMED WASHINGTON DC/261910ZOCT2001//
REF/Q/DOC/NWDC TACMEMO 3.11/23OCT2002//
REF/R/DOC/NAVSUP PUB 505/11DEC2001//
REF/S/DOC/USAMRIID/-/FEB2001//
REF/T/MSG/COMUSNAVCENT/181303ZMAR2003//
NARR/REF A provides interim BW guidance.
REF B provides specific guidance for response to underway shipboard Anthrax threat.
REF C provides specific guidance on first responder procedures for Anthrax incidents.
REF D delineates COMUSPACFLT postal policy and procedures for handling suspicious unopened parcels.
REF E is CDC interim recommendations for protecting workers from exposure to bacillus anthracis in work sites where mail is handled or processed, (www.bt.cdc.gov/documentsapp/anthrax/10312001/han51.asp)
REF F provides recommendations for processing military mail.
REF G is Navy occupational safety and health program manual for forces afloat.
REF H is the Navy Ship Technical Manual (NSTM) Chap 470, Shipboard BW/CW Defense.
REF I is CDC guidelines on packaging and labeling biological substances (www.bt.cdc.gov/labissues/packaging/packaginginfo.pdf).
REF J specifies medical event reporting procedures.
REF K provides surface ship CBRD actions.
REF L promulgates special incident reporting procedures.

REF M is BUMED guidance on clinical management.
REF N is DoD Regulation 4500.9-R, Defense Transportation Regulation.
REF O is CDC health advisory on hand-held immunoassays for detection of bacillus anthracis spores (www.bt.cdc.gov/documentsapp/anthrax/10182001healthalertpm/10182001healthalertpm.asp).
REF P is BUMED clinical guidance for management of personnel possibly exposed to anthrax and NEPMU contact information.
REF Q is Navy TACMEMO, Guide to Biological Warfare Defense and Bioterrorism -Afloat and Ashore.
REF R is DoD guidance on packaging and shipping information for hazardous materials and class 6.2 agents (infectious substances).
REF S is USAMRIID medical management of biological casualties handbook available at www.usamriid.army.mil/education/bluebook.html.
REF T is NAVCENT OPTASK NBC Warning and Reporting Systems//
POC/Marty Erickson/N802 civ/COMFLTFORCOM/loc:Norfolk VA/tel:757-836-6682/tel:DSN:836-6682/email:martin.erickson@Navy.mil//
POC/M. Zwick/LCDR/BDRD/loc:Washington DC/tel:301-319-7647/tel:DSN:285-7647//
POC/A. Mateczun/CAPT/BDRD, Director/loc:Washington DC/tel:301-319-7511/tel:DSN: 285-7511//
POC/24 hr Tech Reach/back assistance/BDRD/-/tel:pager: 877-243-1532/tel:pager: 877-243-1528//
RMKS/1. Overview
1.a. Purpose/scope: this is a joint Commander Atlantic Fleet/Commander Pacific Fleet (*sic* CLF/CPF) message to provide guidance to naval units outfitted with confirmatory laboratories for use of equipment described herein and for receiving, sampling, testing, reporting, packaging and transport of suspected BW samples. It is addressed to all deployed ship platforms currently outfitted with confirmatory labs aboard, in lieu of formal established tactics, techniques and procedures (*sic* TTP)/doctrine for this capability. The confirmatory laboratory uses highly reliable polymerase chain reaction (PCR) technology to confirm or discount presumptive hand held assay (HHA) results. Testing a presumptive HHA sample with a second independent method leads to a very high level of certainty for sample identification. This uniquely layered approach to bio-defense leads to highly reliable biological warfare (sic BW) agent identification.
2. Definitions.
2.a. Polymerase chain reaction (PCR) testing: confirms the presence of the DNA of a specific BW agent. PCR equipment is deployed as part of the confirmatory laboratory.
2.b. PCR instrument - lightcycler or Ruggedized Advanced Pathogen Identification Device (*sic* r.a.p.i.d.): laboratory instrument used to conduct PCR testing.
2.c. Dirty area: the dirty area is the portion of the confirmatory laboratory where positive control standards and suspect samples are prepared for PCR testing.
2.d. Clean area: the portion of the confirmatory laboratory where PCR reagents and negative controls are prepared for PCR testing.
2.e. PCR reagents: materials required for PCR testing.
2.f. Quality control program: monthly testing program established to maintain the proficiencies of PCR trained laboratory technicians.
2.g. Reachback: protocols established to contact subject matter experts at the Biological Defense Research Directorate (BDRD). Reachback is the definitive third component of the Navy's robust layered approach to BW agent detection.
2.h. Biosafety cabinet (BSC): specialized laboratory equipment used to keep potentially biohazardous materials isolated. Confirmatory laboratories utilize the BSC to safely manipulate suspect BW agent samples.
2.i. Receiving party: person or persons responsible for receiving and transporting suspect package to its next destination.
3. Environmental sampling: Navy units are trained and outfitted with environmental sampling protocols and equipment to sample for the presence of aerosolized BW agents and suspicious powders and liquids in letters and parcels. Upon the detection of a suspect BW agent, the Navy units are trained in the proper procedures to safely package and ship a sample of the suspect BW agent to the nearest confirmatory laboratory (REF A). Selected Navy units have received confirmatory testing capabilities. These capabilities include the confirmatory PCR

laboratory equipment, microbiology area, and HHA capabilities. The confirmatory laboratory is staffed to deliver a second opinion on a positive environmental sample or a suspicious letter/parcel sample.

4. Confirmatory PCR laboratory set up:

4.a. The confirmatory PCR laboratory consists of five components. These components include a clean area, a dirty area, a Biosafety cabinet (BSC), a PCR instrument (either a r.a.p.i.d. or a Lightcycler), and a set of reagents and standards. The clean area must be set up in an area where potential biological sample contaminations are not present. All reagents and negative PCR control standards are set up in the clean area. The dirty area may be set up in the standard medical laboratory. Positive controls and samples are set up in the dirty area. The BSC is co-located with the dirty area. While manipulating suspect samples within the BSC, in order to prevent DNA contamination of the clean and dirty areas, the PCR instrument must be set up in a separate space from the clean/dirty areas. The reagents and standards must be stored in a manual defrost freezer maintained at negative 20 degrees Celsius. Freeze/thaw cycles are detrimental to these reagents and standards.

