THE MANNING REQUIREMENTS FOR THE U.S. NAVY'S FORWARD DEPLOYABLE PREVENTIVE MEDICINE UNIT DETACHMENT

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

THE NAVY'S FORWARD DEPLOYABLE PREVENTIVE MEDICINE UNIT DETACHMENT'S MANNING REQUIREMENTS, by LCDR Steven E. Rankin, MSC, USN, 128 pages.

This thesis examines the potential manning shortfalls for the Navy's proposed Forward Deployable Preventive Medicine Unit's (FDPMU) twelve-member Detachment. The twelve-member detachment is derived from the existing twelve-member preventive medicine Mobile Medical Augmentation Readiness Team (MMART)--a Navy medical deployment augmentation program for operational platforms and contingencies. Generally the MMART team was fully employed during deployments but now has the additional Chemical, Biological, Nuclear/Radiological and enhanced Environmental (CBRE) mission taskings. This unit can be task organized for fewer personnel but has a twelve-member core detachment necessary to provide coverage to all the technical specialties supported by the full team.

The current manning utilized by U.S. DOD units with similar and overlapping mission requirements in the areas of preventive medicine, CBRE, and laboratory capabilities was examined. The number of personnel identified as essential to support those similarities were compared to those proposed for the FDPMU Detachment. The study concludes that the FDPMU Detachment manning requirements are feasible, but as the minimum number of personnel required for basic mission accomplishment in a low threat environment.

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To my staff section group, 7B, my family away from my family during my geo-baching days here at CGSC. Ya'll are the best. Go MAG Seven.

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ABBREVIATIONS

AFNORTHWEST	NATO's Allied Forces Northwest
AFRAT	Air Force's Radiation Assessment Team
AML	Area Medical Laboratory (replaces the TAML)
AMMAL	Authorized Minimal Medical Allowance Lists
BDT	Biological Detection Teams
BIDS	Biological Integrated Detection Systems
CBIRF	U.S. Marine Corps Chemical Biological Incident Response Team
CBN-RE	Chemical, Biological, Nuclear/Radiological and/or Environmental
CBRE	Chemical, Biological, Radiological and/or Environmental
CBRT	TEU Chemical Biological Response Team
CDR	Commander
CINC	Commander in Chief
CONUS	Continental U.S.
CST	Civil Support Team
DEST	Domestic Emergency Support Team
DNBI	Disease Non-Battle Injury
DOD	Department of Defense
DOMS	Department of Military Service
DVECC	Disease Vector Ecology and Control Center
EDCU	Navy Epidemic Disease Control Units
ELISA	Enzyme Linked ImmunoSorbent Assay

FBI	Federal Bureau of Investigation
FDL	Navy Forward Deployed Laboratory
FDPMU	Forward Deployed Preventive Medicine Unit
FEMA	Federal Emergency Management Agency
FM	Field Manual
FM 3-4	*NBC Protection*
FM 3-5	*NBC Decontamination*
FM 3-14	*Nuclear,Biological, and Chemical (NBC) Vulnerability Analysis*
FM 3-19	*NBC Reconnaissance*
FM 3-100	*Chemical Operations Principles and Fundamentals*
FM 3-101-6	*Biological Defense Operations: Battle Staff and Biological Defense Company, Tactics, Techniques, and Procedures*
FM 4-02.17	*Preventive Medicine Services*
FM 8-9	*NATO handbook on the Medical Aspects of NBC Defensive Operations, AmedP-6(B)*
FM 8-10-7	*Health Service Support in a Nuclear, Biological, and Chemical Environment*
FM 8-10-18	*Veterinary Service: Tactics, Techniques, and Procedures*
FM 8-30	*Veterinary Food Inspection Specialist*
FM 8-55	*Planning for Health Service Support*
FM 8-250	*Preventive Medicine Specialist*
FMFM	Fleet Marine Force Manual
HMMWV	High Mobility Multipurpose Wheeled Vehicle
HQ	Headquarters

IRF	CBIRF's Initial Response Force
JP	Joint Publication
JP 3-11	*Joint Doctrine for Nuclear, Biological, and Chemical (NBC) Defense*
MANMED	Navy Manual of the Medical Department
MCRP	Marine Corps Reference Publication
MCWP	Marine Corps Warfighting Publication
MCWP 3-37	*MAGTF Nuclear, Biological, and Chemical Defense Operations*
MECU	Navy Malaria and Epidemic Control Units
MAGTF	Marine Air Ground Task Force
MMART	Mobile Medical Augmentation Readiness
MOPP	Mission Oriented Protective Posture
MTOOW	Military Operations Other Than War
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NCO	Noncommissioned Officer
NEHC	Navy Environmental Health Center
NEPMU	Navy Environmental and Preventive Medicine Unit
NIRF	AFRAT's Nuclear Incident Response Force
NWP	Naval War Publication
OCONUS	Off Continental U.S.
OH	Marine Corps Operational Handbook
OSH	Occupational Safety and Health

PCR	Polymerase Chain Reaction
PDD	Presidential Decision Directive
PVNTMED	Preventive Medicine
QDR	Quadrennial Defense Review
RAID	Rapid Assessment and Initial Detection
RAT	AFRAT's Radioanalytical Assessment Team
TAML	Theater Army Medical Laboratory (to be replaced by the AML)
TAACOM	Theater Army Area Command
TEU	Technical Escort Unit
TRADOC	U.S. Army Training and Doctrine Command
USAMRIID	U.S. Army Medical Research Institute for Infectious Diseases
WMD	Weapons of Mass Destruction.
WMPICP	Weapons of Mass Destruction Incident Contingency Plan

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CHAPTER 1

INTRODUCTION

> Whether or not gas will ever be employed in future wars is a matter of conjecture, but the effect is so deadly to the unprepared that we can never afford to neglect the question.[1]
>
> General John J. Pershing, *Chemical Warfare in World War I: The American Experience, 1917-1918*

Overview

With the ending of the Cold War, the threat to U.S. citizens, at home and abroad, did not abate. Rather, the monolithic threat of war with the Soviet Union evolved into a global security environment emerging with a wide range of challenges and threats. These challenges and threats range from the unintentional impact of weakened industrial systems and the potential for transnational environmental pollution problems to low intensity conflicts to terrorism in an asymmetrical threat environment. Industrial accidents, such as Chernobyl and Bhopal, demonstrate the potential health threat from consequences involving transnational players. The bombings at the World Trade Center,[2] Oklahoma City,[3] Khobar Towers,[4] and the U.S. Embassies in Kenya and Tanzania[5] are indicative of the increasing boldness on the part of today's extremists and nonstate actors. This chemical and nuclear threat is international in scope and was part of the agenda at the recent G-8 Kyushu-Okinawa Summit.[6] Maulana Fazlur Rehman's, Chief of Jamiat Ulema-e-Islam, recently alleged comments in Taliban argue that terrorism is a justifiable response to U.S. attacks in Afghanistan.[7]

The need to counter this asymmetrical threat both at home and during military operations other than war (MOOTW), such as humanitarian assistance, peacekeeping, nation building, coupled with the increasing awareness of force health protection through disease and non battle injuries (DNBI), is a growing concern for civil authorities and U.S. commanders. A significant cog of this defensive response wheel is the ability to identify, assess, and evaluate the perceived or actual threat, resulting in technical guidance to decision makers on the scene or during the planning process.

The Navy is developing such a capability through the enhancement and expansion of existing assets currently in place. This capability is known as the Forward-Deployed Preventive Medicine Unit (FDPMU), consisting of thirty-nine personnel with specialized technical skills for force health protection threat assessment. This unit can be task organized for fewer personnel but has a twelve person core detachment necessary to provide coverage to all the technical specialties supported by the full team. The twelve-member detachment is derived from the existing twelve-member preventive medicine Mobile Medical Augmentation Readiness Team (MMART)--a Navy medical deployment augmentation program for operational platforms and contingencies. Generally the preventive medicine MMART was fully employed during deployments but now has the additional chemical, biological, nuclear and radiological, and environmental (CBRE) mission taskings. This thesis will examine the potential manning shortfalls the additional CBRE requirements have added.

Background

Weapons of Mass Destruction

Since the collapse of the Soviet Union, the proliferation of weapons of mass destruction (WMD) is an increasing concern to both U.S. homeland defense and force protection. The U.S. and its allies are at greater risk from WMD then at any time since the 1962 Cuban missile crisis.[8] The U.S. State Department has identified seven states that pose a potential WMD threat to the U.S. either individually or through the support of terrorism.[9] Although the Chemical Weapons Convention[10] and the Biological Weapons Convention[11] prohibit the development or proliferation of these weapons, the barriers to possessing and using these weapons are eroding.[12] History indicates that as one state achieves a technology, capability, or method that gives advantage to one nation over another, it will eventually be exploited for strategic objectives. Arguably it is indicative that the strategy of WMD nonproliferation is doomed to fail on its own[13] and should not be the sole effort in preventing WMD use. The world has shown remarkable restraint in WMD use by states against states. Rogue states or nonstate actors may undermine this record so it is prudent and timely that preparations be developed to counter the horrendous consequences of WMD use.

Already there are numerous developing and industrialized nations trying to develop the resources and expertise to develop these weapons or to acquire them through other means. Steady advancements in technology continue to enhance the probability of successful employment of these weapons in the future. As technology advances, weapons designs become smaller, making detection more difficult while being smuggled into the target area. Senator Sam Nunn predicted that over the next decade the greatest threat to the U.S. from a WMD was more likely to come from a suitcase than a missile.[14] In a recent study by the Center for Strategic and International Studies, the center argues

for the need for the U.S. to consider a "future where weapons of mass destruction are a common aspect of asymmetric warfare . . . conducted against the U.S and its allies."[15] These weapons pose a significant security risk, giving smaller states and terrorists "the ability to inflict damage that is wholly disproportionate to conventional means."[16]

That future may already be here. In 1993 near Boskovici, Bosnia, Muslim forces allegedly used "chlorine filled mortar shells against Bosnian Serb forces."[17] Likewise, in early January 2000, for the third time during the Chechnya rebellion, the Russian military accused the Chechen rebels of using chemical weapons,[18] specifically bombs containing "chlorine and ammonia" in the eastern suburbs of Grozny.[19] Later in July 2000, Chechen rebels allegedly threatened to blow up Russian nuclear plants, in addition to any "military, industrial or strategic objectives" regardless of ownership to justify their "absolute right to return the blows of the aggressor."[20] Although, these are not typical military WMD, it does demonstrate how a readily available source of chemical or nuclear products or wastes can be employed with improvised explosives technology to terrorize, threaten, or deny a force use of an area.

Although there are a number of countries against the use and proliferation of chemical and biological weapons, Secretary of Defense William S. Cohen believes that the proliferation of WMD is "the greatest threat the world has ever known." More countries are acquiring and developing chemical and biological weapons capability for both theater and long-range missile systems.[21] Recent revelations of Soviet military secrets exposed an active biological weapons program which produced, among other agents, smallpox virus that is potentially, through black markets, in the hands of terrorists[22] possibly including Iraq and North Korea.[23] Even with United Nations and

international support, the complete destruction of Iraq's chemical and biological weapons capabilities following Desert Storm was never fully realized.[24]

Russia now admits that the Soviet Union had one-kiloton nuclear devices that were about the size of a suitcase. Although it is not enough to destroy a major metropolitan area, it could take out everything within a one-half mile radius of Washington D.C.'s Capital Hill[25] or the Kremlin. There is debate regarding their alleged inability to verify the number produced nor the exact location of each of them.[26] In the hands of a terrorist, it could change the world's outlook on the threat of terrorism.[27] It is not unimaginable that an adversary could secretly pre-position such a small device under New York or Washington, D.C., to utilize as a negotiating tool.

In his Naval War College thesis, Commander William J. Larsen argues that the recent resurgence in the use of chemical weapons seems to have drawn little outrage from much of the international community.[28] One can assume that this perception might influence unscrupulous parties to be less inhibited on their reliance of these weapons. Secretary Cohen comments that the use of WMD, especially to disrupt U.S. operations and logistics, is a likely condition of future warfare and that the U.S. military "must plan and prepare to fight and win . . . under such conditions."[29]

But exposure to a WMD incident may not be intentional. On 2 December, 1943, the German's conducted an air attack against Allied shipping utilizing the southwestern Italian port of Bari, sinking the merchantman SS *John Harvey*. This ship was loaded with one-hundred tons of one-pound mustard bombs, which leaked the chemical into the harbor waters and vaporized in the flames, dispersing into town through the clouds of smoke.[30] Although it was not U.S. policy to use chemical weapons, they were available

as a retaliatory response, and since all shipping manifests were secret, few were aware that the Allied chemical weapons were in the vicinity.[31] Inadvertently, the German attack released the liquid mustard into a completely unsuspecting population, taking over two days to correctly identify medically and mitigate, resulting in over 1,650 military and civilian casualties.[32] More recently, accidental exposure during the destruction of Iraqi chemical weapons during Desert Storm is being considered as a possible contributor to the Persian Gulf illness.[33]

Environmental and Occupational Hazards

Attacks may not come from foreign terrorist groups or domestic extremists bent on modifying state policy or action. Recently in France, 153 laid-off workers forced the government to meet their demands for severance pay and unemployment benefits after dumping 790 gallons of sulfuric acid into a Meuse River tributary, using ecoterrorism as a labor-negotiating tactic.[34] The intentional release of anhydrous ammonia in Pleasant Hill, Missouri, on 29 February 2000, by unknown persons for undetermined reasons resulted in the injury of two people and the evacuation of at least 250 more.[35]

Although these examples demonstrate the intentional consequences from the use of WMD or ecoterrorism, most of the environmental threats may simply be the result of unintentional consequences of an occupational or industrial hazard, or accidental exposure to legitimate products, wastes, or contamination that affect complex systems. For example, the Spanish Flu Pandemic of 1918-1919, responsible for over twenty million deaths worldwide, can be traced back to the burning of manure at Fort Riley, Kansas, in March of 1918.[36] The massing of military troops is an ideal setting for disease outbreaks. It mixes varying strains of illnesses with immunologically naive populations

from broad geographical backgrounds forced into confined and restricted spaces. A flu outbreak occurred and subsided, and troops were deployed to the trenches in Europe, where the virus mutated. Spanish Flu broke out in the trenches, killing more American soldiers than were killed in battle.[37] The disease followed the major world trade routes,[38] and the returning American veterans spread the disease in the United States.

