Chapter 3

SAFETY AND OCCUPATIONAL HEALTH PROGRAMS FOR THE US NAVY AND US MARINE CORPS

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INTRODUCTION

The primary mission of the Department of the Navy (DoN) safety and occupational health (SOH) program is to provide US Navy (USN) and US Marine Corps (USMC) active duty personnel and civilian employees a safe and healthy workplace. The Navy SOH program and Marine Corps safety program comprise the DoN SOH program for all military and civil service personnel, although uniquely military operations require flexibility in implementation of medical surveillance requirements for operational forces. The programs include medical surveillance of personnel in military-unique environments, foreign nationals under status of forces agreements, and contract workers with occupational and environmental medicine (OEM) services in their contacts. This chapter provides an overview of the scope and organization of Navy SOH programs and the role of Navy medicine support of these programs in the USN and USMC. More complete details can be found in the *Navy Occupational and Environmental Medicine Field Operations Manual*.[1]

ORGANIZATION OF THE DEPARTMENT OF THE NAVY AND NAVY MEDICINE

The DoN differs from other military departments in that it consists of two distinct military services (the USN and the USMC) that jointly report to the civilian secretary of the Navy. DoN has several principal components: the operating forces of the USN (referred to as the "Fleet") and the USMC (referred to as the "Fleet Marine Force"), the USN and USMC reserve components, and, in time of war, the US Coast Guard (currently a component of the US Department of Homeland Security); the shore establishment, which provides support to the operating forces; and executive offices known as the Navy Department (Figure 3-1).

The Navy Bureau of Medicine and Surgery (BUMED) is a shore establishment command reporting directly to the chief of naval operations (CNO) as the echelon one commander (ie, BUMED is an echelon two command). The surgeon general of the Navy, a three-star flag officer, serves as chief of the BUMED, and in this role provides oversight on direct and indirect systems providing health services to all USN personnel, USMC personnel (in conjunction with the medical officer of the Marine Corps, a Navy rear admiral Medical Department officer), and other beneficiaries.[2,3] The Navy surgeon general has direct authority over shore-based medical assets (which are under two echelon three regional commands, Navy Medicine East and Navy Medicine West). The Navy and Marine Corps Public Health Center (NMCPHC) falls under Navy Medicine East as an echelon four command. The regional commanders direct the military medical treatment facilities (MTFs), which range in size from large tertiary care medical centers to small ambulatory care clinics.[3] Navy Medicine East is headquartered in Portsmouth, Virginia, and the headquarters for Navy Medicine West is in San Diego, California. Exhibits 3-1 and 3-2 list the MTFs in each region.

The role of the regional commands is to support the MTFs in the delivery of world-class healthcare to active duty personnel, their dependents, retirees, and other beneficiaries. Regional experts determine proper staffing, as well as the equitable distribution of fiscal resources. The regional commands serve as a conduit to funnel information down from BUMED and a channel to raise concerns up from the MTFs to the attention of BUMED.[3]

The MTFs provide medical care, including OEM, audiology, and industrial hygiene services, to employees of the shore establishment as well as to the operating forces when in port, as needed. The Navy currently has two tertiary care medical centers: Naval Medical

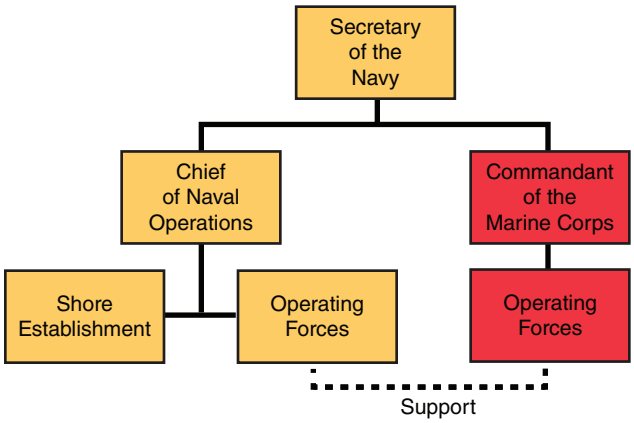

Figure 3-1. Department of the Navy organization. The US Navy was founded on October 13, 1775, and the Department of the Navy was established on April 30, 1798. There are three principal components: (1) the Navy Department, consisting of executive offices mostly in Washington, DC; (2) the operating forces, including the Marine Corps, the reserve components, and, in time of war, the US Coast Guard (in peacetime, the Coast Guard is a component of the Department of Homeland Security); and (3) the shore establishment. The dashed line marked "Support" indicates the cooperative relationship of the Navy-Marine Corps team, in which each of the operating forces supports the other.
Adapted from: http://www.navy.mil/navydata/organization/org-over.asp.

EXHIBIT 3-1

NAVAL MEDICAL TREATMENT FACILITIES IN NAVY MEDICINE EAST AREA OF RESPONSIBILITY

- Naval Medical Center Portsmouth, Portsmouth, Virginia
- Naval Hospital Beaufort, Beaufort, South Carolina
- Naval Hospital Camp Lejeune, Camp Lejeune, North Carolina
- US Naval Hospital Guantanamo Bay, Guantanamo Bay, Cuba
- Naval Hospital Jacksonville, Jacksonville, Florida
- US Naval Hospital Naples, Naples, Italy
- Naval Hospital Pensacola, Pensacola, Florida
- US Naval Hospital Rota, Rota, Cádiz, Spain
- US Naval Hospital Sigonella, Sigonella, Italy
- Captain James A. Lovell Federal Health Care Center, Great Lakes, Illinois
- Naval Health Clinic Annapolis, Annapolis, Maryland
- Naval Health Clinic Charleston, North Charleston, South Carolina
- Naval Health Clinic Cherry Point, Cherry Point, North Carolina
- Naval Health Clinic Corpus Christi, Corpus Christi, Texas
- Naval Health Clinic New England, Newport, Rhode Island
- Naval Health Clinic Patuxent River, Patuxent River, Maryland
- Naval Health Clinic Quantico, Quantico, Virginia
- 2nd Dental Battalion, Camp Lejeune, North Carolina