4.b. Confirmatory microbiological laboratory: the microbiological laboratory consists of standard plating techniques for bacterial samples.

4.c. HHAs: the HHA is repeated in the confirmatory laboratory setting (REF A). This verifies the HHA result from the field.

5. Confirmatory laboratory operations - upon notification of inbound presumptive BW agent samples: senior medical department representative (SMDR) or officer in charge (OIC) directs PCR qualified laboratory technician to prepare for receipt of sample, and to prepare confirmatory laboratory. SMDR/OIC initiates reachback communication with Biological Defense Research Directorate (BDRD) (*sic* bio-defense research development).

6. Receiving presumptive BW agent package:

6.a. Commander of affected unit utilizes chain of command to arrange for safe transport of decontaminated (per REF A) package containing the presumptive BW agent sample to confirmatory lab unit. Commander of receiving Navy unit alerts receiving party that suspect package is inbound. Receiving party prepares for receipt of suspect package.

6.b. Suspect package is received, while maintaining chain of custody procedures.

6.c. Receiving party escorts suspect package to confirmatory laboratory for testing while maintaining chain of custody procedures.

6.d. SMDR/OIC or lab tech receives package while maintaining chain of custody procedures.

6.e. Confirmatory laboratory tech opens BW agent package within BSC and ensures integrity of sample container. The primary container is removed, decontaminated with a hype-wipe, and the sample is prepared for testing.

6.f. Lab tech runs confirmatory tests including HHA, PCR, and microbiological analysis as appropriate. See sections 7 & 8.

7. Confirmatory laboratory testing and responses for negative HHA:

7.a. If receiving a suspicious letter/parcel sample with a previously negative HHA test result:

7.a.1. SMDR/OIC instructs confirmatory lab tech to repeat a complete HHA panel to verify negative HHA result, perform microbiological analysis on blood agar or MacConkey's media as available, and conduct PCR testing. Conduct reachback for specific agent test procedures.

7.a.2. Results of all confirmatory tests will be verified via reachback consultation with BDRD.

7.a.3. SMDR/OIC directs medical monitoring of "at-risk" personnel until lab clears sample (i.e., no growth on blood agar or MacConkey's media after the appropriate time period and/or PCR testing negative) or as deemed appropriate by SMDR/OIC (no clinical cases observed following an anticipated agent-specific incubation period).

7.a.4. If sample is determined negative by confirmatory testing:

7.a.4.a. Alert chain of command of negative result.

7.a.4.b. Chain of command issues follow-on messages as appropriate.

7.a.4.c. Chain of command will determine further treatment of the sample(s) and follow-on action. If sample is shipped from the confirmatory laboratory, package as a class 6.2 infectious substance but label and ship as an environmental sample. Engage local shipping experts for further detail.

7.a.5. If sample is determined positive for a BW agent by confirmatory laboratory testing:

7.a.5.a. SMDR/OIC directs medical treatment appropriate to BW agent detected. Since multiple agents could be present in a positive sample, engage reachback subject matter experts at BDRD for instruction on additional testing of the sample.

7.a.5.b. Chain of command issues follow-on messages as appropriate.
7.a.5.c. Chain of command will determine further treatment of the sample(s) and follow-on action. If sample is shipped, package and ship as a class 6.2 infectious substance. Engage local shipping experts for further detail.
8. Confirmatory laboratory testing and responses for positive HHA:
8.a. If confirmatory laboratory is receiving a sample that has tested positive via the HHA:
8.a.1. SMDR/OIC directs laboratory technician to conduct confirmatory tests including a complete HHA panel, PCR testing for the BW agent identified, and microbiological analyses (as available) for the BW agent identified. Since multiple agents could be present in a positive sample, engage reachback subject matter experts at BDRD for instruction on additional testing of the sample.
8.a.2. SMDR/OIC directs medical monitoring of "at-risk" personnel until lab clears sample (i.e., no growth on blood agar or MacConkey's media after 72 hours and PCR testing negative) or as deemed appropriate by SMO (no clinical cases observed following an anticipated agent-specific incubation period).
8.a.3. If lab confirms presence of BW agent, SMDR/OIC reports positive results and recommends appropriate medical course of action to co.
8.a.3.a. Commanding Officer (*sic* CO) initiates NBC Warning and OPREP 3 messages; engages technical reach back support as appropriate.
8.a.4. If after consultation with BDRD reachback confirmatory laboratory determines that the sample is negative (i.e. no BW agent detected):
8.a.4.a. SMDR/OIC reports negative result to CO.
8.a.4.b. CO initiates appropriate follow on message traffic.
8.a.4.c. Chain of command will determine further treatment of the sample(s) and follow-on action. If sample is shipped, package as a class 6.2 infectious substance but label and ship as an environmental sample. Engage local shipping experts for further detail.
9. PCR quality control program:
9.a. PCR quality control reagents (unknown samples) are deployed to confirmatory laboratories.
9.b. Confirmatory laboratories are instructed to conduct PCR quality control testing on a monthly basis.
9.c. PCR quality control testing consists of periodically analyzing a set of unknowns, and completing the BW report form. Send results via unclassified internet to bdrdbw@nmrc.Navy.mil for reachback analysis and confirmation.
10. Technical reachback POC information.
10.a. Naval Medical Research Center, BDRD watch stander pager numbers:
Primary 877-243-1528
Secondary 877-243-1531
STU III DSN 285-7509 com: 301-319-7509
Email: NIPR: bdrdbw@nmrc.Navy.mil
SIPRNET bdrd.ops@intecwash.Navy.smil.mil
Classified message traffic NAVMEDRSCENTER SILVER SPRING MD
NMRC Officer of the day (OOD)
DSN: 285-9053
Com: 301-526-1649
Inform the NMRC OOD that you need the BDRD watch stander paged; provide contact information to the OOD.
11. Confirmatory laboratory inventories.
11.a. Inventory checklists are included in the dirty and clean laboratory boxes.
11.b. Questions regarding inventory components may be addressed through reachback to BDRD.//
BT”
Unquote

APPENDIX G

Decontamination of Non-Ambulatory Personnel

The procedures described herein are intended for the decontamination of non-ambulatory, chemically and biologically contaminated casualties in a collective protection system (CPS) protected casualty decontamination station. The following conditions apply:

1. Due to the unique ability of the LHD/LHA platforms they should be considered the host ship for all injured or wounded personnel. They offer CPS protection, a large medical staff, and a special casualty decontamination station that allows medical personnel to monitor wounded personnel through the entire decontamination process.