Likewise, the 1984 Union Carbide gas tragedy in Bhopal, caused by a complex set of human, organizational, and technological errors, resulted in death toll estimates up to 18,000 and 250,000 with permanent disabilities. During the immediate consequence management of the disaster, medical responders where overwhelmed, relying on disinformation and erroneous information to treat victims, compounding the problem.[39] The Chernobyl meltdown resulted in transnational consequences that spread radiation contamination across Europe, with elevated radiation levels detected throughout the rest of the world. Although the Chernobyl accident caused a wide range of physical damage across Europe, due to seasonal timing the contamination did not have long-term detrimental effects throughout Europe, excluding several hundred miles surrounding the plant area.[40] Moreover, on 2 April 1979, a secret Soviet biological weapons facility accidentally released a cloud of anthrax spores in Sverdlovsk (now named Ekaterinburg), affecting ninety-four persons and killing at least sixty-four.[41]

While conducting a military campaign, it is highly likely that intentional targets may have unintentional consequences. Targets are identified and lists developed to efficiently plan the systematic reduction of an adversary's ability to wage armed conflict. As demonstrated by the attack on Bari, many targets have obvious military functions. However, targets include the enemy's ability to support the conflict. In today's WMD

proliferation environment, it is excusable to find a chemical plant targeted for military strikes because of the potential for conversion of that plant into a chemical weapons production facility. However, due to the chemicals legitimately being made at the time of the military attack, a scenario like Bhopal might be created.

On the other hand, unscrupulous actors may target such sights for the anticipated industrial "accident" it might cause. During Operations Desert Shield and Desert Storm, there was a large petrochemical plant directly across the port of Al Jubail, where Fleet Hospital Five, I Marine Expeditionary Force, and other forces were employed in and around or transiting through the port. This facility caused growing concern because it had the world's largest on-site storage for vinyl chloride monomer and ammonia, which, if attacked could have produced a deadly plume, killing most of the city's civilian population and that of the military in the port area. Since the port was a primary logistical supply and transiting point, pressure was applied to have the chemicals relocated to a more remote location.[42]

Exposure to environmental and industrial pollution is a growing force health protection issue as DOD personnel serve in states where environmental and occupational concerns are not a high priority. In a 1995 U.S. Marine exercise in Qatar, a sudden onset of upper respiratory complaints were perceived to be caused by a local iron smelter located in the port area. This resulted in the deployment of two U.S. Navy Environmental and Preventive Medicine Unit Number 7 personnel for evaluation and recommendations.[43] More recently, the French press agency reported "high lead pollution" 200 times the maximum World Health Organization recommended level, "endangering inhabitants . . . of Kosovska Mitrovica"[44] located in Kosovo.

Post-Cold war Russia is facing significant environmental problems coupled with strained economic resources, reducing their ability to prevent disaster much less handle the consequences. The threat of a nuclear hazard from Russia, much like the one experienced by Chernobyl, has forced Norway to mount numerous "bilateral and multilateral programs to deal with various aspects of the problem."[45] Finland considers a Russian nuclear disaster to be its most severe and most likely security threat.[46] Per Air Chief Marshal Sir John Cheshire, NATO's Allied Forces Northwest (AFNORTHWEST) Commander in Chief, the military must be prepared to respond to a nuclear disaster, developing with little advanced warning.[47] With the definitive causes still unidentified, the Persian Gulf illness is a prime example of the complicated health threat environment of the military's modern day warrior.

Inevitably, the military medical professional will be involved in consequence management, either on a large or small scale, rising from intentional or unintentional consequences from incidents associated with social, agricultural, industrial, or military resources. Military personnel may be in the area prior to an incident and may have been the primary target. Or personnel may deploy into the area to provide humanitarian assistance to alleviate suffering and reestablish basic public services because of such an incident. The better prepared the medical assets are during early detection and analysis, and in established policy, techniques, and procedures, then the quicker the field commander receives advice and recommendations for mediation. This allows for a greater probability that the consequence will be managed as efficiently and effectively as available resources will allow.

DOD Force Health Protection Response to Chemical, Biological, Radiological, and Environmental Threats

Regardless the direction of the CBRE threat, the Federal Government has the authority for emergency or disaster response to provide assistance for public health, safety, and property via the Stafford Disaster Relief and Emergency Assistance Act.[48] Additionally, the Nunn-Lugar-Domenici Amendment, also known as the Defense Against Weapons of Mass Destruction Act of 1996, mandated the improvement of domestic preparedness and response capabilities for CBRE terrorist attacks.[49] It additionally appoints DOD as the lead agent to strengthen national preparedness for response and consequence management of these attacks. To help reduce America's vulnerability to terrorism, President Clinton signed Presidential Decision Directive (PDD) 39, designed to strengthen domestic capabilities, thereby deterring terrorists acts.[50] This directive included implementation measures to respond "rapidly and effectively to threats or actual terrorist acts, giving highest priority to developing sufficient capabilities to combat and manage the consequences."[51]

The PDD-39 reaffirms the Federal Bureau of Investigation (FBI) as the lead agent for operational response for *crisis management* within U.S. territory, whereas for *consequence management* it is the Federal Emergency Management Agency (FEMA).[52] Within the U.S., if the incident is perceived to be criminal in nature then the FBI is the lead agent for the crisis, taking responsibility as the on-scene commander. Once the FBI determines that the incident has passed out of the crisis phase, it moves into the

consequence phase and the responsibility passes to FEMA. Both the FBI and FEMA may initiate crisis and consequence management phases simultaneously if an incident, such as the detonation of a WMD device, occurs. However, the incident may never enter the crisis management phase, as demonstrated in FEMA activities during natural disasters. At anytime during either of these phases, the FBI or FEMA may request DOD support through the Department of Military Service (DOMS), which will validate the need and task Joint Forces Command for support.[53]

As the lead agent for enhancing domestic preparedness response and consequence management, DOD can include "threat assessment, Domestic Emergency Support Team (DEST) deployment, technical advice, operational support, tactical support . . . and custody."[54] This threat assessment, technical advice and operational support was addressed medically for force health protection primarily in operational settings in DOD Directive 6490.2. This directive tasks medical surveillance to "assess . . . combat casualties, including those produced by chemical and biological and nuclear weapons."[55]

Per DOD Instruction 6490.3, DOD Components "will conduct comprehensive, continuous and consistent medical surveillance to implement early intervention and control strategies."[56] This includes the utilization or deployment of "technically specialized units" with the capability and expertise to conduct medical surveys[57] to include “the identification and assessment of potential hazards and actual exposures to environmental contaminants and stressors."[58] Specific guidance included testing air, water, and soil samples for industrial, chemical, metal, biological, radiological, and pesticide contaminants to evaluate and record occupational exposure.[59] Capable, technically specialized units included "the Navy Forward Deployed Laboratory (FDL),

520th Theater Army Medical Laboratory (TAML) and the Air Force Tactical Reference Lab."[60]

The advantages of a field laboratory providing rapid diagnostic and laboratory based surveys in theater has been demonstrated historically. The alternative was delayed analysis because the samples would have to be shipped out of theater, sometimes back to Continental U.S. (CONUS). The Navy Forward Laboratory "provided invaluable support as the only comprehensive reference lab" for infectious disease diagnosis during Operation Desert Shield and Desert Storm. Likewise in Somalia, a Joint Field Laboratory was established in Mogadishu to diagnose infectious diseases.[61] These forward capabilities provided timely, on-the-scene medical threat information and were credited with "helping to minimize infectious disease morbidity in U.S. personnel."[62] Again, during the 1996 NATO peacekeeping operations in Bosnia, the 520th TAML provided environmental exposure assessments within theater. The precamp and postcamp site environmental surveys provided the documentation needed to verify that all the camp sites at issue had been previously contaminated with industrial wastes or spills prior to U.S. occupation, saving the implementation force millions of dollars in environmental legal liabilities. The FDL, the successor to the Navy Forward Laboratory utilized in the Gulf War, had enhanced biological weapons analysis capabilities and was deployed to Prince Sultan Air Base, Saudi Arabia, during Operation Southern Watch, as an early detection and analysis capability following the Khobar Towers bombings. Recently the FBI office in Hawaii has used the FDL as a reference laboratory to analyze letters allegedly containing anthrax spores.

The mission of preparing the U.S. for homeland defense is enormous and is receiving constant scrutiny from Washington. Although a great deal of funds, from $5.7 billion in 1996 to $11.1 billion for 2001,[63] and training have been spent on enhancing the first responder capabilities, growing debates rage over exactly how much more may still be needed. The 1997 *Quadrennial Defense Review* (QDR) stated that the military was required to provide support when civil authorities are overwhelmed by disaster.[64] With ever-decreasing DOD resources taxed with increasing peacekeeping and humanitarian assistance missions, the need to enhance and evolve existing capabilities is essential. This need is the driving force for the evolution of the Navy Forward Deployed Preventive Medicine Unit from existing operational preventive medicine assets into a naval war platform.

The Forward Deployable Preventive Medicine Unit

Background

Prior to World War II, Navy preventive medicine was coordinated within a unit's medical department. Early in the Pacific Theater, it was discovered that more casualties were coming from malaria and other arthropod borne diseases than from battle. To combat the appalling rise of casualties from communicable diseases, the Navy created Malaria and Epidemic Control Units (MECUs), rising to over 150 by the end of the war.[65] In 1949 six Navy Epidemic Disease Control Units (EDCUs) were established second generation from the remnants of the MECUs. With changing military needs, the unit names and missions changed periodically, but the emphasis was on "preventing or controlling health problems of naval importance due to biological, physical, chemical or other causes."[66] By 1971, the unit names were changed to Navy Environmental and

Preventive Medicine Units (NEPMU).[67] Two Disease Vector Ecology and Control Centers (DVECC), responsible for vector-borne diseases study and control, evolved from the former EDCUs.[68]

That same year the Navy Bureau of Medicine and Surgery acquired control of the Naval Ordnance Environmental Health Center, renamed the Navy Environmental Health Center (NEHC) in 1974. Its mission was fleet support in areas of "analytical laboratory services, radiation health, hazardous materials identification, asbestos hazard control, preventive medicine, epidemiology, and hearing conservation."[69] In 1981,[70] NEHC assumed command and control of the four NEPMUs and two DVECCs.[71]

The U.S. Navy Preventive Medicine Program has been the mission of the NEHC since 1974, expanding in 1981 to centralize navy occupational and environmental health, and preventive medicine to all U.S. Naval forces.[72] The DVECCs and NEPMUs have combined garrison and operational missions. These missions include supporting established shore based facilities and providing preventive medicine support to deployed units where the need is beyond the unit's organic preventive medicine capabilities. Per Bureau of Medicine Instruction 5450.157, the NEPMUs

> are to provide expert and specialized consultation, advice, and recommendations in matters of preventive medicine and environmental health to commands afloat and ashore, to provide epidemiological, laboratory and technical services to assist in detection and elimination of direct or potential health hazards to personnel in the naval service and their families, and to provide training and indoctrination of personnel in the methods and techniques of preventive medicine.[73]

Likewise, the DVECC objectives are to provide technical and specialized services in the fields of vector prevention and control. These services include evaluations in vector ecology, surveillance, prevention, and control; field and laboratory testing;

identification of entomological vector agents of biological warfare; vector-borne disease assessments; and emergency vector surveillance and control.[74] The primary effort of the EPMUs and DVECCS is towards a technical capacity beyond that of individual commands.[75]

Under the operational mission, personnel deploy in support of an operation or exercise through the Navy Bureau of Medicine's MMART program. The MMART program allows for the augmentation of specialized teams of medical personnel to any unit requiring medical support above and beyond their normal capabilities. All preventive medicine MMART responsibilities are managed by NEHC.[76]

This capability has included technical and professional expertise in "environmental health, entomology, epidemiology, industrial hygiene, radiation health and microbiology."[77] The preventive medicine MMART program was placed under the command and control of NEHC, which developed the guidance for MMART teams. These teams consisted of a twelve member team covering all technical specialties but had the flexibility to be tasked organized, allowing for the deployment of only the technical expertise required for that specific operation or exercise. Because of this tasking flexibility, this author has rarely seen deployments of teams numbering more than eight members. Follow-on augmentation was available if additional needs arose beyond the capabilities of the original team. For example, if only vector control for mosquito-borne diseases was required then the team may consist of only four persons: entomologist(s) and preventive medicine technicians. This team could be augmented with additional personnel if the requirement so dictated, as would be demonstrated with Environmental Health Officers augmenting for field sanitation.

However, this MMART role did not include the types of deployable laboratory capabilities that proved to be so effective during Operations Desert Shield and Desert Storm and Somalia. This resulted in the development of the FDL, which was an expansion of the existing MMART microbiology capability, consisting of "very limited, classical microbiology diagnosis,"[78] currently held at the NEPMUs. These capabilities were not designed to be a duplication of routine clinical laboratory assets. Still, it could be enhanced to include analysis for biological threats.[79] With both classical and current cutting-edge technology, such as Enzyme Linked Immunosorbent Assay (ELISA) and Polymerase Chain Reaction (PCR), the laboratory could be used to identify endemic diseases.[80] The need to enhance this resource further came through Joint Chief of Staff and Chief of Naval Operations guidance requiring the need for specially trained and equipped forces for rapid technical assistance,[81] to include "all aspects of CBRE casualty care."[82] With the necessary personnel and framework in place, the initiative to expand this capability was again addressed through Navy channels giving rise to the Forward Deployed Preventive Medicine Unit (FDPMU) concept.

Forward-Deployable Preventive Medicine Unit Concept

The FDPMU enhances the DOD resources for passive defense capabilities while maintaining its traditional preventive medicine force health protection emphasis. It incorporated and expanded the MMART Preventive Medicine and FDL assets in place. Each of the Authorized Minimal Medical Allowance Lists (AMMAL), per table 1, was re-evaluated and enhanced to include current collection, analysis, and diagnostic technology. The environmental and industrial capabilities were enhanced to include

chemical weapons, and industrial and environmental contamination or hazards. Radiological assessments were added. The thirty-nine person manning requirements were addressed through NEHC and its subordinate commands.[83]

The FDPMU has a core twelve-member detachment utilizing the historical twelve member preventive medicine MMART team concept known as the FDPMU Detachment. A Radiological Health Officer has been substituted for one of the Preventive Medicine Technicians for radiological threats from pollution or attack. Since the full FDPMU is expected to be employed only during large events, such as the theater operations as demonstrated by the 520th TAML in Bosnia, the FDPMU Detachment would be the piece more regularly exercised. However, the FDPMU Detachment now has additional mission taskings beyond the MMART mission, expanded specifically by the CBRE collection, detection, and analysis capabilities. With the increased work load added to a preventive medicine mission that has historically been fully employed during deployments, the necessity for additional manning requirements to effectively and efficiently accomplish the current mission needs to be addressed.