Center (NMC) Portsmouth on the Atlantic coast and NMC San Diego on the Pacific coast. Both facilities offer the full range of specialty care, including both inpatient and outpatient services. In 2011, as directed by the 2005 Base Realignment and Closure Commission, the National Naval Medical Center was merged with Walter Reed Army Medical Center to form the joint Walter Reed National Military Medical Center (WRNMMC) in Bethesda, Maryland, reporting to the newly created Defense Health Agency. WRNMMC remains a world-class tertiary care medical center, serving uniformed and civilian beneficiaries from all services.[4]

The Navy's community hospitals are staffed by dedicated professionals and support staff who understand the unique needs of military members and their

EXHIBIT 3-2

NAVAL MILITARY TREATMENT FACILITIES IN NAVY MEDICINE WEST AREA OF RESPONSIBILITY

- Naval Medical Center, San Diego, California
- Naval Hospital Bremerton, Bremerton, Washington
- Naval Hospital Camp Pendleton, Camp Pendleton, California
- Naval Health Clinic, Lemoore, California
- Naval Hospital Oak Harbor, Oak Harbor, Washington
- Naval Hospital Twenty-nine Palms, Twenty-nine Palms, California
- US Naval Hospital Guam, Agana Heights, Guam
- US Naval Hospital Okinawa, Okinawa, Japan
- US Naval Hospital Yokosuka, Yokosuka, Japan
- Naval Health Clinic Hawaii, Pearl Harbor, Hawaii
- 1st Dental Battalion, Camp Pendleton, California
- 3rd Dental Battalion, Okinawa, Japan

families throughout the world. In addition, more than 100 Naval health clinics and smaller branch health clinics are located on or near Navy bases worldwide.[5] These ambulatory clinics provide primary care, along with limited specialty care, and refer patients to the larger hospitals and medical centers or to the Tricare network when inpatient or additional specialty care is needed.

Front-line medical support of the operating forces is provided by Navy medical personnel assigned to units of USN and USMC operating forces, as well as by field activities of the NMCPHC (Figures 3-2 through 3-5).

A BRIEF HISTORY OF NAVY PREVENTIVE MEDICINE AND OCCUPATIONAL HEALTH AT THE DECK PLATE AND IN THE FIELD

Before World War II, USN Medical Department personnel serving on Navy ships and at shore stations with the US Marines carried out preventive medicine programs based on service guidance from BUMED.[6] By 1942, in the South Pacific area of operations, disease nonbattle injuries due to malaria and other infectious diseases accounted for greater losses than combat injuries.[7,8] In response, the US Army and Navy developed disease control teams comprised of malariologists, entomologists, and parasitologists working with Navy corpsmen to provide direct support to US and allied forces in theater at the unit level.[7,9] For example, detachments of the Malaria and Epidemic Control Organization, known as epidemiology units, evaluated areas with high rates of preventable illnesses such as malaria among deployed troops, decreasing the incidence of communicable diseases in these areas throughout the remainder of the war.[7,8] Of the 122 epidemiology units existing at the conclusion of World War II, all but six were disbanded by 1949. The six remaining units were renamed epidemic disease control units, and were tasked with providing technical assistance to commands to prevent epidemic disease conditions.[6]

During the Korean War, a renewed focus on preventive medicine became necessary.[9] The Navy organized two shipboard mobile units to provide preventive medicine in forward areas. Known as fleet epidemic disease control units (FEDCUs), these teams studied and controlled communicable diseases among both United Nations forces and prisoners of war. Due to difficulty in mobilizing the FEDCUs, the units evolved from shipboard to air-transported teams. In 1952 their mission was changed to "preventing or controlling health problems of naval importance due to biological, physical, chemical or other causes."[6] In March

Figure 3-2. USS *Constitution*'s 1812 Marine Guard fire vintage Springfield flintlock muskets during the "Constitution Day Cruise" while the ship is underway. Boston, Massachusetts, June 23, 2006. US Navy photo by Airman Nick Lyman.
Reproduced from: http://www.navy.mil/view_image.asp?id=36221.

Figure 3-3. "The US Marine Corps War Memorial. The Marine Corps War Memorial stands as a symbol of this grateful Nation's esteem for the honored dead of the US Marine Corps. While the statue depicts one of the most iconic photos of World War II, the memorial is dedicated to all Marines who have given their lives in the defense of the United States, since 1775." Located in Arlington, Virginia, the statue depicts five Marines and a Navy corpsman raising a visible flag on February 23, 1945, during the battle on the Japanese island of Iwo Jima. This memorial represents the honor, courage, and commitment of the US Marines and the Navy Medical Department personnel, who provide worldwide support to the Marine Corps. US Navy photo.
Reproduced from: http://www.navy.mil/management/photodb/photos/040709-N-0295M-001.jpg.

Figure 3-4. The US Navy and Marine Corps project the influence of the United States by having ready naval forces worldwide at sea at all times. US Navy photo by Photographer's Mate 2nd Class Daniel J. McLain.
Reproduced from: http://www.navy.mil/management/photodb/photos/150415-N-SF984-096.JPG.