2. A non-ambulatory casualty, in mission-oriented protective posture 4 (MOPP 4) or a patient protective wrap, which has been exposed to chemical and/or biological (CB) agents with or without conventional injuries, will generally be received at an echelon 2 or higher facility.

3. Decontamination teams consisting of non-medical personnel are dressed in MOPP 4 with butyl rubber aprons and supervised by a medical provider.

4. All CPS air sweeps must be open in the casualty decontamination station.

5. All watertight doors in the casualty decontamination station must remain closed when not in use and no two doors may be opened simultaneously.

The standards of performance to decontaminate the non-ambulatory casualties shall be in accordance with the steps of performance listed below for each stage. The following assumptions shall apply:

1. All casualties received from areas where CB weapons have been employed shall be viewed as contaminated.

2. Medical care shall be provided in a toxic-free environment in a collectively protected system.

3. Medical units ashore and afloat can expect to receive contaminated casualties and shall be capable of CB casualty decontamination.

4. Applicable North Atlantic Treaty Organization (NATO) triage criteria should be applied in preparing casualties for the decontamination process.

5. Decontamination teams shall consist of trained non-medical personnel supervised by a medical provider.

All supplies shall be per the supply requirements for the contamination control area (CCA) or decontamination station. The decontamination process shall include:

1. Stage I. Casualty Receiving Area.

a. Objective. Prepare the casualty for entry into the CPS casualty decontamination station.

b. Staffing in MOPP Level 4

(a) One Triage officer

(b) Two Corpsmen

(c) Two Decontamination Personnel (non-medical)

c. Steps of performance

(1) Remove all battle dress items and place in plastic bags.

(2) Remove all ordnance and weapons to designated area.

(3) Triage the casualty based on NATO criteria.

(4) Decontamination of masks and rubber gloves.

(a) Decontaminate casualty's mask and gloves.

(5) For chemical contamination, use M291 decontamination kit to wipe entire exposed mask, then gloves; for biological contamination, use a sponge damp with 1 percent high test hypochlorite (HTH) solution to wipe entire exposed area of the mask, then the gloves. Note: Do not let the HTH solution drip from the sponge or mask, since it may contaminate the neck area.

(a) With a sponge, wipe overboots thoroughly with 9 percent HTH solution.

(6) Casualty is moved by stage I litter bearers to stage II.

2. Stage II. Overgarment Removal – Note: This becomes a liquid hazard area.

a. Objective. Remove the protective overgarment and avoid contamination of the casualty; if casualty is not wearing a protective overgarment, cut away the outer layer of clothing in the liquid hazard area. Staffing should be dressed in MOPP Level 4. Staffing shall consist of:

1. A Senior corpsman (i.e., team leader)
2. Four cutters (i.e., non-medical personnel)

b. Overview. Cutters will remove the protective overgarments by cutting, protective boots by pulling and/or cutting, and gloves by pulling. Overgarment, boots, and gloves will be double-bagged and passed back to Stage I. Bags must be placed far away and downwind to control re-contamination. The patient is then placed in a plastic bag and move with patient to Stage III for further transfer to a Veterans Administration hospital or similar facility.

c. Preparation. Bag and remove all clothing and equipment from the previous casualty. Decontaminate gloves, scissors, tables, rollers and work stands with 5 percent HTH solution. Note: If the collective protective system is equipped with communications between stages and the clean area, then the team leader will read from the card and a designated person in the clean area will transcribe the information onto a new card to await the arrival of the patient. Otherwise the card will be read in stage III and recorded by a designated person in stage IV.

d. General Procedures. Carry the litter into the liquid hazard area directly beside the clean stainless steel table or roller table. Stage II personnel gently pull the casualty off contaminated litter and onto the stainless steel or roller table. If the casualty decontamination station is the “head-to-toe” design, place casualty on the clean roller table with the casualty’s head towards the transfer scuttle to stage III. The team leader carefully stabilizes the casualty's head and neck during this transfer process. Cut up the legs of the outer trouser to the waist. Peel the overgarment away from the inner garment and skin with one hand while cutting with the other hand. If protective boots can be pulled off, carefully pull them off. If protective boots are tight and cannot be pulled off, cut the rubber overboots at the toe or heel (depending on whether the casualty is on his back or stomach) and remove the over boots. The two remaining cutters cut up the sleeves of the overgarment to the collar hood opening, keeping the scissors clear of the inner garment and skin while peeling the overgarment away from the skin or inner garment. Remove the casualty's rubber gloves by pulling straight off by the fingers. All further handling of the casualty at this stage shall be done by grasping the casualty through the outside of the outer garment. Cut the hood away; the hood will be integral with either the mask or the jacket of the overgarment.

(1) Mask and hood combination.

(a) Loosen all drawstrings and underarm straps.

(b) Open "chin" zipper to the mask.

(c) Cut through the zipper and around the mask inlets and eye pieces to the other side of the zipper completing a circle around the rubber portion of the mask. Note: Keep the scissors over the rubber portion of the mask and not on the skin of the casualty.

(2) Integral hood and overgarment.

(a) Release the drawstring and loosen the hood from the casualty's mask and head.

(b) Cut down the top seam ensuring the scissors do not contact the hair or skin. When the hood is cut away, the other cutters cut up from the waist to the collar completing the cutting process. The cutters grasp the outer garment on the outside surface and pull flat under the casualty. Note: Do not touch the charcoal lining side of the overgarment; contact should be made only on the outside of the overgarment to prevent contaminating the casualty. Transfer the casualty to stage III.