Table 1. MMART AMMAL List and Description

AMMAL Block 0021	Contingency Administrative Support Block
AMMAL Block 0024	Environmental Health Block
AMMAL Block 0025	Epidemiology Block
AMMAL Block 0026	Vector Rapid Assessment Block
AMMAL Block 0027	Entomology Laboratory
AMMAL Block 0028	Rodent Surveillance Block
AMMAL Block 0029	Microbiology Block
AMMAL Block 0030	Arthropod Surveillance Block
AMMAL Block 0031	Hand Held Dispersal Equipment Block
AMMAL Block 0032	Backpack Pesticide Dispersal Equipment Block
AMMAL Block 0033	Truck Mounted Ultra Low Volume Sprayer Block
AMMAL Block 0034	Aerial Ultra Low Volume Sprayer Block

AMMAL Block 0035	Tools and Safety Equipment Block
AMMAL Block 0036	Pesticides and Repellents Consumables Block

Problem Statement and Research Questions

This thesis will examine the manning requirements for the FDPMU Detachment to determine, if any, shortfalls. In the absence of equivalent specialized units within DOD, similar units will be compared to FDPMU Detachment subcomponents to analyze manning needs. These specialized units will include: the Army chemical company (biological detection); the Army nuclear, biological, chemical reconnaissance company; the Army technical escort unit (TEU) Chemical Biological Response Team (CBRT); the Army preventive medicine detachment; TAML; the National Guard civil support team (CST); the Air Force's Radiation Assessment Team (AFRAT); and the Marine Chemical Biological Incident Response Force (CBIRF). Other units may be added as required. Modifications of manning requirements, where applicable, from these units will be examined to assess the reasons for those modifications, and different scenarios will be examined for recommendations of where manning requirements might be adequate or need augmentation. Terms will be defined: for example, collection, monitoring, detection, analysis, and assessment. The parameters of those terms will be reviewed for potential confusion, miscommunication, or misperception, necessitating the need for greater clarification.

Unit Descriptions

Army Technical Escort Unit

The Army's TEUs are the only units by law allowed to escort a nuclear weapon or device and to render safe a chemical or biological weapon or device. Primarily tasked for crisis management they can support consequence management. On order, they provide

"no-notice deployment to provide Chemical and Biological advice, assessment, sampling, detection, field verification, and mitigation" worldwide.[84] Additionally, they provide packaging, escort and remediation of a device or hazard, with limited decontamination primarily of the device or hazard to be escorted. CONUS based, there is one team pre-assigned per theater Commander in Chief (CINC). TEU is organized with a headquarters (HQ) section and four companies, with a basic operational element being the twelve-member CBRT.[85]

National Guard Civil Support Team

Originally called the Rapid Assessment and Initial Detection (RAID) element, the name was recently changed to the CST.[86] The team is a National Guard unit designed to plug into the incident commander's existing task force structure. During an incident involving a WMD, their mission is to provide "early assessment, initial detection, and technical advice to the incident commander" and to facilitate identifying DOD assets needed for consequence management support.[87] Each team consists of twenty-two personnel and are stationed throughout the U.S., but can be task oriented with a minimum of twelve persons. Doctrine dictates that a domestic response requires two teams.[88]

Marine Corps Chemical Biological Incidence Response Force

The U.S. Marine Corps developed the CBIRF in 1996 for two primary tasks: (1) to assist in developing force protection training, countermeasures and equipment for Marine Expeditionary Units and (2) to help federal, state, and local governments develop training and response capabilities.[89] When deployed, their primary mission is to turn victims of a chemical or biological incident into patients, safe for evacuation for medical treatment. It is a battalion-sized unit, structured into two pieces. The Initial Response

Force (IRF) is an eighty-one-member force "capable of providing initial incident assessment and limited consequence management."[90] The follow-on is comprised of approximately two-hundred-fifty persons.

Army Nuclear, Biological, and Chemical Reconnaissance Company

The NBC reconnaissance companies are allocated one per corps and assigned to the corps and TAACOM Chemical Battalion.[91] They provide NBC reconnaissance regarding "radiation monitoring and chemical agent detection" to determine the presence and extent of NBC contamination and support NBC accident or incident control plan operations. They are normally employed in route and are organized into a headquarters section, a maintenance section, and three reconnaissance platoons, subdividing each platoon into three reconnaissance platoon headquarters with four reconnaissance squads each.[92]

Army Chemical Company (Biological Detection)

The chemical company (biological detection) units are assigned one per corps. They provide "early warning, detection, location, and identification of biological agents" continuously in any weather condition, but have limited chemical detection capabilities.[93] A chemical company is organized with HQ and maintenance sections, and five Biological Integrated Detection Systems (BIDS) platoons of seven teams each. Each four-person team operates one self-sustaining, independent BIDS, is forward deployed, and may be separated ten to one hundred kilometers from another team. This chemical company can be task organized with a company HQ and one to five platoons as required by theater and threat level.[94]

Army Preventive Medicine Detachment

The Army Medical Department's medical re-engineering initiative examined and revised the Army's medical force structure to support the CONUS-based Force XXI projection capabilities. The resulting Medical Force 2000 (MF2K) proposed structure will replace both the preventive medicine detachment (entomology) and preventive medicine detachment (sanitation) with a universal preventive medicine detachment.[95] Comprised of eleven personnel, the detachment may function as one team or split into a headquarters section and three teams. The operational capabilities include, but are not limited to: DNBI surveillance and epidemiology, environmental health, medical entomology, CBRE threat, health promotion and education, and retrograde cargo inspections.[96]

Army Theater Army Medical Laboratory

The TAML is scheduled to be reorganized as the area medical laboratory and is allocated to one per theater army, but can be attached to a HQ company, medical command or brigade. It is organized into a command section and six medical specialty sections, including anatomical pathological section, biochemistry section, microbiology section, veterinary laboratory section, entomology section, and epidemiology section. It provides regional medical laboratory support, to include analysis and advice on chemical, biological, and radiological samples, endemic diseases, consult on new CBR or endemic diseases, field sanitation, vector-borne, and zoonotic diseases.[97]

Air Force Radiation Assessment Team

The Air Force Radiation Assessment Team (AFRAT) is composed of thirty-seven personnel. It is broken down into two nuclear incident response force (NIRF) teams, teams1 and 2, and the Radioanalytical Assessment Team (RAT). The NIRF Team 1 is a seven-member team designed for rapid twenty-four hour response anywhere in the world. It is the initial assessment team that will either request additional follow-on support or will mitigate the incident, collect samples for analysis by the RAT upon return to CONUS. The NIRF Team 2 is a twenty-member team, designed as an as-needed follow-on capability that would provide all the additional necessary equipment indicated as necessary by the first team. This team includes the industrial hygiene capabilities for analysis of hazardous materials that might be a natural consequence of damaged equipment or facilities at the accident site.[98]

The RAT is a stand-alone capable team that is normally deployed in a supporting role for the AFRAT NIRF teams 1 or 2, or for both simultaneously. It is composed of a core team of ten personnel, consisting of two Health Physicists[99] (equivalent to a Navy Radiation Health Officer),[100] two Medical Laboratory Craftsman, and six Medical Laboratory Journeymen. Fewer personnel can be deployed if threat conditions warrant.[101] The mission of the RAT is to provide field radioanalytical support to the command surgeon in response to radiation accidents and incidents and "provide expert guidance on the type and degree" of a radiological hazard. The RAT "measures, analyzes, and interprets environmental and occupational samples for their content of radioactivity."[102]

Primary Research Question

Is the traditional twelve-member Navy MMART team manning requirements capable of supporting the additional CBRE mission?

Secondary Research Question

1. What are the overlapping parameters of the units in the similar areas of responsibilities?

2. What are the manning requirements for DOD units with similar capabilities?

3. What manning modifications have been implemented with similar specialized units?

4. How do threat conditions modify manning requirements?

Key Definitions

For the purpose of this thesis, the following definitions apply:

Active Defense. In a hostile CBRE environment, it is "the state of operating in a BW defensive posture while prosecuting the operational and tactical offense. It includes knowledge, dispersal, detection, protection (individual and unit), . . . ensuring contamination avoidance . . . and rapid decontamination."[103]

Asymmetrical Threat. Threats that strike in a manner or against a target which is unprepared. It often has no perceived boundaries, discernable lines of contact, or forward edge of battle, and is demonstrated by terrorism or by internet viruses.

Cold Zone. The area outside the warm zone.[104]

Consequence Management. The "measures to protect public health and safety, restore essential governmental services, and provide emergency relief to governments,

businesses, and individuals affected by the consequences"[105] of disasters, either man made or natural.

Contamination. "The deposit, absorption, or adsorption of radioactive material, or of biological, chemical agents," or industrial chemicals or toxins, "on or by structures, areas, personnel, or objects."[106]

Crisis Management. Largely a law enforcement response, it "refers to measures to identify, acquire, and plan the use of resources needed to anticipate, prevent, and/or resolve a threat or act of terrorism."[107]

Detection. The determination of the presence of an agent[108] by the use of chemical, biological, nuclear and radiological, or environmental (CBN-RE) detectors to determine the location of CBN-RE contamination or hazards.[109]

Homeland Defense. Also known as Homeland Security. It encompasses "protecting our territory, population, and infrastructure at home by deterring and defending against all threats to US sovereignty; supporting civil authorities in crisis and consequence management; and helping to ensure the availability, integrity, survivability, and adequacy of critical national assets."[110]

Hot Zone. An area that contains lethal, infectious biological,[111] chemical, or radiological agents or contaminants.

Identification. The positive verification of the presence of a CBRE agent.[112] This term can be further subdivided into two definitions: (1) Classification. "The determination that a compound or organism is a member of a chemical or biological class without knowing the exact identity of the compound or organism,"[113] (2) Definitive

Identification: "The determination of the exact identity of a compound or organism through the establishment of a group of unique characteristics."[114]

Medical Threat: "A collective term used to designate all potential or continuing enemy actions and environmental situations that could adversely affect the combat effectiveness of friendly forces, to include wound, injuries, or sickness incurred while engaged in a joint operation."[115]

Monitor. The act of detecting the presence of CBN-RE agents or hazards with the use of equipment or indicators.[116] Monitoring can be a continuous process used as early warning indicators of agents employed in a hostile environment where there is a high CBN-RE threat and when evaluating an area for the presence of agents or hazards.

Passive Defense. In a hostile CBRE environment, it includes the capabilities to provide protection against effects of an attack. It includes "contamination avoidance (reconnaissance, detection, and warning), force protection (individual and collective) and decontamination."[117]

Sample. The act of securing "a specimen which reflects as closely as possible the state of the original material, ideally including its viability."[118] Samples are collected as evidence of crime scenes and to be taken back to qualified laboratories for confirmation.

Warm Zone. A designated area surrounding the hot zone used to triage and decontaminate people exiting the contaminated area.[119]

Weapons of Mass Destruction. "Title 18, U.S.C. 2332a, defines a weapon of mass destruction as (1) any destructive device as defined in section 921 of this title, [which reads] any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more that one-quarter ounce, mine or device similar to the above; (2)

poison gas; (3) any weapon involving a disease organism; or (4) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life."[120]

Assumptions

One of the basic assumptions regarding the manning requirements is that the units will be fully employed in the field. Although it is understood that this is not always the case, both extremes are found throughout any deployment.

Limitations

Limitations are the restrictions on a project outside the influence of the author. In this case, it would have been very informative to have complete access to all after action reports filed by the units examined to analyze actual unit utilization and employment and help to clarify issues or circumstances. However, these were often not available or minimal at best.

Secondly, the information regarding the FDPMU is from preliminary concepts and plans. They have neither been standardized nor has every issue or concern been addressed. Therefore, some areas are vague or incomplete, making the comparative conclusions the same.

Delimitations

Delimitations are those artificial limitations placed on the project per the discretion of the author. This thesis will not address specific equipment utilized by any of the units presented in this study. Nor will it address consumables or logistical support requirements, either for transportation or base operating support requirements. Additionally, training requirements will not be address. Only unclassified and unrestricted information will be used for resources.

There are some units or specialties involved within the CBRE arena that were not used in this study. Both Army[121] and the Navy[122] direct responsibility for food wholesomeness to the U.S. Army Veterinary Service. Therefore, this aspect of CBRE detection, sampling and collecting, and agent identification will not be considered in the research methodology. Additionally, due to time and research constraints, only U.S. DOD units were utilized in this study. No foreign military equivalents were considered or examined.

Under the Force XXI reorganized army, NBC reconnaissance detachments are designed to provide CBR reconnaissance through collection and analysis, and have limited identification capabilities for the contaminant.[123] They are assigned to a heavy division cavalry squadron.[124] Organized into detachment HQ and three reconnaissance squads, they are comprised of twenty-one personnel, commanded by a captain.[125] However, these detachments are still in the planning phases and the organization and manning structures are still fluid. Therefore, this unit was not considered for examination.

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CHAPTER 2

REVIEW OF LITERATURE

> A general in all of his projects should not think so much about what he wishes to do as what his enemy will do; that he should never underestimate this enemy, but he should put himself in his place to appreciate difficulties and hindrances the enemy could interpose; that his plans will be deranged at the slightest event if he has not foreseen everything and if he has not devised means with which to surmount the obstacles.[1]
>
> Frederick the Great, *Dictionary of Military and Naval Quotations*

Introduction

This chapter will contain a review of the literature that is relevant to the research topic. This review will examine published literature and official documents, and include interviews with military personnel possessing expertise or experience in the areas under discussion. The official documents will be represented through joint military and service specific publications, manuals, reports, and correspondence. Field manuals (FMs), by nature, attempt to cover their respective subject in its entirety so that it can be an independent resource to the user who may not possess the additional cross-referenced manuals. This often results in significant repetition and overlap in many of the manuals regarding concepts, procedures, and techniques. The FMs can be service specific or may be utilized by multiple services. For this thesis, the FMs will be identified with the service belonging to the first numeric identification number.

This chapter will cover three areas. First, it will examine the historical significance of military preventive medicine in military history and the growing need within Department of Defense (DOD) concerning chemical, biological, radiological and

environmental (CBRE) capabilities and expertise. Next, CBRE defense and protection doctrine will be reviewed. Finally, the author will assess the relevant information pertaining to the units used in the comparative methodology of chapter 3. Only unclassified materials were used for the review.