1953, the units were redesignated as USN preventive medicine units (PMUs). In 1957, the PMUs were assigned more specialized and technical services: four PMUs were assigned to provide direct fleet support and two were designated as disease vector control centers (DVCCs), located in Jacksonville, Florida, and Alameda, California.[9] In 1971, the PMUs became Navy environmental and preventive medicine units (NEPMUs), with expanded fleet support services in industrial hygiene and occupational health.[5] At the same time, the DVCCs were redesignated as disease vector ecology control centers (DVECCs).[9]

In the early 20th century, Navy medicine also provided groundbreaking occupational medicine support to military aviation and submariners. In 1923 a Naval medical officer assigned to the Boston Navy Yard attended 1 year of occupational health training at Harvard University. This was a landmark in military occupational medicine.[10] A specific division of industrial medicine was first set up at BUMED in 1941, and

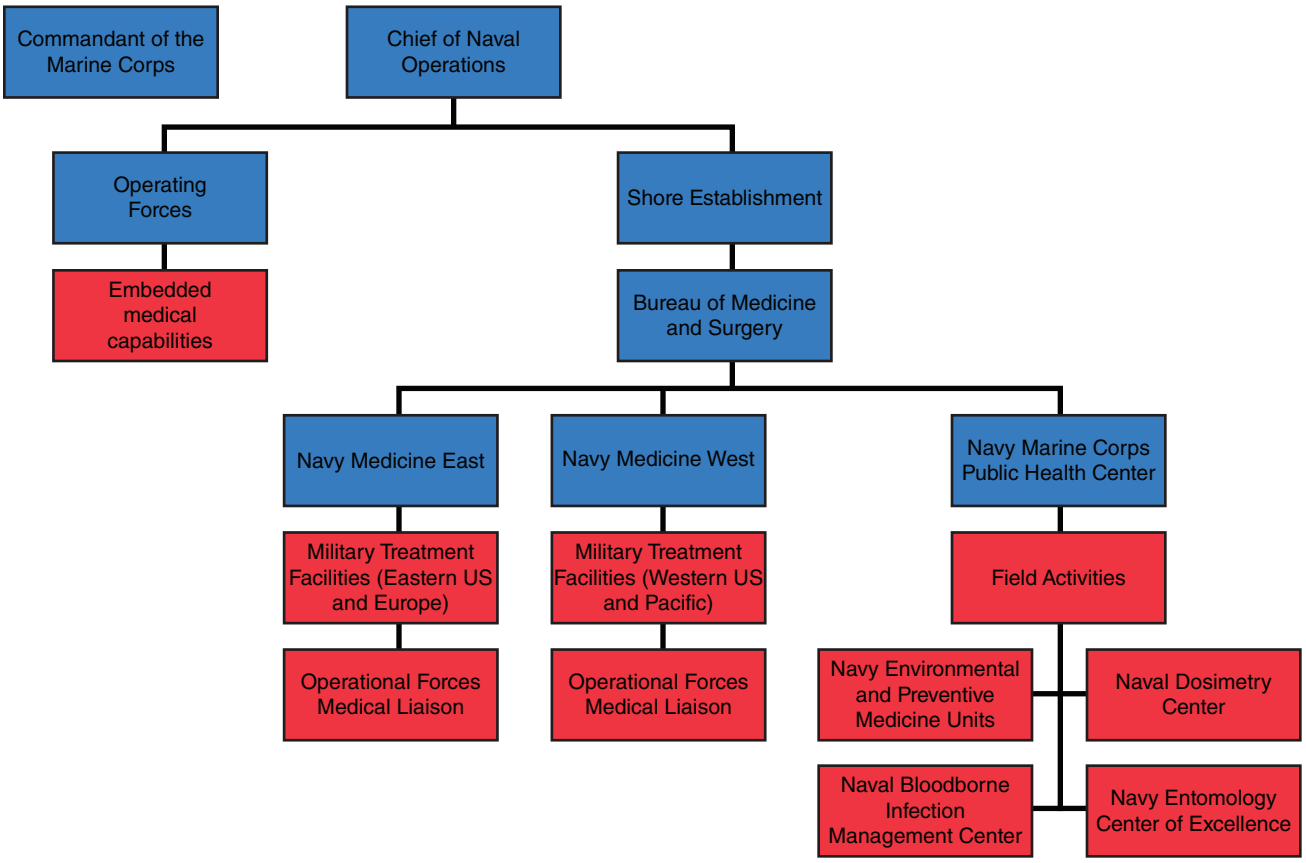

Figure 3-5. Organization of the Navy Medical Department.
Data source: Navy Bureau of Medicine and Surgery. *Chief, Bureau of Medicine and Surgery Organization*. Falls Church, VA: Department of the Navy; December 22, 2016. BUMEDINST 5450.165C. http://www.med.navy.mil/directives/ExternalDirectives/5450.165C.pdf. Accessed October 12, 2017.

Figure 3-6. An industrial hygiene officer assigned to Navy Environmental and Preventative Medicine Unit Six (NEPMU-6) tests an air sample for contaminants. US Navy photo by Journalist 2nd Class Ryan C. McGinley. Reproduced from: http://www.navy.mil/management/photodb/photos/060207-N-3019M-003.jpg.

in the first 2 years more than 50 Naval medical officers completed post-medical degree certification programs in industrial hygiene (Figure 3-6).[11] By 1947, the Navy Medical Service Corps had been formed. The Medical Service Corps now has commissioned officer SOH specialists such as audiologists, entomologists, environmental health specialists, and industrial hygienists, among 11 allied health disciplines.[12]

The birth of a comprehensive Navy occupational health program occurred at a Naval Bureau of Weapons facility in Crane, Indiana, in 1964.[13] The need for a comprehensive occupational health program for Navy line and medical commands had become apparent, and the senior medical officer at this facility was tasked with providing consultative support for all Naval weapons facilities worldwide. The concept of establishing a single Navy consultative center for occupational health soon gained support. Through a series of organizational consolidations and relocations, the center moved from Crane, Indiana, to Cincinnati, Ohio, and then to Norfolk, Virginia. By 1978, the Navy Environmental Health Center (NEHC) had evolved into the focal point for the development of BUMED occupational health program consultation and guidance. The move closer to the large concentration of Fleet and the Fleet Marine Force personnel and commands in Tidewater, Virginia, reflected NEHC's increasing worldwide responsibilities, including the Navy SOH inspection program, analytic laboratory services, radiation health program support, hazardous materials identification, asbestos hazard control, and hearing conservation programs.[13]