(c) Transfer by passing the casualty through the scuttle and onto the table in the stage III, a vapor hazard area. The casualty should not need to be lifted off the tables but slid from one table to the next through the scuttle. Note: Only stage III personnel may touch the patient.

(3) Stage II personnel bag the outer garments; contaminated equipment, clothing, and other items as they are removed. Stage II team decontaminates and rinses table, rollers, and their rubber gloves in preparation for the next patient.

3. Stage III. Inner garment removal in the vapor hazard area.

a. Objective. Remove inner garments, except the mask in order to expose the skin.

b. Staffing in MOPP level 4 should be one senior corpsman (i.e., team leader) and four non-medical cutters.

c. Overview. The cutters remove the inner garments except mask and rinse all dirt, blood, and any debris with water and apply bandages, tourniquet, intravenous, splints--change, or decontaminate as needed. Patient is then transferred to Stage IV.

d. Preparations. All stage III cutters have decontaminated their gloves, scissors, tables, rollers and work stands with 5-percent aqueous HTH solution. All clothing from the previous casualty has been bagged and returned to stage II.

e. Procedures. The stage II team leader passes the casualty's treatment status and injuries to the stage III team leader. The cutters cut and remove all inner clothing except mask; and rinse away dirt, blood, and debris on the casualty with water. Upon direction of the team leader, exterior bandages may be cut or be cut around dependent on the wounds. The team leader assesses the type and extent of injuries and the need to replace bandages and tourniquets. All tourniquets shall be rinsed with water. If required, place a new tourniquet 1/2- to 1-inch proximal to the old tourniquet; remove the old tourniquet. If necessary, decontaminate the skin around the wound with an M291 skin decontamination kit or a 0.5-percent aqueous hypochlorite solution. All bandages will be cut off and rinsed with water. If necessary, the skin will be decontaminated and bandages replaced as necessary. For splints and backboards, remove and maintain body position. Contaminated tourniquets, bandages, and splints are bagged and discarded with the contaminated clothing. Removal of intravenous bags and tubing is at the discretion of the team leader. It may be necessary to remove them in order to complete the removal of the casualty from the overgarment – if the casualty can be disconnected temporarily without being placed at greater risk. Procedures shall be as follows:

(1) Clamp the tubing between the casualty and the bag.

(2) Cut the tubing between the clamp and the bag; remove necessary garments; replace with clean bag and tubing; attach at entry part.

(3) If it is to remain, the bag and the tubing shall be decontaminated by using a M291 Decontamination Kit before transfer to stage III.

f. The casualty is ready for transfer to the airlock. Open the airlock door, remove the plastic bag containing the previous casualty's mask, carefully transfer casualty to airlock, then close the airlock door and signal to personnel in the toxic free area.

4. Stage IV. Operations in the toxic free area.

a. Objective and staffing. Remove the mask transfer the casualty into the toxic free area. Staffing should consist of a senior corpsman (i.e., team leader), an assistant corpsman, and one non-medical assistant.

b. General Procedures. While operating in the CPS protected facility, no protective equipment is required for stage IV personnel. Medical personnel must wait 2 minutes before opening the casualty air lock door on the clean CPS side in stage IV. Note: Only one airlock door may be opened at a time. The following procedures shall be followed:

1. Open the casualty airlock door in the toxic free area. Note: Only stage IV personnel may touch the casualty.

2. Remove the mask before removing the casualty from the airlock.

3. Place a plastic bag over the mask.

4. Grasp the chin and remove the mask.

5. Pass the bagged mask back to stage II**.**

6. Transfer casualty into the toxic free area for further medical treatment.

7. Close airlock door.

APPENDIX H

Medical

Figure H-1, developed by the U.S. Centers for Disease Control and Prevention (CDC), categorizes critical bio-agents and associated diseases (i.e., biological warfare (BW) agents) with the respective post-exposure chemoprophylaxis; while Figure H-2 provides general information regarding agent detection levels and Navy sources for confirming samples.

BIOLOGICAL AGENT	DISEASE	POST EXPOSURE PROPHYLAXIS
CATEGORY A		
Variola Major	Smallpox	Vaccinia Vaccine
Bacillus anthracis	Inhalational Anthrax	Ciprofloxin or Doxycycline + Anthrax Vaccine
Yersinia pestis	Pneumonic Plague	Streptomycin (Gentamicin as an alternate), Chloramphenical, Ciprofloxin or Doxycycline or Tetracycline
Clostridium botulinum toxin	Botulism	None
Francisella tularensis	Tularemia	Streptomycin (Gentamicin as an alternate), Chloramphenical, Ciprofloxin or Doxycycline or Tetracycline
Filoviruses (Ebola, Marburg) Arenaviruses (Lassa, Machupo)	Viral Hemorrhagic Fever	None
CATEGORY B		
Coxiella burnetti	Q Fever	Doxycycline or Tetracycline
Brucella species	Brucellosis	Doxycycline +Rifampin
Burkholderia mallei	Glanders	Possibly TMP-SMX
Alphaviruses (Venezuelan, eastern and western equine encephalitis)	Encephalitis	None
Toxins (Ricin, T-2 Mycotoxins, epsilon toxin of C. perfringens, Staphylococcus Enterotoxin B (SEB))	Toxic Syndromes	None
Rickettsia prowazeki	Typhus	Doxycycline
Chlamydia psittaci	Psittacosis	Tetracycline, probably Doxycycline
Food Safety Threat Agents: Salmonella species, Shigella dysenteriae, Escherichia coli 0157:H7		
Water Safety Threat Agents: Cryptosporidium parvum, Vibrio cholerae		
CATEGORY C		
This category refers to emerging pathogens that could be engineered for mass dissemination in the future because of availability, ease of production and dissemination, the potential for high morbidity and mortality, and major health impact. Diseases and post exposure prophylaxis will be a function of the strains developed. Likely pathogens include: Nipah Virus, Hantavirus, Tickborne Hemorrhagic Fever Viruses, Tickborne Encephalitis Virus, Yellow Fever, and Multi-drug-Resistant Tuberculosis.		