Literature Review

Historical Perspective

History is replete with examples of military victories and disasters that were the consequence of disease and vermin rather then genius. In Hans Zinsser's classic *Rats, Lice, and History*, he comments that diseases like plague, cholera, typhoid, and dysentery, "have decided more campaigns then Caesar, Hannibal and Napoleon." The latter lost Haiti in 1803 because 22,000 of his 25,000 troops died of yellow fever.[2] In World War I, more American soldiers died of Spanish Flu then in battle.[3] Likewise, during World War II, disease and non-battle injuries (DNBI) and fatalities significantly surpassed those received in battle from both land and sea combined.[4] During the short 1967 Sinai Campaign twenty percent of the Egyptian killed in action were due to heat.[5] More recently, the 1995 Russian Chechen campaign experienced significant disease prevention problems where one brigade suffered fifteen percent casualties to hepatitis alone.[6] Today DNBI are the "major medical threat" of the military at any time,[7] regardless if it is in garrison, on exercises, peacekeeping operations, or military conflicts. Without preventive medicine services, equated to public health, an increase in disease incidence and morbidity will occur.[8]

The preventive medicine mission is to prevent injuries and disease and to help maintain military readiness and unit integrity. In addition to the preventive medicine

concerns of disease incidence, immunizations, environmental and occupational hazards, field sanitation, and insect borne diseases, preventive medicine expertise is being called upon for CBRE issues and concerns.[9] DOD Instruction 6490.3, *Implementation and Application of Joint Medical Surveillance for Deployments*, clarifies the military preventive medicine role as the "anticipation, prediction, identification, prevention, and control of preventable diseases, illnesses and injuries caused by exposure to biological, chemical, physical or psychological threats or stressors" that can be identified at any work environment. Additionally, it specifically states that the core military preventive medicine disciplines include "epidemiology, clinical preventive medicine, occupational medicine, industrial hygiene, environmental health sciences and engineering, medical entomology, health promotion and wellness, community health, mental health disciplines, toxicology and laboratory sciences." [10] As the world becomes smaller and more industrialized, the medical threat probability from industrial accidents increases.

Today, the military preventive medicine role is met through consultation, recommendations, and the development and implementation of programs covering every spectrum of medical threat issues that are preventable. Additionally, they conduct inspections and surveys to help identify hazards and medical threats, and provide technical assistance and guidance where needed. Preventive medicine is the medical deterrence for injury and disease.

Numerous publications, directives, and laws govern guidance on the Army, Air Force, and Navy (which includes Marine Corps) military preventive medicine. Several FMs are available, specifically for the Army on preventive medicine units, personnel, and specialties, along with tactics, techniques, and procedures manuals that give greater detail

into the management of specific activities. With the Navy, there are Bureau of Medicine and Surgery publications--as demonstrated by various volumes of manuals of the medical department--and directives. Much of the services' guidance institutes policy from federal law, mandates, or agency guidance or policy.

Within the Army and Navy, preventive medicine units or detachments function in similar manners regarding the conduct of the specific preventive medicine mission, specialties, and expertise. Therefore, since their employment is so similar, this thesis will not review the specific materials, other than to review their mission and manning requirements.

The Argument for Deterrence

In his Naval War College thesis, Commander William J. Larson argues that the probable threat from chemical and biological weapons of mass destruction (WMD) is increasing as world opinion becomes more tolerant of their use in recent years. They are the poor man's "force multiplier,"[11] where death by chemical and biological weapons is viewed to be no less humane than "bullets or flame."[12] Sir Peter Hill-Nortan defines deterrence as "creating the fearful doubt in the mind of a potential aggressor that any likely gain is simply not worth the inevitable risks."[13] It can be achieved through both capability and credibility:[14] the capability being strong conventional forces to apply a proportional response and the credibility in that the U.S. will use that force.

The Gulf War demonstrated the U.S. capability to use strong proportional conventional force.[15] This capability enhances U.S. credibility to using proportional conventional forces in response to the destructive power of a WMD, with greater international moral acceptance.[16] It broadcasts the message to any potential employers of

WMD that the cost for using such weapons against the U.S., for example, military forces, national security or infrastructure, and possibly U.S. allies, will be unacceptable.

However, U.S. strong conventional force capability may be the synergist that pushes a state or nonstate actor to use nuclear, chemical, or biological weapons. Secretary of Defense Cohen states that there is likelihood for potential future adversaries to resort to WMD use against the U.S. because such WMD capabilities are prevalent and that they face overwhelming U.S. conventional dominance.[17] When the Indian Military Chief of Staff was asked what he thought the lessons of the Gulf War were, he reportedly replied, "Never fight the U.S. without nuclear weapons."[18]

The U.S. is less tolerant of receiving American casualties in areas where U.S. national interest is limited. This was evidenced by U.S. strategic disengagement after the loss of life at both Beirut and Mogadishu. If the responsible parties are difficult to identify or locate, a response with proportional force may be limited. The threat or use of nuclear weapons by the U.S., although effective against Saddam Hussein,[19] is less likely to be actually used, and therefore less credible for deterrence against WMD use.[20] If the credibility of the deterrence is in question, the risk of such an attack is greater, because there is the perceived reduction in any effective retaliation by the U.S. Therefore, the ability to lessen the effects of such an attack, as demonstrated through effective personal protective measures, strong homeland defense, and force protection crises and consequence management, should theoretically alleviate the probability of such an attack.

Denying or limiting the enemy the benefits of WMD use may be the best deterrence. It at least ensures U.S. preparedness and enhances its ability to respond and react should other deterrence fail.[21] In light of this, "U.S. forces must plan and prepare to

fight and win major theater wars under such (WMD use) conditions."[22] Many countries are not prepared for a WMD incident, much less able to protect personnel or equipment from its use.[23] It must be remembered, as previously discussed in chapter 1, that the effects of a WMD attack may not come from an adversary but from an industrial accident, creating many of the same threats, albeit unintentional. The enhanced abilities to respond to such WMD or unintentional accidents are some of the reasons for the development of the FDPMU and similar units discussed in this thesis. By developing, enhancing, and maintaining the ability to manage the consequences of any intentional or unintentional event, the U.S. may possess greater deterrence to the potential adversary contemplating the implementation of such an event.

CBRE Detection and Protection

Most of the FMs reviewed identify the CBRE environment under the phrase nuclear, biological, and chemical (NBC). For the sake of this chapter, the term CBRE will continue to be used in place of NBC. The Joint Publication 3-11, *Joint Doctrine for Nuclear,Biological, and Chemical (NBC) Defense*, identifies three principles of CBR: avoidance, protection, and decontamination.[24] FM 3-101-6, *Biological Defense Operations: Battle Staff and Biological Defense Company, Tactics, Techniques, and Procedures,* includes "deterrence and destruction" to the list as the first principle of CBRE principles. It defines avoidance as the "passive and active measures used in avoiding (CBR) attacks." Again in Joint Publication 3-11, it argues that protection "consists of: hardening positions, protecting personnel, assuming Mission Oriented Protective Posture (MOPP), physical defense measures, and reacting to an attack."[25] Decontamination includes reducing the "possibility of additional casualties from

inadvertent exposure or failure of protection."[26] These principles are identified to reduce vulnerability to a WMD threat.

The FM 3-14, *Nuclear, Biological, and Chemical (NBC) Vulnerability Analysis*, defines WMD vulnerability reduction measures as being active or passive. Active measures involve the destruction of enemy WMD capabilities, for example, production facilities, munitions, or delivery systems.[27] Passive measures include peacetime counterproliferation and deterrence. Deterrence attempts to influence the adversary to not use WMD, arguing that it would be unsuccessful and counterproductive. If deterrence fails, then active measures may be employed while passive avoidance measures are initiated. Due to the constant threat of deterrence failure or to the more probable scenario of an industrial accident, units must take constant precautions to reduce the effects of an attack[28] or an accident.

Passive Defense

The best way to prevent CBRE casualties is through avoidance, which is defensive in nature. The Marine Corps Warfighting Publication (MCWP) 3-37, *MAGTF Nuclear, Biological, and Chemical Defense Operations*,[29] and the FM 3-100, *Chemical Operations Principles and Fundamentals*, state that there are two types of avoidance: active and passive avoidance measures,[30] which can be both proactive and reactive.[31] When avoiding CBRE effects through active and passive avoidance measures, units "reduce casualties, . . . [and] the burdens of protection and decontamination, [therefore] eliminating significant time and resource requirements. . . . [Active measures] include . . . reconnaissance, detection, warning and limitation of contamination spread."[32]

The military preventive medicine mission is the active prevention of diseases and injury to help maintain unit integrity. This is accomplished in two ways: first, (1) by establishing programs to eliminate an atmosphere conducive to injury and exposure to disease, and (2) by responding rapidly to a disease outbreak or rise in injuries to alleviate further or future disease incidence or injury. It is these active measures, sometimes reactive in nature, that concern this study the most.

Active Measures of Avoidance

In FM 3-100, active measures of avoidance "include . . . reconnaissance, detection, warning and limitation of contamination spread."[33] Per MCWP 3-37, CBRE detection is part of conventional reconnaissance[34] and, clarified further in FM 3-100, provides important information on the presence or absence of contamination.[35] It includes four reconnaissance techniques: searching the anticipated area, surveying to familiarize the team with the site, conducting the actual surveillance of the site for contamination, and then collecting (and possibly analyzing) samples when suspected contamination has been located.[36] The FM 3-101-6 provides a four-step process to determine the absence or presence of CBRE threats. They are: monitoring, sampling, detection, and then identification.

Regardless of the semantics, these processes are in place to provide indications of the presence or absence of the agent, what type of agent it is to help determine its potential duration and potency level, and help recognize medical symptoms as early as possible.[37] According to FM 3-19, *NBC Reconnaissance*, there are only three Army units primarily designated to collect chemical and biological samples: NBC reconnaissance units, technical intelligence teams, and preventive medicine units (for potable water

sources only). Yet FM 8-10-7, *Health Service Support in a Nuclear, Biological, and Chemical Environment,* indicates that only veterinarians are allowed to collect samples from suspected contaminated food.[38] The technical intelligence teams are primarily for gathering intelligence regarding the verification of use through data collection of samples and interviews.[39]

However, the sampling of toxic industrial chemicals is the responsibility of preventive medicine personnel.[40] The Army,[41] Navy,[42] and Air Force[43] have Occupational Safety and Health (OSH) programs based on the *Occupational Safety and Health Act of 1970,* generally run by industrial hygienists and safety officers. The FM 3-14 indicates the magnitude of the problem, stating that over 25,000 commercial facilities worldwide "produce, process, or stockpile chemicals that fall within the scope of the Chemical Weapons Convention."[44]

These include chemicals that could be used for both legitimate civilian purposes and chemical warfare agents, as attempted in the terrorist bombing of the World Trade Center with a homemade chemical weapon.[45] Annually, billions of tons of over 70,000 varying chemicals are utilized in some manner by the global chemical industry. These chemicals are a sufficient hazardous threat when utilized legitimately, but could be a force protection and a force health protection threat, either through deliberate or unintentional release, to military personnel.[46] Additionally, the FM 8-250, *Preventive Medicine Specialist*, states that chemicals are found where many "toxic materials are produced, used or stored," and may be a natural by-product or impurity of an otherwise safe substance.[47] The more universally available these chemicals are the higher the probability of U.S. military casualties from an accident or deliberate release.[48] This

probability increases in states where environmental and occupational standards are less stringent than in the U.S. or where economic hardships have allowed for facility degradation.

Reconnaissance and Detection

According to FM 3-101-6, detection is a key element of contamination avoidance.[49] However the Marine Corps Operational Handbook (OH) 6-1, *Ground Combat Operation,* adds that the best defense is "constant monitoring with available detection devises."[50] In regards to biological defense operations, FM 3-101-6 provides the following:

> Agent detection determines where decontamination might be required. Identification determines whether or not decontamination is required, and, if required, what methods of decontamination work best against the agent. Depending on weather and its field behavior, the identified agent may decay to negligible levels so that decontamination might not be required at all.[51]

The suspicion that contamination is present or likely to occur is based on the initial intelligence threat estimate, personal observations, activation of early warning devices, or diagnosis of medical patients, animals, or plants. Nuclear and chemical detection is easier to predict, observe and sample. If there is a high threat perception, then alarms and monitors should be placed up wind of friendly forces; individuals can place detector paper where maximum exposure is anticipated.[52]

The FM 8-9, *NATO handbook on the Medical Aspects of NBC Defensive Operations, AmedP-6(B)*, states that there are no single instruments that can cover all aspects of radiological detection, but adequate equipment is available for detection.[53] However, detection and repeated measurements will give important information for the commander and medical personnel.[54] Surveys will determine ground contamination

patterns and airborne activity levels and will be used to establish boundaries and protective measures.[55]

Chemical agent monitoring, detection, and sampling can be done at a number of levels. The MCWP 3-37 states that units at all levels,[56] starting with company, battery, and squadron,[57] should have the capabilities for basic detection and identification of CBR agents.[58] The Army has the same capability down at the company level, with every unit having organic monitoring and warning systems. These can be placed on the perimeter or on vehicles at the front of unit movement.[59]

Guidance from FM 3-19 provides for a unit member to make preliminary identification using basic issue M-8 and M-9 detection papers, and the M256, Chemical Detector Kit, authorized at the squad level. Using the procedures in FM 3-19, units can use the M113 Armored Personnel Carrier or high mobility multipurpose wheeled vehicle (HMMWV) and standard CBR detection, identification, and sampling equipment to determine the presence of radiological or chemical hazards or collect samples for laboratory analysis.[60] Furthermore, FM 3-100 suggests that unknown chemical agents should be evacuated back to a laboratory facility for definitive identifications[61] and that all field identifications from nonchemical or medical units should receive secondary confirmation. Per FM 3-101-6, confirmation for National Command Authority decisions and medical treatment regimens will require proper collection and detailed analysis of the samples.[62]

In FM 8-10-7, CBR field samples are collected by three primary groups, each with its specific area of specialty. Chemical corps personnel collect air, soil, vegetation, and environmental samples; preventive medicine personnel collect from water; and

veterinarians collect from food samples.[63] NBC reconnaissance units may be employed with the M93 Fox Vehicle,[64] while veterinarians[65] and preventive medicine personnel[66] may utilize manually transportable equipment or collect samples to be analyzed back in the laboratory. All have the specialized training to conduct more thorough sampling and analysis to rapidly assess the extent and specificity of the agent in question. Positive identification will support the commander's comprehension of the situation.[67]

Biological weapons are discussed extensively in FM 3-4, *NBC Protection*, FM 3-14, and FM 8-9. They are harder to detect and difficult to distinguish between an attack or the background organic matter or endemic diseases naturally occurring in the atmosphere. Humans and animals are often the only means of biodetection. It can be disseminated covertly and by aerosol,[68] possibly through natural animal or insect vectors mass infected and released,[69] and therefore more difficult to protect personnel and treat victims and patients.[70] Since biological agents have to incubate in the victim, detection is slower and more difficult, hampering tactical and political responses.[71] The culprit responsible for employing the agent will be long gone, and since collecting viable evidence against the user is extremely complicated, retaliation is problematic.[72] In retaliation (although back in the realm of active defense), the U.S. "retains the right . . . in response to enemy (CBRE) attack."[73] Therefore, it is crucial that adequate and accurate intelligence be obtained to develop an effective defense against a biological agent. Immunizations and possible detection of an aerosol using the Biological Integrated Detection System (BIDS)[74] prior to arrival should allow for adequate time for personnel to put on their protective equipment.