Figure 3-7. Commander Richard Maiello, an industrial hygienist attached to the Forward Deployed Preventive Medicine Unit Seven (FDPMU-7), conducts training on the Chemical Volatile Organic Compound Unit, which is used to screen soil, water, and air for the detection of toxic materials such as chemical, biological, and radiological agents. US Navy photo by Photographer's Mate 2nd Class Steven P. Smith. Reproduced from: http://www.navy.mil/view_image.asp?id=36275

NEHC assumed command and control of the four NEPMUs and the two DVECCs in March 1981, further expanding its mission to include preventive medicine.[6,13] The scope of NEPMU services likewise had expanded from epidemiology and infectious disease control to include industrial hygiene, consolidated industrial hygiene laboratories, environmental health, and deployable multidisciplinary teams, referred to as forward deployable preventive medicine units (FDPMUs; Figure 3-7). FDPMUs were based on the success of prototypes fielded in 1990–1991, during the Persian Gulf War. The current locations of the four NEPMUs are Rota, Spain; Norfolk, Virginia; San Diego, California; and Pearl Harbor, Hawaii. The Navy Entomology Center of Excellence (NECE) is located in Jacksonville, Florida. Both the FDPMUs and the NECE deploying units served with distinction while providing forward support in both the Iraq and Afghanistan conflicts.

With increasing recognition of the need for USN/USMC-wide guidance on wellness, preventive behavioral health, and physical fitness, these programs were consolidated at NEHC in the 1990s. NEHC moved to its current location on the grounds of the Naval Medical Center, Portsmouth, Virginia, in 2002, and was renamed the NMCPHC in 2007 to reflect the worldwide need and focus of SOH and preventive medicine programs for both the USN and USMC.[13]

CURRENT STRATEGIC-LEVEL SAFETY AND OCCUPATIONAL HEALTH RESPONSIBILITIES

The assistant secretary of the Navy for energy, installations, and environment is the designated agency SOH officer for the DoN. Implementation of SOH programs is delegated to the deputy assistant secretary of the Navy for safety. The overarching principles of aggressive and comprehensive leadership involvement, personal responsibility on and off duty, worksite analysis, operational risk management, medical surveillance, certification, and training are emphasized as part of the secretary of the Navy implementation policy.[14] A commitment to safety and occupational health for every individual throughout the DoN chain of command is considered the foundation of safe and healthful working conditions. The DoN SOH program's organizational structure and chain of command reflects the complexity and wide range of USN and USMC missions.

Echelon one commanders (the CNO and the commandant of the Marine Corps [CMC]) issue SOH policy, guidance, and standards that meet or exceed the requirements of Department of Defense instructions (DODIs) pertaining to SOH, including DODI 6055.1, *DoD Safety and Occupational Health (SOH) Program*,[15] and DODI 6055.05, *Occupational and Environmental Health (OEH)*.[16] Naval SOH subject matter expertise is provided to both the CMC and CNO by the commander of the Naval Safety Center in Norfolk, Virginia, who also serves as the CNO's special assistant for safety matters and is responsible for program sponsorship of occupational health Navy-wide.[14,17] Additionally, the Navy surgeon general serves as the principal advisor to the CNO on the provision of centralized, coordinated policy, guidance, and professional advice on health service programs for DoN, including occupational health services (the medical officer of the Marine Corps, a one-star Navy medical flag officer, is the principal health services policy advisor to the CMC, as described previously).[3]

For SOH matters of mutual interest, policy is issued jointly by the USN and USMC to ensure uniformity (eg, *Mishap Investigation, Reporting and Record Keeping*, which is both Chief of Naval Operations Instruction [OPNAVINST] 5102.1 and Marine Corps Order [MCO] P5102.1).[18] For SOH program requirements unique to the mission of the two services, the services issue service-specific policies.[14]

The Naval Safety Center commander is the SOH program sponsor. While primarily responsible to the CNO and secretary of the Navy for compliance with DODI 6055.1[15] and 6055.05,[16] both ashore and afloat, certain areas of SOH policy are governed by specialty components. A complete listing of specialty subject matter responsibility is found in Appendix 2A of the *Navy Safety and Occupational Health Program Manual*,[17] and examples are listed in Exhibit 3-3.

Echelon two commands each create and maintain SOH instructions for guidance to their subordinate commands. These instructions "shall emphasize known significant occupational health problems"[17] through their respective design, engineering, maintenance, supply, facilities and training cycles. In the Navy, the accountability and inspection process is split between the Naval inspector general, for shore-based commands, and the Board of Inspection and Survey, for forces afloat. The Naval Safety Center commander and BUMED are further tasked with providing subject matter expertise to all other USN and USMC echelon two commands in the areas of safety and health, respectively.

EXHIBIT 3-3

CHIEF OF NAVAL OPERATIONS STAFF RESPONSIBILITIES FOR OPERATIONAL UNIT SAFETY POLICY

Staff Code	Area of Responsibility
N85	Expeditionary warfare: parachute, diving, and air drop safety, assigned ships and small craft.
N86	Surface warfare: assigned surface ships.
N87	Submarine warfare: submarines, assigned surface ships, deep submergence systems, and diving.
N09F	Naval aviation safety (aircraft-specific policies are at lower level). The Commander, Naval Air Forces, is responsible for safety of assigned ships (ie, aircraft carriers).
N00N	Nuclear propulsion program safety: reactor and associated Naval nuclear propulsion plants and radioactivity.
N09F	Shore safety.
N41	Conventional explosive safety.
N46	Nuclear explosive safety.