Figure H-1. List of Post-Exposure Prophylaxis Medications

BW Agent Detection Level	Definition
Presumptive	A test for presumptive identification has the following characteristics: it is rapid (completed on the order of minutes); inexpensive, and requires limited training to use. Although other types of technologies may be developed, all currently deployed presumptive tests are immunochemically-based. These include: Interim Biological Agent Detection System (IBADS); Biological Identification and Detection System (BIDS); Portal Shield; Dry Filter Units (DFUs) with Hand Held Assays (HHAs); and the Joint Biological Point Detection System (JBPDS). Presumptive identification acts as a precursor to follow-on confirmatory testing.
Confirmatory	Confirmatory identification (i.e., field confirmatory identification) is a second, independent test carried out on a sample that has already undergone presumptive testing. A test for confirmatory identification is rapid, but will likely take longer to conduct than a presumptive identification test (hours versus minutes). Confirmatory testing must be completed within 24 hours of when the original environmental sample was collected. Confirmatory identification must rely on a technology distinct from that used for presumptive testing.
Definitive	Definitive identification is accomplished at a select few Continental United States (CONUS)-based laboratories by scientific experts. Analysis may occur over multiple days. Scientists at this level of testing may employ all presumptive and confirmatory technologies, while also employing additional technologies and analyses that may not be available to forward-deployed units. The ultimate purpose of this level of testing is to provide the most definitive identification of a BW agent and collect forensic data.

Figure H-2. BW Agent Detection Levels for Environmental Samples

BW Agent Detection Level	Afloat	Ashore
Definitive	None	Biological Defense Research Directorate (BDRD)
Field Confirmatory	CV/CVN/LHD/LHA/T-AH	NEPMU, FDPMU, BDRD, Deployable Labs, Theater Medical Surveillance Team (TMST)
Presumptive	All US Navy Surface Combatants and Auxiliaries	SEABEES
Retrograde movement of laboratory samples for enhanced levels of accuracy of testing will flow from far-forward-deployed units possessing presumptive identification to designated platforms possessing confirmatory identification capability and finally to Continental United States (CONUS)-based definitive level facilities.		

Figure H-3. US Navy BW Agent Test Site Facilities

APPENDIX I

Biological Warfare Agent Detection and Response Guidance

The following guidance provided by Commander, Fleet Forces Command (CFFC) is reprinted and quoted to assist personnel charged with packaging and shipping biological warfare (BW) and hazardous materials in the performance of their duties. For clarity and simplification of reading, page breaks have been deleted and the message text edited to appear in sentence case; abbreviations for commands have not been spelled out nor provided in the list of abbreviations and acronyms.

QUOTE:
"R 142055Z MAR 03
FM COMFLTFORCOM NORFOLK VA//N01//
TO ALLANTFLT
ALL MSCLANT SHIPS
COMSCLANT NORFOLK VA
COMSCPAC SAN DIEGO CA
INFO COMPACFLT PEARL HARBOR HI//N3/N5/N8//
COMUSNAVEUR LONDON UK//N3/N5//
COMUSNAVCENT//N3/N5//
COMDT COGARD WASHINGTON DC//G-OPD//
COMLANTFLT NORFOLK VA//N9//
CNO WASHINGTON DC//N34/N51//
COMSC WASHINGTON DC
UNCLAS //N06000//
MSGID/GENADMIN/COMFLTFORCOM//
SUBJ/BW AGENT DETECTION AND RESPONSE GUIDANCE//
REF/A/GENADMIN/CINCPACFLT/130449ZDEC2001//
REF/B/GENADMIN/DIRNAVCRIMINVSERV/151830ZOCT2001/-/-/NAVATAC//
REF/C/GENADMIN/CINCPACFLT/310240ZOCT2001//
REF/D/DOC/CDC/31OCT2001//
REF/E/MEMO/MILITARY POSTAL SERVICE AGENCY/26OCT2001//
REF/F/DOC/OPNAV/30AUG2001//
REF/G/DOC/NAVAL SHIPS TECHNICAL MANUAL/-/CHAP 470//
REF/H/DOC/CDC/-//
REF/I/DOC/BUMEDINST 6220.12A/-//
REF/J/DOC/NWP 3-20.31/-//
REF/K/DOC/OPNAV/01JUN1995//
REF/L/GENADMIN/BUMED/021615Z5NOV2001//
REF/M/DOC/DOD/-//
REF/N/DOC/CDC GUIDANCE ON HAND-HELD ASSAY/18OCT2001//
REF/O/GENADMIN/BUMED/261910ZOCT2001//
REF/P/DOC/NWDC/-//
REF/Q/DOC/NAVSUP/11DEC2001//
REF/R/DOC/USAMRIID/-//
NARR/Reference (REF) A provides specific guidance for response to underway shipboard anthrax threat. REF B provides specific guidance on first responder procedures for anthrax incidents. REF C delineates CINCPACFLT postal policy and procedures for handling suspicious unopened parcels. REF D is official Centers for Disease

Control and Prevention (*sic* CDC) health advisory: CDC interim recommendations for protecting workers from exposure to bacillus anthracis in work sites where mail is handled or processed, hTTP:www.bt.CDC.gov/documentsapp/anthrax/10312001/han51.asp). REF E provides recommendations for processing military mail. REF F is OPNAVINST 5100.19d, *Navy Occupational Safety and Health Program Manual for Forces Afloat*. REF G is the Navy Ship Technical Manual (NSTM) Chapter 470, *Shipboard BW/CW Defense and Countermeasures*. REF H is CDC guidelines on packaging and labeling biologic substances (www.bt.CDC.gov/labissues/packaging/packaginginfo.pdf). REF I specifies medical event reporting procedures. REF J provides surface ship CBRD actions. REF K is OPNAVINST 3100.6G, promulgates special incident reporting procedures. REF L is BUMED guidance on clinical management. REF M is DoD Regulation 4500.9R, *Defense Transportation Regulation*. REF N is official CDC health advisory on hand-held immunoassays for detection of bacillus anthracis spores (www.bt.CDC.gov/documentsapp/anthrax/10182001healthalertpm/ 10182001healthalertpm.asp). REF O is Bureau of Medicine (*sic* BUMED) clinical guidance for management of personnel possibly exposed to anthrax and Navy Environmental Protection and Medicine Unit (*sic* NEPMU) contact information. REF P is Navy Warfare Development Command (*sic* NWDC) Tactical Memorandum (*sic* TACMEMO), *Guide to Biological Warfare Defense and Bioterrorism - Afloat and Ashore*. REF Q is Naval Supply Publication (*sic* NAVSUP Pub) 505, DoD Guidance on Packaging and Shipping Information for Hazardous Materials and class 6.2 agents (infectious substances). REF R is USAMRIID Medical Management of Biological Casualties Handbook available at www.usamriid.army.mil/education/bluebook.html//