Warnings

Warnings are covered in a number of FMs and cover both the immediate warning on the field from monitoring efforts and the dissemination of warning via the chain of command. The decision to disseminate a CBRE warning or alarm is an important one to the commander.[75] The overriding concern of providing ample warning is countered by an opposing concern of avoiding problems associated with false alarms.[76] Since many biological attacks may not be identified until much later, rapid and accurate diagnostics, along with timely reporting to the commander may play critically in the success or failure in avoiding further casualties,[77] and in preventing false alarms. However, once the CBRE threat or incident is reported, then warnings are disseminated to all affected units and medical commands will be alert to potential symptoms for rapid diagnosis and treatment.[78] Through good detection, intelligence, and medical analysis, warnings can be tailored, as preferable to blanket warnings for the specific threat and area.[79] The warning will be to selected units in the suspected hazarded area, the entire force, or units after confirmation of identification of the suspected agent.[80]

Once the warnings have been sent, then active monitoring as previously discussed under section Reconnaissance and Detection should be implemented. If a unit does not have this capability then the alternative is to don protective equipment and seek shelter.[81]

Limiting Contamination Spread
or Exposure

Per JP 3-11[82] and FM 3-101-6,[83] the CBR principles of protection and decontamination fall under this heading. The FM 3-100 states that protection includes the active avoidance and control of contaminated areas,[84] and the donning of a protective

posture to prevent exposure in an anticipated or confirmed contaminated environment.[85] This may include individual protection, as demonstrated with mission-oriented protective posture (MOPP) personal protective equipment, and collective protection of units and fighting systems, as demonstrated with hardening of vehicles, ships, and structures.

The FM 3-4 goes into great detail regarding CBR protection. In chapter 2 it lists and discusses varying levels of personal protection as described with MOPP levels and their use.[86] Chapters 4 and 6 discuss personal and collective protection using terrain, shelter selection, equipment, and proper construction of hardened facilities.[87] Chapter 5 discusses measures that must be taken prior, during, and after a biological attack to reduce casualty rates.[88] Chapter 4 of MCWP 3-37 also discusses the issues listed above.[89]

Where occupational hazards occur, such as toxic chemical contamination, MOPP personal protective equipment should only be used to escape the area since it is not designed for toxic industrial chemicals. The best defense from this threat is evacuation because the greatest risk from toxic industrial chemicals is to personnel who cannot or do not leave the area, become overwhelmed by fumes or blast effects, or injured through chemical burns or an irritating dermatitis.[90]

As in the Sarin gas attack in Tokyo subways where 4,000 of the 5,500 had no identifiable effects from the agent,[91] when a chemical and biological threat exists or an incident has occurred, personnel who have not been exposed will seek medical attention.[92] Rapid and accurate diagnoses in these circumstances are crucial to maintain confidence, moral, and to prevent unnecessary concern on personnel. Per FM 8-55, *Planning for Health Service Support*, the Area Medical Laboratory can provide CBRE

analysis, diagnosis and recommendations. Per NWP 4-02.4 Part C, *Forward Deployable Laboratory*, the Forward Deployable Laboratory can provide biological analysis, diagnosis, and recommendations.[93] For personnel exposed to CBRE contamination, FM 8-250[94] and the Naval Bureau of Medicine MANMED P-117, *Navy Manual of the Medical Department*,[95] give guidance regarding the maintenance of a patient's or victim's medical record to ensure that proper data is collected as a whole and that a record is secured for the member in question.

The FM 3-100[96] discusses avoiding contaminated areas altogether by bypassing the identified site. Additionally, FM 3-14 states that movement restrictions or quarantine may be recommended to prevent further exposure once a biological agent has been identified.[97] The alternative to avoidance of the contaminated site is to decontaminate the area or equipment, which is discussed extensively in FM 3-5, *NBC Decontamination*.[98]

Unit Mission Capabilities Regarding
CBRE Responsibilities

As described in chapter 1, this thesis will examine special Department of Defense units that have capabilities, technical skills and expertise in areas of preventive medicine, and CBRE protection to review the identified manning requirements specific to the specialty taskings listed above. These specialized units will include: the Army technical escort unit (TEU) Chemical-Biological Response Team (CBRT), the National Guard civil support team (CST), the Army nuclear, biological, chemical reconnaissance company, the Army chemical company (biological detection), the Army preventive medicine detachment, the theater army medical laboratory (TAML), the Marine Corps Chemical Biological Incident Response Team (CBIRF), and the Air Force's Radioanalytical

Assessment Team (AFRAT). The section will also review the parameters for employing the units and the environments they could be deployed in.

The TEU is the only unit by law allowed to escort a nuclear weapon or device and to render safe a chemical or biological weapon or device. Primarily tasked for crisis management they can support consequence management. On order, they provide "no-notice deployment to provide chemical and biological advice, assessment, sampling, detection, field verification, and mitigation" worldwide.[99] Additionally, they provide packaging, escort, and remediation of a device or hazard, with limited decontamination primarily of the device or hazard to be escorted. CONUS based, there is one team preassigned per the theater CINC. The TEU is organized with a headquarters (HQ) section and four companies, with a basic operational element being the twelve-member CBRT.[100]

The CST[101] is a National Guard unit designed to plug into the incident commander's existing task force structure. During an incident involving a WMD, their mission is to provide "early assessment, initial detection, and technical advice to the incident commander" and to facilitate identifying DOD assets needed for support.[102] Each team consists of twenty-two personnel who are stationed throughout the U.S., but can be task oriented with a minimum of twelve persons. Doctrine dictates that a domestic response requires two teams.[103]

The NBC reconnaissance companies are allocated one per corps and assigned to the corps and TAACOM Chemical Battalion. They provide NBC reconnaissance regarding "radiation monitoring and chemical agent detection" to determine the presence and extent of NBC contamination and support NBC accident or incident control plan

operations.[104] They are normally employed in route and are organized into a HQ section, a maintenance section, and three reconnaissance platoons, subdivided into a reconnaissance platoon headquarters with four reconnaissance squads each.[105] The platoon could be subdivided down to two squads, but nothing smaller.[106]

As discussed in chapter 1, NBC reconnaissance detachments are still in the planning phases, and the organization and manning structures are still fluid and therefore not considered in this thesis for review. However, these detachments are assigned to a Force XXI heavy division cavalry squadron[107] and organized into detachment HQ and three reconnaissance squads, comprised of twenty-one personnel and one officer.[108] They are designed to provide NBC reconnaissance through collection, analysis and have limited identification capabilities for the contaminant.[109]

The chemical company (biological detection) units are assigned one per corps or higher, as indicated in FM 3-101-6.[110] They provide "early warning, detection, location, and identification of biological agents" continuously in any weather condition, but have limited chemical detection capabilities.[111] A chemical company is organized with a HQ and maintenance sections, and five Biological Integrated Detection Systems (BIDS) platoons of seven biological detection teams (BDT) each. Each BDT is comprised of team leader (staff sergeant), an assistant team leader (sergeant) and two operations specialists.[112] The teams operate one self-sustaining, independent BIDS, are forward deployed, and may be separated ten to one-hundred kilometers from another team.[113] This chemical company can be tasked organized with a company HQ and one-to-five platoons as required by theater and threat level.[114]

Per FM 4-02.17, *Preventive Medicine Services*, under the Army medical re-engineering initiative, the proposed medical force 2000 (MF2K) will replace both the preventive medicine detachment (entomology) and preventive medicine detachment (sanitation) with a universal preventive medicine detachment. The detachment is comprised with an entomologist, an environmental science officer, a senior preventive medicine (PVNTMED) noncommissioned officer (NCO), a PVNTMED NCO, and six PVNTMED specialists. The detachment commander can be either the environmental science officer or entomologist. The detachment may function as one team or split into a HQ section and three teams. Its basis of allocation is one detachment per 17,000 personnel supported and can be attached to division units or higher. The operational capabilities include, but are not limited to: DNBI surveillance and epidemiology, environmental health, medical entomology, CBRE threat, health promotion and education, and retrograde cargo inspections.[115]

Both Army[116] and the Navy[117] policies direct responsibility for food wholesomeness to the U.S. Army veterinary service. Therefore, this aspect of CBRE detection, sampling, collecting, and agent identification will not be considered in the research methodology.

The TAML, soon to be replaced by the area medical laboratory (AML), is also discussed in FM 4-02.17. The MRI reorganization provides greater flexibility to unit commanders and has a minimum staff comprised of a PVNTMED officer, an NCO, two medical laboratory specialists, a PVNTMED NCO, and a PVNTMED specialist.[118] Allocated one per theater, the AML is assigned to a medical command or medical brigade, and can be task organized for specific deployments. It includes the following

sections: HQ section, biochemistry, anatomic pathology, microbiology, veterinary laboratory, environmental health, and epidemiology.[119] It specifically concentrates on endemic diseases, and occupational and environmental health hazards.[120]

The U.S. Marine Corps developed the Chemical Biological Incidence Response Force in 1996 for two primary tasks: (1) to assist in developing force protection training, countermeasures and equipment for Marine expeditionary units, and (2) to help federal, state, and local governments develop training and response capabilities.[121] When deployed, their primary mission is to turn victims of a chemical or biological incident into patients, safe for evacuation for medical treatment. However, they do provide "detection and identification of military [and] toxic industrial chemical agents, biological agents, and radiological materials," and are supported, as needed, by a Navy Medical Research Institute deployable laboratory for biological agents.[122] It is a battalion-sized unit, structured into two pieces. The Initial Response Force (IRF) is an eighty-one-person force "capable of providing initial incident assessment and limited consequence management."[123] The follow-on is comprised of approximately two hundred fifty persons.

The Air Force Radiation Assessment Team (AFRAT) is composed of thirty-seven personnel. It is broken down into two nuclear incident response force (NIRF) teams, team 1 and 2, and the Radioanalytical Assessment Team (RAT). The NIRF Team 1 is a seven-member team designed for a rapid twenty-four hour response anywhere in the world. It is the initial assessment team that will either request additional follow-on support or will mitigate the incident, collect samples for analysis by the RAT upon return to CONUS. The NIRF Team 2 is a twenty-member team, designed as an as-needed

follow-on capability that would provide all the additional necessary equipment indicated as necessary by the first team. This team includes the industrial hygiene capabilities for analysis of hazardous materials that might be a natural consequence of damaged equipment or facilities at the accident site.[124]

The RAT is a stand-alone capable team that is normally deployed in a supporting role for the AFRAT NIRF teams 1 or 2, or both simultaneously. It is composed of a core team of ten personnel, consisting of two health physicists[125] (equivalent to a Navy radiation health officer),[126] two medical laboratory craftsmen, and six medical laboratory journeymen. Fewer personnel can be deployed if threat conditions warrant.[127] The mission of the RAT is to provide the command surgeon with field radioanalytical support in response to radiation accidents and incidents and "provide expert guidance on the type and degree" of a radiological hazard. The RAT "measures, analyzes, and interprets environmental and occupational samples for their content of radioactivity."[128]

Forward Deployable Preventive Medicine Unit

Since the FDPMU is in the conceptual phase of development, standard official documents regarding its concept of operations, doctrine, tactics, techniques, and procedures are not yet available or are draft copies only. Therefore, the author will utilize the available documentation to discuss the current concept of employment and manning of the unit.

There are two federal government documents providing the requirements for the FDPMU. They are the *Stafford Disaster Relief and Emergency Assistance Act* for assistance for public health, safety and property,[129] and the *Defense Against Weapons of Mass Destruction Act of 1996*, which mandated improvements in domestic preparedness

and response capabilities for CBRE terrorist attacks.[130] Additionally, the Presidential Decision Directive 39, *U.S. Policy on Counterterrorism,* is designed to strengthen domestic capabilities, to include DOD assistance, in the hope that it will deter terrorists acts.[131]

Force health protection is addressed medically, per DOD Directive 6490.2, *Joint Medical Surveillance,* to provide for technical advice and operational support for threat assessment. This directive tasks medical surveillance to "assess . . . combat casualties, including those produced by chemical and biological and nuclear weapons."[132] Furthermore, it directs that the medical departments will be prepared to "conduct comprehensive, continuous and consistent medical surveillance to implement early intervention and control strategies."[133]

Per DOD Instruction 6490.3, DOD components "will conduct comprehensive, continuous and consistent medical surveillance to implement early intervention and control strategies."[134] This is to be accomplished in part by the utilization or deployment of "technically specialized units," as demonstrated by the Navy Forward Deployable Laboratory (FDL), with the capability and expertise to conduct medical surveys.[135] Specific guidance includes testing for numerous environmental and occupational hazards in air, water and soil samples for industrial, chemical, metal, biological, radiological, and pesticide contaminants to evaluate and record occupational exposure.[136] In 1998, the Chief of Naval Operations appointed the Navy's Bureau of Medicine and Surgery as the responsible naval agent for all aspects of the development and implementation of CBRE casualty care,[137] which under the Joint Chief of Staff direction includes U. S. Navy preventive medicine units.[138] Through the Navy Bureau of Medicine and Surgery, under

the guidance of both DOD Directive 6490.2 and DOD Instruction 6490.3 and OPNAVINST 3400.10F, *Chemical, Biological and Radiological (CBR) Defense Requirements Supporting Operational Fleet Readiness*, the FDPMU was directed to include CBRE casualty prevention and training.[139]

In the Draft Naval War Publication 4-02.4 Appendix A, *Forward Deployable Preventive Medicine Unit (FDPMU)*, the introduction describes the FDPMU as a "rapidly deployable, task-organized, specialized preventive medicine platform . . . (that) includes the capabilities of the Forward Deployable Laboratory, plus . . . CBRE agent detection and identification."[140] The FDPMU mission is to:

> enhance Force Health Protection by identifying and evaluating environmental health hazards (including CBRE), assessing the risk of adverse health outcomes, monitoring the health of deployed forces, and advising the operational commander concerning significant risks and recommending preventive medicine interventions needed to protect the health of the force.[141]

Per the draft, the FDPMU is organized into four components. The Preventive Medicine component covers field sanitation, occupational and environmental illnesses, and epidemiology. The Chemical component is responsible for the "detection, identification, and monitoring of chemical warfare, environmental and radiological hazards and exposures."[142] Normally, the FDPMU detachment could conduct basic radiological detection, accumulate data, and collect samples for analysis by an augmenting radiological team or for shipment back to a laboratory.[143] The Microbiology component covers the "detection, identification and testing of naturally occurring and biological warfare infectious diseases agents, and laboratory diagnosis of military relevant public health diseases."[144] The Disease Vector component is responsible for all aspects of the surveillance, collection, identification, and control of animals and insects

that potentially cause injury or transmit diseases. All of these components provide recommendations regarding their specialties.[145]

In the revised FDPMU manning structure, used in the 8-10 September 1999 Working Group Session, a fully deployed FDPMU is manned with thirty-nine personnel, while the FDPMU detachment, the basic manning requirement is eleven personnel. This detachment includes one preventive medicine officer, one environmental health officer, one entomologist, one industrial hygiene officer, one microbiologist, five preventive medicine technicians, and one laboratory technician, which covers everything but the radiological detection that cannot be conducted by field unit personnel or the industrial hygiene officer.[146] This was modified again to include the addition of an independent duty corpsman,[147] to bring the total to twelve personnel. By augmenting a radiological team, consisting at a minimum a radiology health officer and a radiology health technician, the manning would be fourteen. During nondeployed status, the majority of personnel are assigned to the Navy environmental and preventive medicine units and to disease vector ecology and control centers.[148]

Conclusions

This chapter reviewed the official unclassified publications and documents regarding CBRE doctrine, unit missions, and employment of personnel to aid in analysis of manning requirements for chapter 3. Since the FDPMU is still in the conceptual stage, the planning and mission concepts and structure were examined to lay the groundwork for comparative analysis methodology described in the next chapter. Much of the FDPMU information comes from planning conference documents, doctrinal publications, and instruction drafts, and interviews of personnel involved with the FDPMU program.