LAWS, REGULATIONS, AND GUIDANCE

Executive Order 12196 approves alternate SOH standards for the Department of Defense (DoD) based on performance of military and uniquely military duties.[19] Overarching guidance and standards for the DoN SOH programs are provided by three DoN directive series, OPNAVINST 5100.23 for USN forces ashore,[17] OPNAVINST 5100.19 for forces afloat,[20] and MCO 5100.19 for USMC forces.[21] Additional Navy instructions provide amplifying guidance for specific programs (eg, the *Navy Radiation Health Protection Manual*).[22] When DoN standards are not in conformance with the most recent Occupational Safety and Health Administration (OSHA) standards, the current OSHA standards are used as interim guidance until new DoN standards can be developed and issued. Other nationally recognized sources of SOH guidance, such as the American Conference of Governmental Industrial Hygienists and the American National Standards Institute, are also considered when evaluating workplaces. The Office of Personnel Management sets medical qualification requirements for federal civilian employees in certain positions, and other federal agencies, such as the Department of Transportation, may specify physical examination requirements and standards for personnel performing specific transportation duties.

ORGANIZATION AND STAFFING OF MARINE CORPS SAFETY AND OCCUPATIONAL HEALTH PROGRAMS TODAY AND NAVY MEDICINE'S ROLE

USMC commands apply Public Law 91-596, the Occupational Safety and Health Act of 1970,[23] to all non–military-unique work environments per MCO 5100.29B.[24] A variety of published USMC orders provide procedures for safety and occupational health officials and supervisory personnel (Exhibit 3-4). SOH training is integrated into programs and technical and tactical publications, with occupational medicine, industrial hygiene, and allied health professional support provided by Navy medical personnel assigned to both BUMED and operational units. Functionally, BUMED supports USMC SOH programs with the same process as Navy operational and shore commands. Occupational health medical specialists, technicians, nurses, and physicians are billeted primarily to fixed shore-based Navy medical clinics.

BUMED provides medical officers from all specialty backgrounds to meet the primary care and occupational health medical requirements at the unit level. Navy Medical Department industrial hygiene officers (IHOs) are assigned to various billets in the Fleet Marine Force to provide both safety and industrial hygiene program management and consultation services.

NMCPHC is the USN and USMC center for public health support, including epidemiology, exposure monitoring, and illness and injury tracking. Through its echelon four NEMPUs, NMCPHC provides health risk assessments and field operation support. As previously described, NMCPHC provides deployable public health specialty support through FDPMUs, consisting of the four NEPMUs and one NECE mobile unit.[13,25,26]

ORGANIZATION AND STAFFING OF NAVY SAFETY AND OCCUPATIONAL HEALTH PROGRAMS TODAY AND NAVY MEDICINE'S ROLE

The responsibility for conducting an integrated and aggressive SOH plan throughout the Navy is delegated to the level of commanding officers and officers in charge both at sea and ashore. They are responsible for ensuring the SOH program is robust and functioning at all levels of their command. Daily SOH operation and functions within Navy commands are facilitated by the three SOH specialized professional components: safety professionals, industrial hygienists, and occupational medicine providers.

Safety

Each Navy command assigns a safety officer accountable directly to the commanding officer for managing safety programs in compliance with the applicable shore or afloat instructions. Full-time safety professionals are required for every unit with more than 400 personnel. Smaller commands may assign the role as a collateral duty, or one full-time safety professional may provide services to two or more smaller commands. The OPNAVINST 5100.23 series[17] provides guidance on appropriate safety staff size for larger commands, and for shared safety professionals.

Safety functions are subdivided into two categories: mission safety and base operating support (BOS) safety. In 2003, Navy Installations Command was established as an echelon two command tasked and funded for providing BOS, including certain safety programs ashore such as traffic safety, recreation and off-duty safety, radiation safety, and explosives safety. BOS functions are those considered to be common to

EXHIBIT 3-4

US MARINE CORPS OCCUPATIONAL SAFETY AND HEALTH PROGRAM ORDERS AND OTHER APPLICABLE DIRECTIVES

Marine Corps Orders Series

- P5100.8, Marine Corps Ground Occupational Safety and Health Program
- 5100.29, Marine Corps Safety Program
- 3500.27, Marine Corps Operational Risk Management Program
- M5100.19, Marine Corps Traffic Safety Program
- P5102.1, Marine Corps Mishap Reporting Program
- 5100.30, Marine Corps Off-Duty and Recreation Safety Program
- 1553.3, Marine Corps Training Management
- 6200.1, Marine Corps Heat Injury Prevention Program
- 6260.1, Marine Corps Hearing Conservation Program
- P8020.10, Marine Corps Ammunition Management and Explosives Safety Policy Manual
- 5104.1, Navy Laser Hazard Control Program
- 5104.2, Marine Corps Radio Frequency Electromagnetic Field Personnel Protection Program
- 5104.3, Marine Corps Radiation Safety Program
- P11000.11, Marine Corps Fire Prevention
- 5100.32, Marine Corps Safety Awards Program
- P3570.1, Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat
- 5040.6, Marine Corps Inspections

Other Applicable Directives and Manuals

- Executive Order Executive Order 12196, 45 FR 12769, 3 CFR, Occupational safety and health programs for federal employees (1980)
- The Occupational Safety and Health Act of 1970 (Pub L 91-596, with amendments), Section 19, Federal Agency Safety Programs and Responsibilities
- *Navy Safety and Occupational Health Program Manual* (OPNAVINST 5100.23G)

Data source: Department of the Navy, US Marine Corps. Marine Corps commander's guide to safety. http://www.imef.marines.mil/Portals/68/Docs/IMEF/Safety/Marine%20Corps%20Commander's%20Guide%20to%20Safety%20(2).pdf. Accessed October 11, 2017.

the host installation or the base. Installation safety professionals manage these programs with input and support from tenant command safety professionals, who coordinate the program within their units. Line commands are supported by occupational medicine professionals through the establishment of periodic safety council meetings.