POC/Erickson, Martin/civ/CFFC N802/-/tel:757-836-6682//

POC/Rick Breaux/civ/OPNAV N707/-/tel:703-614-2202/tel:DSN:224-2202//

POC/M. Zwick/LCDR/BDRD/-/tel:301-319-7647/tel:DSN:285-7647//

POC/A. Mateczun/CAPT/Director BDRD/-/tel:301-319-7511/tel:dsn:285-7511//

POC/24 hr tech reachback assistance/callsign: contact BDRD watch standers/-/tel:877-243-1532 /tel:877-243-1528//

RMKS/1. Overview. CFFC does not regularly direct procedures to the operational fleet, but in the absence of approved tactics, techniques and procedures (*sic* TTP) this message provides integrated guidance for DoD biological agent detection equipment including hand-held assays (HHA), dry-filter units (DFU), and bio-response bags (BRB), which were recently deployed to the fleet. CFFC is providing this detailed guidance to rapidly disseminate procedures that tie together the numerous references involved in BW agent detection and response. A single worldwide process for processing BW detection has been requested and will improve training and foster the development of the Navy TTP in this area. Until a compressive TTP is approved the guidance in this message should be incorporated into existing CBR doctrine. This message should have widest possible dissemination.

2. Definitions.

a. Infectious substance: a viable microorganism, or its toxin, that causes or may cause disease in humans or animals, and includes those agents listed in 42 CFR 72.3.2. Substances known to contain, or reasonably expected to contain, pathogens (e.g., bacteria, viruses, Rickettsia, parasites, fungi) (see References M and Q).

b. Biological warfare (BW) agent: an infectious substance or biological toxin used to produce casualties in man or animals and damage to plants or materiel.

c. BW response team: three-person team that has received specialized training in responding to known or suspected BW threats. Shipboard teams are constituted with damage control (*sic* DC) personnel, ashore units utilize force protection or CBR personnel.

d. Individual protective equipment (IPE): the major components include a protective suit, mask, boots, and gloves.

e. BRB: equipment used by BW-response teams when responding to a suspected or known BW incident. BRBs contain sampling, packaging and decontamination supplies. REF G provides a list of suggested BW sampling supplies. A modified list of equipment and ordering information is provided in paragraph 7. BRBs are currently supplied to units receiving dry filter units and undergoing specialized BW response training.

f. DFU: an environmental air sampling system designed to be used with HHAs and confirmatory BW testing laboratories to provide "detect-to-treat" capability for naval forces ashore and afloat. The DFU is a high volume air sampler that collects airborne particulate matter as it is drawn through filters.

g. Interim Biological Agent Detection System (IBADS): a semi-automated aerosol detection system installed on selected ships.

h. HHA: HHAs are simple single use test kits that provide presumptive identification of BW agents. HHAs are used to test samples collected with DFUs or IBADS. Presumptive results are available in 15 minutes. They are an excellent screening tool but must be used in conjunction with the confirmatory laboratory.

i. Confirmatory laboratory: a specialized laboratory used to confirm the identity of a BW agent detected with an HHA. Confirmatory laboratories are deployed on selected afloat units and at selected shore sites. Laboratory locations will be provided by separate correspondence (*sic* SEPCOR).

j. Chain of custody: protocols established to ensure traceability of samples involved in an investigation. Proper chain of custody is accomplished by having verifiable documentation indicating the sequence of individuals who have handled a piece of evidence and the sequence of locations where a piece of evidence was stored (including dates and times). For a proven chain of custody to occur the evidence is accounted for at all times, the passage of evidence from one party to the next is fully documented, and the passage of evidence from one location to the next is fully documented (REF P refers).

3. Deployed DFUs and HHAs provide a fleet capability for environmental air sampling to detect aerosolized BW agents. Guidance for operation of DFUs follows:

a. Navy afloat units receive either two (2) three (3) or five (5) DFUs. Afloat units maintain one (1) unit in reserve for internal monitoring. Ashore unit DFU requirements will vary with geography and the size of the unit.

b. DFU air sampling will be managed afloat by shipboard DC personnel and ashore by designated force protection or CBR team personnel.

c. Unless otherwise directed, DFUs will be deployed when BW threat dictates or at MOPP-level 2 afloat.

d. DFU placement: DFUs will be positioned to provide the most efficient air-mass sampling. DFUs, though rugged, should be protected from direct salt spray, aircraft or stack exhaust, or any other source of excessive airborne particulate exposure. Since DFUs are portable, location may vary when ship is underway versus pier side.

e. Unless otherwise directed, the filters in each DFU will be replaced and tested at least every 12 hours. Filter testing from multiple DFUs deployed by a Navy unit will be staggered so as to provide the most efficient rate of air-mass sampling and to conserve consumables. Recommend units with two DFUs stagger the replacement and testing of DFU filters to provide a six-hour window for obtaining test results. For example, filters on DFU Number1 could be replaced and tested at 1200 and 2400 whereas filters on DFU Number 2 could be changed at 0600 and 1800.

f. HHA testing. Two filters are in each DFU. One filter is tested with the HHA using the buffer solution provided in the DFU kit. If the HHA is positive, the HHA, remaining buffer, and the second filter are packaged per REF Q, and transported to a confirmatory laboratory. If the HHA is negative, Navy unit will place the untested filter in a whirl bag, annotate with date/time, and archive for 30 days. Navy units will maintain a log documenting the time of filter testing and HHA results.