While this information is useful, its weakness is in the fluid templates for doctrinal and procedural drafts, which are still subject to change.

This thesis aims to: (1) identify overlapping similarities of DOD units regarding functions and capabilities of the FDPMU, specifically preventive medicine and CBRE monitoring, detection, sampling, collection, and identification, (2) examine the manning requirements regarding those specific similarities, and (3) determine what factors influence task-organized manning requirements, and any subsequent modification, for specified operations or exercises.

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CHAPTER 3

RESEARCH METHODOLOGY

> The price of unpreparedness is always paid, again and again, in lives and in blood. . . . The less prepared we are, the more wishful our thinking, and the greater the costs of war when it comes.[1]
>
> General Creighton Abrams, *Steady the Course*

Introduction

Chapter 1 defined the problem of this thesis. It began by reviewing the historical background of preventive medicine and, in particular, the emerging threat of chemical, biological, radiological, and environmental (CBRE) hazards or attacks. It discussed the broad aspects of military preventive medicine from disease and injury incidence, detection, and prevention, to environmental and occupational hazards. The historical background for the development of the Forward Deployable Preventive Medicine Unit (FDPMU) was discussed, along with the current concept of operations and manning requirements. Chapter 1 highlighted the Department of Defense (DOD) units used for the comparative analysis and definitions of terms that needed clarification. It concluded with the primary and secondary questions, and described limitations and delimitations placed upon the study.

In chapter 2, a review of key research information was provided to focus the study. This information consisted mostly of published materials, but where information was lacking, as demonstrated with the absence of standardized FDPMU doctrine or policy due to the continuation of the planning phase, interviews with personnel involved with the FDPMU development and unpublished documents from planning conferences

and meetings were utilized. Where possible, unit after action reports were used to examine the employment of personnel with in the unit under actual field conditions. The chapter discussed the similar procedures that would be used to determine the manning requirements needed for the comparison. It also reiterated the available documentation regarding those units.

Chapter 3 outlined the specific research methods and procedures used in the thesis. Its objective was to define the evaluation criteria to analyze the primary and secondary questions of this study.

The information derived from the research using the evaluation criteria defined in chapter 3 is analyzed in chapter 4. Specifically, the analysis focused on the overlapping similarities of the DOD units and the manning requirements to fulfill those similarities. It also analyzed the reasons for those manning requirements to help clarify the differences discovered. The chapter concluded by interpreting the results of the analysis derived from the research data.

Finally chapter 5 determined the feasibility of the manning requirements for the FDPMU detachment regarding the enhancement of the historical preventive medicine mission to include CBRE protection and consultation. It discussed the results and the respective interpretations of those results to identify limitations or shortfalls in the proposed FDPMU detachment manning requirements. The end state was with recommendations where perceived manning issues were identified.

Comparative Analysis Research Methodology

The research methodology of this thesis utilizes a comparative analysis and follows a three-step process to determine manning requirements for the twelve member

FDPMU detachment. It will address the secondary questions to answer the primary question. The primary questioned addressed is: Is the traditional 12-member Navy MMART team manning requirements capable of supporting the additional CBRE mission?

The secondary questions are:

1. What are the overlapping parameters of the units in the similar areas of responsibilities?

2. What are the manning requirements for DOD units with similar capabilities?

3. What manning modifications have been implemented with similar specialized units?

4. How do threat conditions modify manning requirements?

The first step to answering the questions is to identify DOD units that have similar missions or capabilities overlapping with the FDPMU. Those similarities include military preventive medicine and laboratory analysis and diagnostics, CBRE monitoring, detection, collection, sampling, and identification. Overlapping responsibilities are common among many military units to reduce gaps in vulnerability and improve efficiency. However, those overlapping similarities do not necessarily represent needless repetition, because each unit fills a specific void within an organizational structure that is often service specific. Moreover, the overlapping similarities may be employed altogether differently and may not be equivalent in application. Although a similar unit from a sister service might be able to provide coverage, that coverage may lack critical specialties or capabilities that are very service specific.

Once the units have been identified, the second step is to spell out those specific areas where the overlap or similar capabilities may occur. This requires close examination of that overlap to clarify how that overlap is both similar and different for adequate comparison. This will include defining the employment of processes that although equivalent in theory by definition are not in reality by application. For example, monitoring could be conducted by one unit with the most basic, nonspecific equipment, resulting in the identification of a potential hazard primarily to warn personnel of a perceived threat so that personal protective measures can immediately be taken. Nevertheless, this method does not always produce positive identification to determine its threat potential. On the other hand, monitoring can be conducted with state-of-the-art technology operated by trained technicians that not only alerts the technician of the potential hazard, it identifies it for immediate response and recommendations.

The third step is to determine the number of personnel required for mission accomplishment within the guidelines of the similarities of the identified units. Examinations for manning differences within the units' identified similarities and for manning modifications to the respective units' table of organization and equipment will be conducted.

Conclusion

This study used evaluation criteria that utilized similarities within DOD units regarding CBRE and preventive medicine capabilities, and the manning requirements to employ those similarities to conduct a comparative analysis. The strength of the study lies in the available doctrine, directives, and techniques and procedures compiled in official publications. The weakness is in the lack of information regarding how the

mission requirements were identified and how the manning requirements were calculated. Additionally, since the FDPMU is still in the conceptual and developmental phase, nothing is concrete as with established units or doctrine and therefore is subject to change and interpretation.

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[1]

CHAPTER 4

ANALYSIS AND RESULTS

> No sane individual, or nation led by rational leaders, would challenge the United States on this nation's terms, which means that the armed forces must be prepared to counter asymmetrical strategies. The old style of deterrence simply will not work in this complex world.[2]
>
> The Honorable Frederick L. Frostic, *National Defense into the 21st Century: Defining the Issue*

Introduction

This chapter addresses the analysis and results of the author's research on subordinate questions in chapter 1. This chapter develops answers to the subordinate questions to provide a foundation for answering the primary question in the next chapter.

The subordinate questions will be answered through the identification of overlapping similarities within DOD units regarding functions and capabilities of the Navy Forward Deployable Preventive Medicine Unit (FDPMU). The specific categories examined, per tables 2 and 3, will include historical preventive medicine services, laboratory services, and chemical, biological, radiological, and environmental (CBRE) monitoring, detection, sampling, collection, and identification.

Discussions on the Overlapping Similar Responsibilities or Mission Requirements

The Forward Deployable Preventive Medicine Unit

The FDPMU mission is derived in part from the historical preventive medicine responsibilities of the Navy field preventive medicine units. These responsibilities included "epidemiology, clinical preventive medicine, occupational medicine, industrial

hygiene, environmental health sciences and engineering, medical entomology, health promotion and wellness, community health, mental health disciplines, toxicology and laboratory sciences."[3] The expanded mission requirements including CBRE detection, collection, and analysis completes the FDPMU mission.

Table 2. Units and Minimum Manning Requirements within the Overlapping Areas

FDPMU Det	TEU CBRT	CST	NBC Recon Platoon	Chemical (Bio Detect) Platoon	CBIRF IRF Recon Team	Prev Med Det	TAML
12	12	12⋇	16◆	28◆	4●	11 or 13	25

This table represents the minimum number of personnel required to adequately complete the overlapping similarities within their defined mission as described by doctrine or SOPs.

⋇ Although two 22-member teams are deployed simultaneously, surveillance into the hot zone could be initiated with a minimum of 12 persons.

● CBIRF IRF is an 81-member force, however, only the four member reconnaissance team samples, collects, analyzes, and identifies the sample.

◆ Includes full employment of platoon. However, if only one point source, then a minimum of only two 4-member NBC Reconnaissance squads or two 7-member Chemical Company teams could be employed.

As discussed previously in chapter 2, the FDPMU mission is to

> enhance force health protection by identifying and evaluating environmental health hazards (including CBRE), assessing the risk of adverse health outcomes, monitoring the health of deployed forces, and advising the operational commander concerning significant risks and recommending preventive medicine interventions needed to protect the health of the force.[4]

Organized into four components, the FDPMU includes: (1) Preventive Medicine (epidemiology and environmental health sciences), (2) Chemical, (3) Microbiology, and (4) Disease Vector (entomology). The Preventive Medicine component covers field sanitation, occupational and environmental illnesses, and epidemiology. The Chemical

component is responsible for the "detection, identification, and monitoring of chemical warfare, environmental and radiological hazards and exposures."[5] Normally, the FDPMU detachment could conduct basic radiological detection, accumulate data, and collect samples for analysis by an augmenting radiological team or for shipment back to a CONUS based laboratory.[6] Microbiology covers the "detection, identification, and testing of naturally occurring (diseases) and biological warfare infectious . . . agents, and (the) laboratory diagnosis of military relevant public health diseases." The Disease Vector component is responsible for all aspects of the surveillance, collection, identification, and control of animals and insects that potentially cause injury or transmit diseases. All of these components provide recommendations regarding their specialties.[7]

Table 3. Units and Overlapping Preventive Medicine and CBRE Similarities

	FDPMU Det	TEU CBRT	CST	NBC Recon	Chemical Company	CBIRF	Prev Med Det	TAML
	Preventive Medicine						✔	
Chem Bio Nuke	Monitoring	✔	✔	✔	✔	✔		✕
	Sampling/ Collecting	✔	✔	✔	✔	✔		✔
	Analysis/ ID	✔	✔	✔	✔	✔		✔
Haz Mat	Monitoring		✔			✔		✕
	Sampling/ Collecting	✔	✔			✔		✔
	Analysis/ ID		✔			✔		■
Med Lab	Monitoring							✔
	Sampling/ Collecting							✔
	Analysis/ ID							✔

✔ = Proficient in skill

✕ = Can conduct activity but not primary duty.

■ = Can conduct some activity but not in all areas. For example, at present TAML can collect air samples for Hazardous Materials but cannot analyze the samples.

The FDPMU detachment is composed of twelve-persons, the minimum number required to cover all the mission essential taskings of the FDPMU, closely resembling the twelve-member Mobile Medical Augmentation Readiness Team (MMART) composition. The technical specialties were in place with the MMART team and with the additional equipment and training, hopefully making the transition to the FDPMU detachment less painful. The Navy Environmental Health Center (NEHC) proposes that a twelve-member FDPMU detachment is adequate to cover all the essential specialties due to: (1) it being the minimum number of personnel for a low threat environment, and (2) because of the cross training of basic tabletop procedures received by all personnel, officer and enlisted. NEHC proposes that in every specialty there are standard tabletop operating procedures that can be effectively conducted by all personnel, providing a more efficient use of manpower by allowing for personnel to assist in a broad spectrum of analysis. The resident technical expert would retain the final authority within the specialty to ensure adherence to regulations, laws, proper laboratory procedures and competent interpretation of and recommendations from the analytical results.

Historical Preventive Medicine Requirements

The Army preventive medicine detachments, presently separated into two units specializing in and respectively named entomology detachments and sanitation detachments. Both basically have the same responsibilities with more emphasis on their respective specialty. With minor differences between the two units, the Army medical re-engineering initiative (tasked with revising the Army medical structure to support the

proposed Force XXI Army) is combining the subtle differences to create equivalent units to reduce unnecessary redundancy while enhancing standardization and services throughout the theater. The mission of each unit changed slightly, with the addition of two personnel to increase the manning requirements to thirteen.[8] Their services include pest surveys and control, water surveillance (including NBC contamination), limited epidemiological consultation, training field sanitation teams, and consultation to commanders.[9] Eleven personnel (pre-Army Medical Re-engineering Initiative) or thirteen personnel (post-Army Medical Re-engineering Initiative) man them, and like the Navy counterpart, can be tasked organized for specific missions requiring fewer personnel. Although, the Navy MMART team was organized into a twelve-member team, in over eleven years the author has never experienced a deployment of the full team. Usually the teams averaged five to six members, some with as few as two while rarely exceeding eight. The majority of these deployments were is support of exercises, operations, and humanitarian assists, that did not require the deployment of entire units, for example, engineer, medical, infantry, therefore resulting in task organized MMART deployments.

With both services requiring similar numbers, plus or minus one, for manning requirements closely covering the same historical preventive medicine services, then the degree of difference for comparison is too small for extensive discussion. From the author's experience in joint environments with Army and Navy preventive medicine units and personnel, the application of the broad spectrum of preventive medicine services kept personnel busy, allowing for a thorough employment of those personnel.

Operations or exercises not requiring the full deployment of all personnel may vary in manning numbers. Although based in doctrine, personal opinions may influence the medical planners--based on their training, experience and intuition--where one service may deploy five persons and the other six. Often these numbers will fluctuate from deployment to deployment, and between intra-service and inter-service planners. However, these numbers are generally close, and therefore the manning requirements in this area are considered comparable.

Chemical, Biological, Radiological, and Environmental Monitoring, Detection, Sample Collection, and Identification

Monitoring, detection, sample collection, and some identification can occur in every situation where an agent or contamination is suspected. The Army, Navy, and Marine Corps have capabilities for basic monitoring, detection, collection, and identification at the unit level. However, this is for rapid early warning and is not considered definitive, requiring secondary confirmation from a credible field laboratory or U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID). It does indicate, however, that there are numerous trained personnel organic to field units throughout the Army, Navy, and Marine Corps that are capable of collecting samples to forward to specialized units responsible for credible analysis and identification.

There are specific specialized units, as demonstrated by the National Guard civil support team (CST), CBIRF, and theater army medical laboratory (TAML) that can do more definitive field analysis for initial identification, relying on secondary confirmation of USAMRIID or other CONUS-based laboratories to ensure proper identification. This is one of the concepts of operation for the FDPMU.