Mission safety relates specifically to the mission performed by the command. Echelon two commands receive separate funding for ensuring the safety of the unique and integral mission functions of their command. Mission safety examples for shore commands include Joint Commission compliance (BUMED), military construction and environmental clean-up (Naval Facilities Command), or ship maintenance work (Naval Sea Systems Command).

Based on this structure, Navy medicine regions and larger MTFs have full-time safety professionals whose primary focus is mission safety for BUMED commands. However, OEM and industrial hygiene specialists must work with safety professionals in all areas of the DoN to achieve the goal of providing a safe and healthy workplace for all DoN personnel.

Echelon two commands must inspect subordinate commands at least every 36 months, and supervisors and designated safety officials must inspect workspaces at least annually to ensure compliance with SOH policies.

Industrial Hygiene

Uniformed IHOs are Navy Medical Service Corps officers who are assigned to both USN and USMC line commands (ashore and afloat), as well as BUMED activities. Navy IHO billets afloat are primarily on larger ships such as aircraft carriers or large amphibious ships. Navy IHOs at operational units are often assigned as the command safety officer, and provide industrial hygiene services to their operational command (Figure 3-8). Industrial hygiene services ashore are provided by the MTFs, predominantly by civil service industrial hygienists who support installations,

tenant commands, facilities, shipyards, ranges, flight lines, and operational units and ships in port within the MTF's area of responsibility.[10] OPNAVINST 5100.23G[17] uses a formula based on the employee population and hazards of an area to estimate the number of industrial hygienists necessary to provide the required support.

Occupational and Environmental Medicine

Occupational healthcare for active duty service members ashore varies by location, provided either through a dedicated occupational health clinic or by a primary care provider. While at sea or deployed, most USN and USMC active duty service members receive occupational healthcare from primary care providers. Occupational health services rendered by the primary care provider include management of work-related illnesses and injuries, individual medical readiness, predeployment and postdeployment assessments and care, documentation of exposure monitoring, and limited duty determinations (Figure 3-9). Approximately 50 Medical Corps billets across the Navy are designated for physicians trained in OEM.[1] These billets are concentrated at MTFs supporting shore commands that perform shipbuilding or maintenance, at tertiary care medical centers, at BUMED Headquarters, and at NMCPHC. BUMED clinics rely heavily on civil service physicians trained or experienced in OEM, but are also staffed by general medical officers, primary care physicians, nurse practitioners, and physician assistants.

Occupational medicine specialty care providers at MTFs focus primarily on providing care to DoN civil service and contract workers. Occupational medicine care for active duty members assigned to shore duty is generally limited to specialty examinations for surveillance of specific work exposures. Occupational health clinics may also provide travel medicine, preventive medicine, and deployment or overseas duty screenings for civil service workers and active duty personnel. A few clinics also provide acute care for minor work-related injuries for civil service and eligible contractors. Occupational health program management responsibility lies with a civilian clinic nurse manager. The clinic nurse trains and oversees civilian occupational health technicians and general duty corps staff within the clinic and reports clinical operations and metrics to the echelon three Navy medicine region.

USN and USMC occupational health services for active duty personnel while deployed or assigned to a ship are provided by the assigned unit ("platform") primary care provider. Major hazard-specific elements of shipboard and deployed SOH prevention programs include asbestos management, heat stress management, hazardous material control and management, hearing and sight conservation, respiratory protection, electrical safety, radiation safety, gas-free engineering, lead control, tag-out (a procedure used to prevent injury while servicing equipment or machinery), and personal protective equipment.[20] Enrollment in medical surveillance programs is based primarily on the industrial hygiene survey. On submarines and small surface ships, the primary care provider is often an independent duty corpsman or medical department

Figure 3-8. Puget Sound, October 26, 2006. Lt Cmdr Paul Treadway, Industrial Hygiene Officer and Assistant Safety Officer of the Nimitz-class aircraft carrier USS *Abraham Lincoln* (CVN 72), uses a sound level meter to demonstrate the high decibel levels on *Lincoln*'s flag bridge as spaces are being rehabilitated. Treadway and other ship and shipyard safety personnel conduct daily safety walkthroughs throughout the ship to ensure sailors and workers are wearing proper personal protective equipment to protect against industrial hazards such as high noise levels. *Lincoln* is currently in dry dock at Puget Sound Naval Shipyard undergoing rehabilitation and maintenance as part of a dry dock planned incremental availability period. US Navy photo by Mass Communication Specialist Seaman James R. Evans (released). Navy photo ID: 061026-N-7981E-019.
Reproduced from: http://www.navy.mil/view_image.asp?id=40336.

Figure 3-9. *Civilian and Navy active duty members play and important role in the safety and occupational health programs serving the US Navy and Marine Corps.* Portsmouth, Virginia, June 5, 2014. Tarnisha Brown, a Navy Medicine audio technician working aboard a hearing conservation bus at Norfolk Naval Shipyard, and Hospital Corpsman 3rd Class James Champion, from Tuscaloosa, Alabama, demonstrates the proper use of hearing protection to sailors assigned to the aircraft carrier *Dwight D. Eisenhower* (CVN 69). *Dwight D. Eisenhower* is undergoing a scheduled docking planned incremental availability at Norfolk Naval Shipyard. US Navy photo by Mass Communication Specialist Seaman Wesley J. Breedlove (released). Navy photo ID: 40605-N-SR567-054. Reproduced from: http://www.navy.mil/view_image.asp?id=177253.

representative (a corpsman), while larger ships have general medical officers (post-internship physicians) and senior medical officers (usually post-residency physicians), as well as other specialists. Aircraft carrier senior medical officers must have completed a residency in aerospace medicine. The OPNAVINST 5100.19 series[20] provides detailed guidance for SOH programs aboard Navy vessels.