(1) HHA negative: HHA must show a pink/red color in the "c" or control line. Nothing is visible in the "t" or test line. Any uncertainty in interpreting a negative HHA test result should be resolved by running a second complete HHA and/or subsequent testing at a confirmatory laboratory.

(a) Deliver spent HHA and the buffer solution containing the tested filter to medical for disposal. This material is not biohazardous, but should be considered operationally sensitive.

(b) Report negative HHA results in daily Operational Summary (*sic* OPSUM) or as promulgated in local fleet directives.

(2) HHA presumptive positive: HHA must have pink/red color in the "c" or control line. A pink/red color must also be present in the "t" or test line. Any uncertainty in interpreting a positive HHA test result should be resolved by subsequent testing at a confirmatory laboratory.

(a) Notify chain of command that a DFU filter sample is positive. Initiate NBC Warning Report and OPREP messages or message traffic as promulgated in local fleet directives.

(b) Run a second complete HHA on the same DFU filter sample. Additional testing of remaining DFUs may occur if such testing aids the assessment of the duration and/or magnitude of exposure.

(c) Packaging: spent HHAs, buffer solution containing tested filters, and untested dry filters are packaged in accordance with REF Q. The package is decontaminated for shipment to the nearest confirmatory laboratory. Packaging and decontamination supplies are contained in the BRBs. High Test Hypochlorite (*sic* HTH) solution (5% for materiel) or a household bleach solution (5% for materiel) may be used for decontamination. Stock household bleach is a 5% solution of sodium hypochlorite. Place each item into its own primary watertight container (for example: zip lock bag). Place the primary containers into a secondary watertight container. Multiple primary containers may be placed into a single secondary container. Decontaminate the secondary container. The decontaminated secondary container is placed into an approved toughened, sealable container (for example: plastic screw capped bottle or sealable paint can) (REF H refers). Decontaminate and place the toughened container and an itemized list of contents into an approved cardboard container and affix appropriate labels (REF H).

(d) Initiate chain-of-custody protocol (REF P). The presence of a BW agent constitutes a crime scene and the proper chain of custody must be maintained to ensure the integrity of evidence. The Department of the Navy (*sic* DON) evidence/property chain of custody form OPNAV 5527/22 is available at TTP:neds.nebt.daps.mil/directives/forms/5527-22.pdf.

(e) Transport decontaminated package to confirmatory laboratory.

(f) Reachback: Officer in Charge (*sic* OIC)/senior medical officer (SMO) of confirmatory lab contacts Biological Defense Research Directorate (BDRD) of the Naval Medical Research Center (NMRC) upon notification that samples are inbound for testing. See section 6.a. for NMRC and BDRD contact information.

(g) Medical response: affected unit will contact and consult higher medical authority for medical instruction. Medical treatment will be considered/initiated after confirmatory laboratory testing is reported. If confirmatory test results are not available within a timely manner, higher medical authority will recommend appropriate medical treatment.

(h) Unit decontamination guidance - see REFs G, J, and P. Additional guidance will be provided by chain of command.

4. Suspicious letter or parcel: upon notification of a possible BW incident involving a suspicious letter, package, powder or liquid, the following basic actions are performed. Section l.3.2 of REF P has more detailed recommended procedures. (If chemical, explosive, or radiological incident is suspected, follow guidance for those events):

a. Personnel at incident site:

(1) Senior person on scene notifies chain of command that an incident has occurred.

(2) Don respiratory protection.

(3) Gently cover suspect letter/parcel.

(4) Secure movement in-and-out of space.

(5) Stand fast.

b. DC/BW response team:

(1) Secure ventilation for contamination control.

(2) Activate response team.

(3) Set contaminated-uncontaminated boundaries and restrict access/egress to incident site.

(4) Assess incident as per unit CBR Defense Bill or local fleet directive.

(5) BW response team obtains IPE, BRBs, HHAs, and reports to contaminated/uncontaminated boundary.

(6) Conduct situation brief; develop action plan.

(7) Select BW sampling supplies and don IPE.

(8) Activate decontamination stations and contamination control areas (CCAs) as per unit CBR Defense Bill.

c. BW response team activities:

(1) Two BW response team members enter the contaminated area.

(2) One member, called the sampler, collects samples and performs HHAs. The sampler places each sample in its own primary watertight container.

(3) Second member, called the assistant, assists the sampler by passing supplies forward, taking detailed notes on the Nalgene writing pad supplied with the BRB, and communicating with personnel in the uncontaminated zone.

(4) Sampler interprets HHAs in accordance with paragraph 4.f.1 and 4.f.2.

(5) Notify chain of command of HHA results. Initiate message(s) as appropriate.

(6) The sampler places HHAs and buffer bottles into individual primary watertight containers and drops these items into a secondary watertight container held open by the assistant. If the primary watertight container contains a liquid, add an absorbent paper towel to absorb fluid if container breaks. The assistant decontaminates the detailed notes, places them into a primary watertight container and adds them to the secondary watertight container.

(7) The assistant decontaminates the secondary watertight container and places it into an approved toughened, sealable container. The assistant decontaminates the toughened container. The assistant transports all packaged items to contaminated/uncontaminated boundary and drops these items into a decontamination vessel (for example: an empty trash can). The third team member completes decontamination and packaging procedures (REF Q) in the uncontaminated zone.

(8) Final packaging: the third team member places all decontaminated items into an approved outside container (for example: a strong cardboard box). A decontaminated itemized list of all contents is included in the final package. Affix appropriate stickers to the final package and label with sender and receiver addresses.

(9) Initiate chain-of-custody protocol (REF P).

(10) Transport decontaminated package to confirmatory laboratory.

(11) Reachback: OIC/SMO of confirmatory laboratory contacts BDRD upon notification that samples are inbound for testing. See section 6.a. for contact information.

(12) Medical response: affected unit will contact and consult higher medical authority for medical instruction. Medical treatment is considered/initiated after confirmatory laboratory testing is reported. If confirmatory test results not available within timely manner, higher medical authority will recommend appropriate medical treatment.