This thesis will discuss two separate scenarios for the monitoring, detection, and collection of samples for CBRE attacks or contamination. The first is under the threat of a broad nuclear, chemical, or biological agent attack or contamination from an exposure to pollution, as demonstrated with the Chernobyl nuclear accident[10] and Sverdlovsk anthrax accident,[11] where accidental releases sent a plume of contamination over a civilian population. In this broad scenario, the agent or contaminant cloud may move over a large area, allowing for exposure to a number of military personnel in multiple areas within a relatively short time.

The primary missions of the NBC reconnaissance companies and chemical companies (biological detection) are for nuclear, chemical, and biological agent monitoring over a large area. Both are capable of having multiple monitoring stations continuously over a large front. However, these units are specifically designed for nuclear, chemical, and biological warfare agents only. The NBC reconnaissance company is not utilized for hazardous materials detection and identification as demonstrated by the industrial accident at Bhopal, India.[12] Hazardous materials are the responsibility of the environmental science officers of the preventive medicine detachments.

At the lowest level, the platoon, the NBC reconnaissance companies provide a minimum of four reconnaissance squads, consisting of four persons per squad totaling sixteen persons, to be dispersed across a front. A platoon within the chemical company would provide seven four-member teams totaling twenty-eight persons. These squads and teams could be placed ten to one-hundred kilometers apart in areas where the greatest threat was perceived mostly likely to occur. These areas could be high value targets, like

airfields, staging areas, or command and control centers. Or they might be areas where meteorological or geographical conditions might produce the greatest potential for channeling drift, as demonstrated through a forested road or city street.[13]

At the most, the FDPMU detachment could provide only one team, consisting of less then four persons due to limited equipment availability, for constant monitoring from an anticipated attack or event. This monitoring might also be restricted, as in radiological data, to only data accumulation and sample collection for shipment depending on the anticipated agent. Although a four person FDPMU detachment monitoring team might be adequate for smaller deployments or exercises where a low-level threat is rapidly elevated or an unanticipated attack or incident is now expected or identified, it is not the intentional concept of operations for either the FDPMU or the FDPMU detachment. Although the NBC reconnaissance company or chemical company (biological detection) are available for deployment, low threat levels and deployment size restrictions may result in a late deployment date or no deployment at all, therefore restricting their ready availability to the field commander. Moreover, with other responsibilities immediately given a lower priority, the FDPMU detachment could only sustain the monitoring station for a short period of time, assumedly less than seventy-two hours. It was not designed to establish nor maintain a constant monitoring station for nuclear, chemical, or biological agents, much less over a broad front, as with the NBC reconnaissance company or chemical company (biological detection).

Commander Harvey Adkins, U.S. Navy, the FDPMU Microbiology component manager, argues that biological agent monitoring, as per the chemical company (biological detection) mission, was not part of the FDPMU concept partially due to the

significant difficulty in definitively identifying a biological agent attack from background or naturally occurring organisms. Although the FDPMU could "monitor" for biological agents in the field, the potential for misinformation from one source could easily mislead a commander.[14] In the absence of specialized monitoring units, where such a scenario could be viewed as rather desperate, the FDPMU detachment could provide some coverage until the appropriate monitoring assets were brought into place, but only for a short period of time. Additionally, thresholds for human infection are lower than that for detection, meaning that all "negative" samples collected from a Biological Integrated Detection Systems (BIDS), or other systems, would still require analysis. This means all the biological samples collected must be processed which in turn leads to a higher number of man-hours required for laboratory analysis.[15]

The second scenario necessary for monitoring a CBRE attack or contamination is from a specified point source, such as the discovery of a suspected agent or contaminant, or as demonstrated through the secret Soviet biological weapons facility accident in Sverdlovsk,[16] or the intentional anhydrous ammonia release in Pleasant Hill, Missouri.[17] This could still cover a large area as demonstrated with an aircraft crash site where contamination may be spread over a number of acres. The NBC reconnaissance company and chemical company (biological detection) can conduct surveys, as mentioned previously, to determine the extent of contamination from a nuclear, chemical, or biological agent contamination. The technical escort unit (TEU) Chemical-Biological Response Team (CBRT), CST, Chemical Biological Incidence Response Force's (CBIRF) Initial Response Force (IRF), and the FDPMU detachment all have this capability in order to conduct their specific mission.

The TAML, to be redesignated the Army theater laboratory (AML) per the Army medical re-engineering initiative, can do point source surveillance also, but considers this for emergencies only, and not as part of their primary mission. If other assets are available, they should be utilized first. Historically, the Navy preventive medicine industrial hygiene department has had the responsibility for industrial contamination or hazardous materials surveillance, making it an easy transition to include the broader field of chemical agents within the FDPMU detachment. Likewise, the industrial hygiene officer can conduct initial gamma radiation surveys to determine levels and boundaries, but sample analysis must be performed by experienced radiation health personnel or CONUS-based laboratories. Any samples sent back to CONUS for analysis would take a minimum of thirty-six hours before an answer could be given, and this is in a perfect world where dedicated aircraft and laboratory personnel are standing by for assistance. In reality, an answer may not be available for four or five days.

Of all the units discussed in this scenario, only the CBIRF IRF, CST, and FDPMU detachment could provide an initial broad-spectrum on-site analysis and identification of the agent or contaminant to a high degree of probability. Depending on the type of toxic material in the air or smoke, the TAML might be able to conduct the analysis, however in the past they have been relegated to collecting samples for definitive analysis at CONUS based laboratories. However, new protocols are being developed for the TAML to allow for an "unknown environmental" analysis in the field.[18] TEU can conduct limited identification of the primary chemical agents, but would require secondary confirmation to ensure positive identification. If the suspected agent was an industrial contaminant, where the possibilities would number in the thousands, TEU

would not have the ability to positively identify the contaminant with a high degree of probability because they do not possess the technical expertise nor technology to make the assessment.

Per Title 29, Code of Federal Regulations 1910, *Occupational Safety and Health Standards*, a minimum of eight persons is required on-site before a known or suspected contaminated area, or hot zone, can be entered. This does not include command and logistics personnel. A two-person minimum is a requirement for any surveillance team entering a hot zone to ensure that emergency assistance is close at hand if a team member becomes a casualty from exposure. Additionally, for every person going into the hot zone, there is a stand-by in the cold zone to expedite emergency assistance in case a surveillance team member is overcome within the hot zone. Four additional persons, concurrently in personal protective equipment one level below the level of the surveillance team, is available for decontamination of the team members coming out of the hot zone.[19]

CBIRF's IRF is composed of eighty-one persons, the majority trained to conduct surveillance in the hot zone, but only the four man reconnaissance team would be used for agent/contaminant identification, sampling, and collection at a given incident. Two person rapid extraction teams, to possibly include medical personnel, may be in the zone simultaneously but these teams are designed for victim extraction only. The rest of the IRF would conduct decontamination of casualties for emergency medical assistance.[20] Likewise, by doctrine when one CST is deployed a second is deployed simultaneously. A twelve-person minimum could initiate the surveillance of the contaminated area,

allowing for eight to don protective equipment for entry into the hot zone and four for command, communications, and logistical support.

Where a point source may be easy to identify, sample, and contain, therefore reducing the amount of time required in the hot zone, a minimum of eight persons should be adequate for a short duration of a few hours only. However, if a large facility or essential asset requires significant decontamination, multiple entries by the team into the contaminated area over a period of hours or days may be necessary in order to assess the effectiveness of the decontamination process. Working in the protective equipment is exhausting, especially where temperatures are elevated, mandating a rest period ratio of four to one in relation to the time spent in protective equipment. This is one of the reasons the National Guard deploys two CSTs totaling forty-four persons to be available if multiple entries were required over a longer period of time. However, the majority of times the crisis is managed quickly, requiring fewer personnel to be utilized.

As in most incidents or accidents, the contamination is readily identified and contained, allowing for rapid ventilation and decontamination. In this particular situation, few personnel would be required for a response, making the twelve-member FDPMU detachment, or twelve-member TEU's CBRT, more than adequate for managing the response. However, as argued for the CST, if the contamination source was not readily identified and contained, or if a large contamination over a long period required multiple re-entries of a survey team into the hot zone, it could easily tax the personnel resources of the FDPMU detachment.

In this scenario, an additional conflict over FDPMU detachment manning requirements could arise when some of the personnel required to provide an eight

member surveillance team are concurrently conducting other routine services in the additional specialties at separate locations within the theater. This is demonstrated during routine field sanitation inspections at facilities located throughout the theater of operations, preventing a rapid assembly of necessary personnel at the incident location. When one considers the preventive medicine experiences in Bosnia, traveling from camp to camp could take hours, sometimes requiring days to complete some routine inspection circuits.

Laboratory Analysis and Identification

In regards to laboratory analysis capabilities, the FDPMU detachment overlaps with both the TAML and the CST. Due to recent technological advancements, the CST has the ability to conduct on-site identification of chemical agents and hazardous compounds. This capability is likewise available in the laboratories of the FDPMU detachment, and possibly the future capabilities of the TAML. Additionally, the FDPMU detachment and TAML possess similar microbiology analysis and identification capabilities, not meant to duplicate clinical laboratory capabilities but to evaluate environmental issues, as demonstrated with vector-borne or endemic diseases. Although the TAML has veterinary and anatomical pathological sections, the FDPMU as a whole does not.

Per the proposed Army Medical Re-engineering Initiative, the TAML manning of seventy-three personnel will be reduced to forty-three[21] in the Area Medical Laboratory (AML), as discussed in FM 4-02.17.[22] Comparatively, a full FDPMU would be composed of thirty-nine persons.[23] Like the FDPMU and historical MMART team

composition in actual deployments, the TAML and future AML can be task organized specific to the anticipated threats and needs. Currently, the TAML requires twenty-five personnel to provide the minimum support needed to cover all its specialties for an indefinite period with twenty-four hour workdays. Each specialty is supported with about four personnel each.[24] The current policy for the AML is for a core of five personnel to be augmented as needed with additional personnel and specialty services.[25]

The FDPMU detachment laboratory specialists are intended to operate primarily in the laboratory facilities and not participate with the routine preventive medicine inspections. Routine samples collected either by the other FDPMU Detachment personnel or other assets organic to the units in theater are to be delivered to the laboratory facility for analysis or can be collected by the laboratory personnel during a point source assessment. This is also the standard operating procedure for the TAML, relying on available assets scattered throughout the theater to ensure the most efficient use of manpower. When the number of samples exceeds the resources of the laboratory personnel, then other FDPMU detachment personnel cross trained in the tabletop laboratory procedures will be relied upon for assistance.

As previously discussed, the FDPMU detachment could provide twenty-four hour coverage, but only for a limited period and at the detriment of its other preventive medicine responsibilities. When the number of samples received exceeds the primary FDPMU detachment laboratory manning resources, then a shift of manpower must be made away from the other services. If this condition continues, then the laboratory analytical capabilities, the remaining preventive medicine services, or both, will suffer. Likewise, if both the Chemical component and Microbiology component are analyzing

numerous samples simultaneously over long periods requiring assistance from other detachment personnel, then the manning requirements would be taxed even more rapidly.

Radiological Assessments

Personnel trained at the unit level, Preventive Medicine Detachments, CST, TEU, TAML, and FDPMU detachment through the use of handheld equipment organic to the units can conduct basic radiological assessments. However, where a greater degree of expertise is required, the FDPMU radiological team and Air Force Radiological Assessment Teams (AFRAT) are available for augmentation. The FDPMU detachment team consists of a minimum of two personnel, which depending on the perceived level of crisis can be larger. On the other hand, the AFRAT, subdivided into three teams, two surveillance teams and the radioanalytical laboratory, is composed of thirty-seven personnel.

The AFRAT mission is a rapid response, globally deployable asset designed to arrive within twenty-four hours at a nuclear or radiological incident site, collect and analyze samples, and provide recommendations to the on scene commander. Depending on the initial site assessment, they may deploy with seven, twenty-seven, or the full thirty-seven personnel. They are not meant to be a prepositioned asset in a theater of operations. They deploy when needed to where needed and leave the area when the crisis and subsequent consequence has been satisfactorily resolved.

The FDPMU detachment radiological team is designed to augment the basic capabilities of the FDPMU detachment when a real radiological or nuclear incident is anticipated or encountered. The radiological team would provide in-house data analysis, recommendations, and risk communications to the theater commander. They would be

able to answer a large percentage of the questions for majority of scenarios most likely encountered by the theater commander. If the incident required additional augmentation, requests for additional support might be made for more FDPMU radiological personnel or for external support as represented in the AFRAT. They are designed to stay in theater as an additional medical asset of the FDPMU detachment providing on-scene recommendations and assessment as requested for the theater commander.

Both teams can easily augment any medical unit or staff and can operate fairly independently. Although not part of the FDPMU detachment, augmentation of either team can be incorporated easily, demonstrating the close similarities of both teams in technical expertise, capabilities, and personnel. However, the AFRAT does provide the manning for consistent twenty-four hour service for a much longer period of time than the two-person FDPMU detachment radiological team.

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[6]Greg Harris, Commander, Radiation Health Officer, Medical Service Corps, U.S. Navy, Navy Environmental and Preventive Medicine Unit No. 2, Norfolk, interview by author, Fort Leavenworth, 29 January 2001.

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[15]Jeff Adamovicz, Lieutenant Colonel, Executive Officer, Army 520 TAML, Aberdeen, interview by author, Fort Leavenworth, 19 January 2001.

[16]Meselson, 1202-1203.

[17]Tanyanika Samuels, "Ammonia leak forces residents from homes," *The Kansas City Star*, 29 February 2000, B3.

[18]Adamovicz, 14 through 19 January 2001.

[19]Mike Macinski, Lieutenant Commander, Industrial Hygiene Officer, U. S. Navy, Navy Environmental Health Center, Norfolk, electronic interview by author, Fort Leavenworth, 28 August 2000.

[20]Eric Hamstra, Captain, U.S. Marine Corps, Assistant Operations Officer, CBIRF, Indian Head, MD, telephone interview by author, Fort Leavenworth, 13 March 2000.