Audiology

Active duty and civil service audiologists serve worldwide at Navy MTFs, providing local and regional services for clinical consultations and programmatic requirements (eg, all US Marines require annual audiograms while on active duty because many personnel are exposed to high noise environments; Figure 3-10). Clinical audiology services such as diagnosis and rehabilitation of auditory and balance problems are offered at most Navy MTFs. In addition, many centers employ audiologists designated as either part-time or full-time occupational audiologists, specializing in hearing conservation program management as well as the determination of auditory fitness for duty. Currently, approximately 54 Navy audiologists specialize exclusively in occupational audiology; about half are active duty Navy Medical Service Corps officers and the others are DoN civil service personnel. They are located at medical centers, hospitals, and a few health clinics. Occupational audiologists serve at the NEPMUs in Norfolk and San Diego, one audiologist serves at the NMCPHC, and a uniformed audiology action officer is on the staff at BUMED. Audiologists also serve as regional subject matter experts (SMEs) and consultants at the two Navy regional medical commands, as described below.

Consultative Support and Oversight

In addition to the larger clinical care components at shore facilities, Navy medicine provides medical support, including OEM and industrial hygiene, for both services (see Figure 3-5). Both military and civil service safety and occupational health professionals serve on the DoN, CNO, and CMC staffs as well as at BUMED to develop policy for SOH and OEM programs.

Regional consultants support the SOH mission by providing technical assistance and oversight to the MTFs. These teams consist of four members including an occupational audiologist, an industrial hygienist, an

Figure 3-10. *The extremely close proximity to jet noise and the conflicting requirement to be in constant communication with a pilot attempting to land on an aircraft carrier at sea puts a Navy or Marine Corps landing signal officer at continuing risk of noise-induced hearing loss*. Pacific Ocean, August 6, 2003. Landing Signal Officer Brian Felloney helps guide the pilot of an F/A-18F Super Hornet assigned to the "Diamondbacks" of Strike Fighter Squadron One Zero Two (VFA-102) to land on the flight deck aboard USS *John C. Stennis* (CVN 74). Stennis is at sea conducting training exercises in the southern California operating area. US Navy photo by Photographer's Mate 2nd Class Jayme Pastoric (released). Navy photo ID: 030806-N-9769P-015.
Reproduced from: http://www.navy.mil/management/photodb/photos/030806-N-9769P-015.jpg.

occupational health nurse, and a safety specialist. All team members are experienced experts in their field, well versed in DOD, USN, and USMC instructions, guidelines, and directives that apply to their particular programs. These SMEs are available to answer policy questions and interpret guidelines, as well as to bring concerns from the field to BUMED when guidelines are ambiguous, outdated, or unclear.

Regional SOH experts also provide advice, technical reviews, and representation on working groups, as requested by BUMED or a higher authority. They encourage interdepartmental and intradepartmental communication, collaboration, and cooperation among all professional SOH disciplines. They are responsible for ensuring that required SOH training occurs, that effective mishap and incident reporting is accomplished, and that required medical surveillance and follow-up is performed in a timely fashion, using the appropriate reporting and management systems, including the Web-Enabled Safety System (WESS) and the Enterprise Safety Applications Management System (ESAMS).

The regional SOH team oversees implementation of these programs at the MTFs, providing both informal and formal program review. Team members provide three types of visits:

1. **Assist visits.** Commands may request an assist visit for specific training, to review an entire program, to review part of a particular program, or even to review a single process. The SME's resulting report is seen only by the commanding officer of the requesting command unless the command chooses to forward the report to the region.
2. **Oversight visits**. Regional SMEs are not required by any regulation to perform oversight visits, but may choose to do them periodically depending on available resources. A variety of tools such as checklists may be used to review compliance with SOH programs. A report of the findings is provided to the site's commanding officer.
3. **Safety and occupational health management evaluations**. The BUMED instruction (BUMEDINST) 5100.13 series[27] requires formal compliance inspections via SOH management evaluations. All SOH programs must undergo formal review every 3 years. Regional staff attempt to schedule SOH management evaluations at a reasonable time before an impending BUMED Medical Inspector General Inspection and Joint Commission Survey, in order to allow commands time to fix any discrepancies identified. Formal checklists are used to review program compliance; a formal report is sent from the region to BUMED, with a copy sent to the commanding officer of the inspected command.

EXAMPLES OF SAFETY AND OCCUPATIONAL HEALTH PROGRAM COMPONENTS AND RESOURCES

Navy and Marine Corps Public Health Center Technical Manuals

NMCPHC publishes an extensive series of technical manuals such as the *Navy Occupational Medicine Field Operations Manual*.[1] An implementation guide for professionals establishing a comprehensive OEM practice, this manual includes information on OEM practice including program elements, trend analysis, worksite visits, preplacement exams, medical surveillance, job certification, fitness-for-duty exams, treatment of work-related illnesses and injuries, health promotion, travel medicine, consultation to management and employees, risk communication, occupational safety and health education and training, employee counseling and referral to employee assistance programs, occupational health clinic staffing, and program assessment.[1] Other technical manuals focus on specific topics including hearing conservation, reproductive and developmental hazards, prevention of heat and cold stress injuries, and bloodborne pathogen exposure control.

Medical Surveillance and Certification Exams and the Medical Matrix

A core function of Navy OEM is performing medical surveillance and certification exams. Medical surveillance is performed to identify unexpectedly high levels of exposure or exposure-related health effects in time to protect the worker or the worker population. Certification exams are done to determine whether an employee is fit to perform the duties of the job. The NMCPHC OEM department publishes the *Medical Surveillance Procedures Manual and Medical Matrix*[28] as the authoritative guide for occupational medical surveillance and certification programs for the Navy. The Medical Matrix Validation Committee was tasked in March 1988 with designing a Navy program for hazard-based medical surveillance by developing a standard examination protocol presented in a useable format. Since the original manual was published in January 1989, the committee has continued to review existing programs

and write new programs as needed for stressors that may lead to chronic health effects. The medical matrix is divided into four sections: chemical stressors, physical stressors, mixed exposures, and specialty (or certification) exams. Each stressor program consists of the following information: medical history questions (personal and occupational), recommended laboratory and ancillary tests, areas of physical exam focus, program-specific special requirements, and a program description including references.