(13) Decontamination guidance - see REFs G, J, and P. Additional guidance will be provided by chain of command.

d. Benign letter or parcel: if HHA negative and BW response team can determine that the sample is not a BW threat (for example: ruptured case of foot powder or talcum powder), treat the sample as a negative. Samples that cannot be determined to be benign are treated as outlined in 5a through 5c.

(1) Damage Control Assistant (*sic* DCA) recommends "all clear" to commanding officer (*sic* CO).

(2) CO makes final benign/negative determination.

(3) Clean spaces.

(4) Routine report to chain-of-command.

(5) Technical reachback point of contact (*sic* POC) information:

(a) Naval Medical Research Center, BDRD/ watch stander pager numbers/ primary/877-243-1528/ secondary/877-243-1531/STU III/DSN 285-7509/com: 301-319-7509/email: NIPR: bdrdBW@nmrc.navy.mil; classified message traffic/NAVMEDRSCENTER SILVER SPRING MD; NMRC Officer of the day/DSN 285-9053/com: 301-526-1649, inform the NMRC OOD that you need the BDRD watch stander paged/provide contact information to the OOD.

(b) Naval Environmental Preventative Medicine Units (NEPMUs):

1. NEPMU-2, Norfolk, VA, DSN 312-564-7671 or commercial (757) 444-7671. Email: nepmu2@nepmu2.med.navy.mil. Plain language address: NAVENPVNTMEDU TWO NORFOLK VA.

2. NEPMU-5, San Diego, CA, DSN 312-526-7070 or commercial (619) 556-7070. Email: NEPMU5@nepmu5.med.navy.mil. Plain language address: NAVENPVNTMEDU FIVE SAN DIEGO CA.

3. NEPMU-6, Pearl Harbor, HI, DSN 315-473-0555 or commercial (808) 473-0555. Email: nepmu6@nepmu6.med.navy.mil. Plain language address: NAVENPVNTMEDU SIX PEARL HARBOR HI.

4. NEPMU-7, Sigonella, Italy, DSN 314-624-4101 or commercial 39-095-56-4101. Email: nepmu7@nepmu7.sicily.navy.mil. Plain language address: NAVENPVNTMEDU SEVEN SIGONELLA IT.

6. BW response bags will be stocked and delivered to units either through ISIC, shipped direct to the command or during attendance at two day BW team responder course. Replacement items contained in the bags can be ordered through the federal stock system:

nsn/order number	nomen	price/ui	mfr
20mob1bk	mobile operation bag	88.95 ea	Black Hawk Industries
6640-01-218-8043	jar, 60ml wide mouth	68.00/ea	
72-694-006	vial, 5ml cryogenic sterile	147.20/cs	SARSTEDT Inc

6306-0500	pad, nalgene writing	15.75/ea	Nalgene
st100	shipper, SAF-T-PAK	199.00/cs	SAF-T-PAK
8105-00-837-7753	bag, ziplock	0.10/ea	
8105-01-387-5442	bag, ziplock 2 gal	12.89/bx	
h36930-0000	trowel, sample plastic	0.71/ea	Bell-Art Prod
h36942-0000	spoon sampler, sterile	0.64	Bell-Art Prod
ef22008da	swab, dacron sterile	139.00/cs	A.Daigger
13-711-48	pipette, transfer lg	57.37/cs	Fisher Scientific
56258c	tape, transparent roll	4.07/ea	Lab Safety
7930-01-423-3699	hype wipes, bleach	73.00/cs	
50468	underpad, absorb	39.95/bx	Moore Medical
6515-00-935-7138	scissors, bandage	6.30	
7530-00-982-0064	label, blank specimen	1.03	
stp806	label, danger aircraft	81.38/cs	SAF-T-PAK
stp802	label, class 6.2 inf sub	52.86/cs	SAF-T-PAK
stp805	label, overpack	79.21/cs	SAF-T-PAK
stp800	declaration, dangerous goods	85.65/cs	SAF-T-PAK\

7. HHAs and DFU kits are provided when DFU systems are fielded. Additional HHA requests and orders should be coordinated through CFFC N41 CDR Tim Greene DSN: 836-6865 timothy.greene@navy.mil and NSWC Dahlgren DFU and Assay Program Manager Ed Lustig, e-mail lustigea@nswc.navy.mil, lustigea@nswcdd.navy.smil.mil. Phone DSN 249-7418 comm 540 653-7418. In addition, a forward depot of HHAs and DFU kits has been established at COMUSNAVCENT. Contact the CJFMCC NBC cell at DSN 318-439-3350 or commercial 011-973-743-350. Email cjfmccnbccell(@)cusnc.navy.smil.mil or cjfmccnbccell(@)cusnc.navy.mil for resupply.//
BT”
UNQUOTE

APPENDIX J

References and Resources

J.1 JOINT AND MULTISERVICE

FM 3-05.105/ NTTP 3-11.30/ AFTTP (I) 3-2.35/ USSOCOM Pub 3-11 *Multi-Service Tactics, Techniques, and Procedures for Special Operations Forces in Nuclear, Biological, and Chemical Environments*, 6 April 2001

FM 3-5/MCWP 3-37.3, *NBC Decontamination Operations,* 31 January 2002

FM 3-11 (FM 3-100)/MCWP 3-37.1/NWP 3-11/AFTTP(I) 3-2.42, *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical Defense Operations*, March 2003

FM 3-11.4/MCWP 3-37.2/NWP 3-11.27/AFTTP(I) 3-2.46, *Multiservice Tactics Techniques and Procedures for Nuclear, Biological, and Chemical (NBC) Protection,* December 2002

FM 3-11.21/ MCRP 3-37.2C/ NTTP 3-11.24/ AFTTP (I) 3-2.37, *Multi-Service Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical Aspects of Consequence Management,* December 2001

FM 3-11.34/ MCWP 3.37.5/ NTTP 3-11.23/ AFTTP (I) 3-2.33 *Multi-Service Procedures for Nuclear, Biological, and Chemical (NBC) Defense of Theater Fixed Sites, Ports, and Airfields*, September 2000

FM 3-14/MCRP 3-37.1A, *Nuclear, Biological and Chemical (NBC) Vulnerability Analysis*, 12 November 1997

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