[21]U.S. Army Force Management Support Agency Requirements Documentation Directorate, *Area Medical Laboratory TOE Narrative* [database on-line] (Fort Leavenworth, Kansas: US Army Force Management Support Agency Requirements Documentation Directorate, accessed 29 September 2000); available from http://www.usafmsardd.army.mil/toenarra.cfm?toenumber=08668A000; Internet.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

> Sometimes our people think we are extravagant with public money, that we squander it, spend it recklessly. I don't agree that we do. We are in the business where it's difficult always to administer your affairs as a businessman can administer his affairs in a company, and good judgement sometimes requires us to build a tank that turns out not to be what we want, and we scrap that and build another one, but that's part of the development, . . . expensive and regrettable, but sometimes unavoidable.[1]
>
> George C. Marshall, *George C. Marshall: Organizer of Victory*

Introduction

This study compared eight Department of Defense (DOD) units with similarities and manning requirements overlapping the proposed Navy's Forward Deployable Preventive Medicine Unit (FDPMU) detachment to answer this thesis' primary question. That question is: Is the traditional twelve-member Navy Mobile Medical Augmentation Readiness Team (MMART) manning requirements capable of supporting the additional Chemical, Biological, Radiological, and Environmental (CBRE) mission?

One of the difficulties encountered in this study was that the FDPMU is still in the preliminary conception and planning phase, meaning that concepts, policies and procedures are not yet standardized. Nor has every issue or concern identified within the FDPMU been addressed. For example, Army doctrine indicates what size unit, that is, a corps or division, or population a unit is expected to support and to which they would be assigned or attached. Additionally, the Army does extensive research calculating the actual number of man-hours required to complete various tasks. This allows for greater precision when calculating the number of personnel necessary to complete a specified

mission for a specified operational tempo. Neither of these issues have yet to be clarified or calculated for the FDPMU.

Therefore, research was occasionally vague or incomplete in some areas, as mentioned above, making the comparative conclusions difficult and inadequate. Additionally, it was often difficult to get timely or satisfactory responses and answers from knowledgeable persons regarding the specifics of the units in question. Although requested, only one unit provided after-action reports for examination.

Conclusions

It is the conclusion of the author that it is possible for the twelve-member FDPMU detachment to accomplish both the historical preventive medicine services and the additional CBRE mission, but under significant limitations. Those limitations are based upon the threat level anticipated for the operation, the size of the deployment, and the geographical dimensions of the theater. During this period of down sizing both in funding and personnel where every service is straining under the more-with-less mentality, the FDPMU detachment is conceptualized more upon the most likely scenario and not the worst case scenario. If the support requirements for worst case scenarios were encountered, the FDPMU detachment would not be able to complete its mission without personnel augmentation.

The FDPMU capabilities come closest to a combination of the Army's preventive medicine detachment for historical preventive medicine services and the theater army medical laboratory (TAML) for field laboratory services. Combining these two units' basic manning requirements would indicate that thirty-seven personnel would be needed to cover all the services provided; the FDPMU detachment has only twelve. Both the

TAML and FDPMU detachment laboratory capabilities rely on the monitoring, sampling, and collecting capabilities organic to units in theater to reduce workloads and redundancy.

This three-to-one manning disparity arises out of two basic operational concepts. First, the FDPMU detachment concept ensures the specific expertise is available to guarantee that all services are provided. Through the cross training of personnel in standard tabletop laboratory techniques and procedures, it attempts to ensure that personnel are available to assist in any analysis. This should allow for more efficient use of manpower and man-hours but does not necessarily cover-worst case scenarios. Worst-case scenarios can be defined as the maximum support, or even large majority, for services needed by all customers in theater at a given time, as demonstrated by the number of samples an entire chemical company (biological detection) platoon could collect within a seventy-two hour period.

The Army philosophy is that if personnel are committed to fewer tasks, then they will be able to complete those tasks with greater proficiency, reducing the probability of error, theoretically reducing damage to or loss of equipment and personnel. If the soldier is expected to be proficient in numerous areas, proficiency is endangered in all areas, and therefore, theoretically, increasing the potential for error and subsequently equipment damage and personnel injury or their loss. Additionally, they plan for worse case scenarios based on the size of unit they are to support. Operational requirements are rarely based on eight-hour days or forty-hour weeks, but twenty-four hour days for undetermined periods of time. Although logically sound, in view of the lighter, smaller

Force XXI Army, the future points toward more responsibility per person because fewer people will be available to the deploying unit.

The FDPMU addresses this concern through the maintenance of professional competence remaining in one or two individuals overseeing the proficiency of the other personnel cross-trained in standard tabletop procedures. Additionally, proficiency is enhanced with the greater accuracy provided through technological advancements in equipment, materials, and training. These advancements also reduce the size of laboratory equipment and the time required for analysis, allowing the deployment of more diversified equipment enhancing the accuracy of the information provided to the specialist. Furthermore, if the threat level or workload is expected to be greater in one or more areas, the augmentation process is readily available both prior to and during deployment, which has effectively been utilized with past MMART deployments..

However, the difficulty encountered with this "cross training" concept is that personnel must be taken from the other specialties to operate in a specific specialty when the workload requires it. It might be justifiable to postpone some preventive medicine or other laboratory services for a short period of time due to the immediate priority of another service. The reality of day-to-day operations requires every unit to prioritize to efficiently use its resources for any mission or task. Yet, there is the danger of becoming rapidly overwhelmed because of the sudden influx of requests or requirements for support with multiple mission essential services of equal importance. This potentially results in more man-hours than the available manpower can provide. Therefore, efficient deployment information and planning is essential.

The second basic concept is regarding the determination of threat conditions.

Fewer personnel are required when threat conditions are low or the theater of operations is relatively small. Conversely, as the threat condition rises and/or the theater size increases, so does the need to augment units with additional personnel for support. Threat conditions not only need to consider the actual probability of an attack or industrial accident, but the theater area where the deployment is to take place. Logically, the greater the threat, the greater the man-hours needed to respond to a crisis or its consequence. Likewise, the larger the theater, the greater the response time in conjunction with the larger numbers of sites an incident could occur. Possibly the customer base requiring services could expand. Theoretically, these conditions would increase the man-hours needed to respond theater wide, because recovery time transiting to and from the incident location would have to be considered, especially if some of the personnel required for incident response were conducting routine services in other areas in theater. In an environment such as post-Hurricane Mitch Relief of 1998, Venezuela Disaster Relief of 1999-2000, or with the U.S. nation-building in Haiti, the FDPMU detachment would be ideal. It is small enough to cover a broad number of services, each requiring a limited number of man-hours small enough to allow for personnel to assist in other areas when needed. However, this would not be the case for a Bosnia type scenario, where it is the opinion of the author that personnel augmentation or the deployment of additional preventive medicine detachments would be required.

In a low threat environment with a deployment population size of 20,000 or less, and a theater size conducive to that size deployment, it is the opinion of the author that the twelve-member FDPMU detachment would be adequate. This opinion is derived through the comparison of support capabilities of units utilized in this study. Likewise, it

takes into consideration the extensive universal preventive medicine and medical training Navy Preventive Medicine Technicians receive, allowing for one person to conduct tasks that other services require from four persons.

Recommendations

During the process of researching this thesis, the author discovered that in spite of the great distance DOD has come towards joint interoperability, there are still great distances to go. Part of problem is derived from the lack of standardization as DOD moves to Off-the-Shelf technology from numerous resources. Training is often required for each of the various pieces of equipment, making the ability to mix and match specialties more difficult. What's more, the theater of operations and the need to standardize in all those theaters can be difficult because the commonalties are so far between. This can be true geographically and intra-service, considering the shipboard environment to that of the Seabee or Marine field environment.

The Navy, or maybe through a joint venture DOD, needs to accurately calculate the actual number of hours needed for each specific task to determine realistic manning requirements. This also needs to consider the various threat levels or potential workloads produced by the customer base being served. For example, how many samples would a typical NBC reconnaissance platoon be able to produce during a twenty-four hour or seventy-two hour period? Without clearly considering exactly whom the customer base might include and how many samples they could produce, it is difficult to realistically estimate more correctly the true manning requirements for any scenario. Although Navy preventive medicine has a strong historical experience base to rely on, it is often restricted to the naval services, with joint experience slowly developing.

The services need consistently to compose in a language with definitions that all can understand. This includes answering or addressing the same universal concerns in a manner that allows for comparison. Although we are moving toward that common goal, it is still not achieved.

Questions For Further Study

The following questions arose during this study and are provided for considerations in future studies.

1. With the rapid advancements of technology making equipment smaller and more diverse, what is the feasibility of NBC reconnaissance companies and chemical company (biological detection) units expanding to include hazardous materials contamination detection and identification? Of possibly combining capabilities of the NBC reconnaissance companies and chemical companies (biological detection) units as the preventive medicine (entomology) and preventive medicine (sanitation) detachments have been combined?

2. Regarding the medical units and specialties within the detection, analysis, consultation arena, what is the joint interoperability of the personnel and their specialties?

3. What impact will civilian contract and national guard personnel have on supporting future Off Continental U.S. (OCONUS) operations?

4. Although not directly related to this study, this issue arose during the course of research. Regarding the consequence management of patients on the battlefield, helicopter transport of patients is the only air transportation available for the U.S. Navy combat or hospital ships. The Army has no certification program for shipboard landings for patient evacuation to the rear. This was an issue during Operation URGENT FURY,

the Grenada Rescue Operation, when Army helicopters had to conduct medical evacuations to U.S. naval ships.[2] How will this impact Army patient evacuation in a theater of operations where hospital ships are a primary echelon care III facility? Should the Army consider adding this certification to their training program?

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[1]Forrest C. Pogue, *George C. Marshall: Organizer of Victory* (New York: The Viking Press, 1973), 458.

[2]Ronald H. Cole, "Assessment of URGENT FURY," as quoted in *Joint Force Command: Syllabus/Book of Readings for Course A534*, ed. Stephen D. Coats (Fort Leavenworth: U.S. Army Command And General Staff College, 2000), M5-5-2.

3

GLOSSERY

Active Defense - In a hostile CBRE environment, it is "the state of operating in a BW defensive posture while prosecuting the operational and tactical offense. It includes knowledge, dispersal, detection, protection (individual and unit), … ensuring contamination avoidance…and rapid decontamination."[1]

Asymmetrical Threat - Threats that strike in a manner or against a target that is unprepared. A threat with no perceived boundaries, lines of contact or forward edge of battle, as demonstrated by terrorism, or internet viruses.

Cold Zone - The area outside the warm zone.[2]

Consequence Management - The "measures to protect public health and safety, restore essential governmental services, and provide emergency relief to governments, businesses, and individuals affected by the consequences"[3] of disasters, either man made or natural.

Contamination - "The deposit, absorption, or adsorption of radioactive material, or of biological, chemical agents," or industrial chemicals or toxins, "on or by structures, areas, personnel, or objects."[4]

Crisis Management - Largely a law enforcement response, it "refers to measures to identify, acquire, and plan the use of resources needed to anticipate, prevent, and/or resolve a threat or act of terrorism."[5]

Detection - The determination of the presence of an agent[6] by use of chemical, biological or nuclear/radiological (CBN-RE) detectors the location of chemical, biological or nuclear/radiological contamination or hazards.[7]

Homeland Defense - Also known as Homeland Security. It encompasses "protecting our territory, population, and infrastructure at home by deterring and defending against all threats to US sovereignty; supporting civil authorities in crisis and consequence management; and helping to ensure the availability, integrity, survivability, and adequacy of critical national assets."[8]

Hot Zone - 1) An area that contains lethal, infectious biological,[9] chemical, or radiological agents or contaminants. 2) The incident site and surrounding contaminated areas.[10]

Identification - The positive verification of the presence of a CBRE agent.[11] This term can be further subdivided into two definitions:

Classification - "The determination that a compound or organism is a member of a chemical or biological class without knowing the exact identity of the compound or organism."[12]

Definitive identification - "The determination of the exact identity of a compound or organism through the establishment of a group of unique characteristics."[13]

Medical Threat - "A collective term used to designate all potential or continuing enemy actions and environmental situations that could adversely affect the combat effectiveness of friendly forces, to include wound, injuries, or sickness incurred while engaged in a joint operation."[14]

Monitor - The act of detecting the presence of CBN-RE agents or hazards with the use of equipment or indicators.[15] Monitoring can be a continuous process used as early warning indicators of agents employed in a hostile environment where there is a high CBN-RE threat and when evaluating an area for the presence of agents or hazards.

Passive Defense - In a hostile CBRE environment, it includes the capabilities to provide protection against effects of an attack. It includes "contamination avoidance (reconnaissance, detection, and warning), force protection (individual and collective) and decontamination."[16]

Sample - The act of securing "a specimen which reflects as closely as possible the state of the original material, ideally including its viability."[17] Samples are collected as evidence of crime scenes and to be taken back to qualified laboratories for confirmation.

Warm Zone - A designated area surrounding the hot zone used to triage and decontaminate people exiting the contaminated area.[18]

WMD - Weapons of Mass Destruction: "Title 18, U.S.C. 2332a, defines a weapon of mass destruction as (1) any destructive device as defined in section 921 of this title, [which reads] any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more that one-quarter ounce, mine or device similar to the above; (2) poison gas; (3) any weapon involving a disease organism; or (4) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life."[19]

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[1]Raymond Shelton, "No Democracy Can Feel Secure," *US Naval Institute Proceeding* (August 1998): 40.

[2]Ken Wilson "Chemical Biological Incident Response Force," Marine Corps Tactical Systems Support Activity Webpage, 1. Available at http://www.mctssa.usmc. mil/Csd/Projects/cbirf.htm; accessed on 30 January 2001.

[3]William W. Mendel, "Military Support for Consequence Management" (Fort Leavenworth: Center for Army Lessons Learned, Foreign Military Studies Office, 1999): 20.

[4]U.S. Marine Corps, *Marine Corp Warfighting Publication (MCWP) 3-37* (Washington, DC: Headquarters U. S. Marine Corps, September 1998), E-6.

[5]Mendel, 20.

[6]FM 3-9, 107.

[7]FM 3-100, Glossery-2.

[8]U.S. Army Training and Doctrine Command, White Paper, *Supporting Homeland Defense*, May 1999 [document on-line]; available at Http://www.fas.org/ spp/starwars/program/homeland/final-white-paper.htm; accessed on 19 October 2000.

[9]Defense Special Weapons Agency Publication DSWA-AR-40H, *Weapons of Mass Destruction Terms Handbook* (Alexandria,VA: Defense Special Weapons Agency, June 1998), 12.

[10]Wilson, 1.

[11]FM 3-100, Glossery-4.

[12]FM 3-9, 109.

[13]Ibid.

[14]U.S. Joint Chiefs of Staff, Joint Publication 4-02, *Doctrine for Health Service Support in Joint Operations*, (Washington DC: U.S. Joint Chiefs of Staff, April, 1995), II-2.

[15]FM 3-9, 110.

[16]Shelton, 41.

[17]FM 8-9, 4-3.

[18]Wilson, 1.

[19]Federal Emergency Management Agency (FEMA), *Terrorism Incident Annex*, FEMA Webpage 1999 [document on-line]; available on http://www.fema.gov/r-n-r/frp/frpterr.htm; Internet; accessed on 26 September 2000.
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