Hearing Conservation Program

Federal hospital services for veterans were consolidated after the First World War into the Veterans Bureau. Auditory injury, including both tinnitus and hearing loss, has been the most prevalent compensated disability from the advent of the Veterans Administration (VA) in World War II through today.[29,30] Even when considered independently, tinnitus and hearing loss are the two most prevalent compensated VA disabilities, according to the Department of Veterans Affairs Annual Benefits Report for fiscal year 2013, not only for new recipients, but also overall for all veterans, with a combined compensation cost of approximately $1.4 billion annually. The VA also buys over 600,000 hearing aids every year, representing nearly one-quarter of all US sales.[30]

Tinnitus and hearing loss are the top two disabilities during times of peace and war, indicating that noise is a problem not only in combat, but also in training and maintenance operations. Naval shipyards, ports, flight lines, surface ships, and submarines are full of noise-hazardous machines and operations that are loud enough to cause permanent hearing loss. Efforts to minimize noise exposure through engineering and administrative controls are not always feasible, either for economic or technological reasons, and the Navy is left with a workforce that must work in areas and perform operations that may be hazardous to their hearing health.

Hearing conservation is, by far, the Navy's largest medical surveillance program. While the program is typically managed by occupational audiologists who are usually located at the larger medical centers and hospitals, an effective hearing conservation program requires cooperation and teamwork from a number of related disciplines. Noise levels are measured by industrial hygienists. While abatement efforts remain the primary goal, it is not always feasible to engineer out noise, or to rotate schedules to minimize cumulative exposures. Employees who are exposed to hazardous levels of workplace noise are enrolled into the hearing conservation program, in which their hearing levels are monitored at least annually. When early changes are seen, follow-up care is provided to determine the nature and type of loss, as well as appropriate case management. Noise-exposed individuals are fit with hearing protective devices that are appropriate for their work environment, and trained in their care and use. Annual

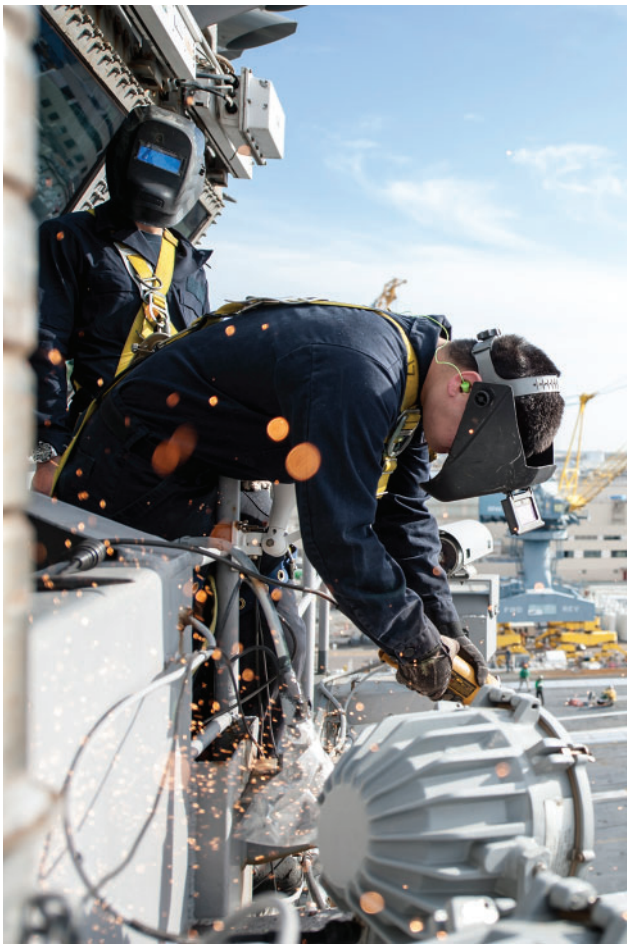

Figure 3-11. *The ocean maritime environment causes corrosion on ships that require constant attention. In this photograph active duty sailors involved in hull maintenance operations face ergonomic, noise, vibration, particulate, and fall hazards in their daily work*. Portsmouth, Virginia, April 6, 2015. Hull Maintenance Technician 2nd Class A. Lightfoot, right, and Hull Technician Fireman R. Beaver perform maintenance and upkeep above the bridge of the aircraft carrier USS *Harry S. Truman* (CVN 75). *Harry S. Truman* is undergoing a condensed incremental availability period at Norfolk Naval Shipyard while training and acquiring certifications required for its upcoming deployment scheduled for later this year. US Navy photo by Mass Communication Specialist Seaman M. Gillan (released). Navy photo ID: 150406-N-MU551-134.
Reproduced from: http://www.navy.mil/view_image.asp?id=194427.

Figure 3-12. *Navy industrial processes such as a shipyard overhaul of ships and submarines require active engagement of all members of the Navy safety and occupational health team to ensure a safe and healthy workplace.* Bremerton, Washington, June 30, 2014. The guided-missile submarine USS *Ohio* (SSGN 726) arrives at Puget Sound Naval Shipyard and Intermediate Maintenance Facility for a scheduled major maintenance period. The shipyard and maintenance facility is one of four public shipyards that play a major role in maintaining America's fleet and providing wartime surge capability to keep the nation's ships ready for combat. US Navy photo by Jason Kaye (released). Navy photo ID: 140630-N-IZ282-005.
Reproduced from: http://www.navy.mil/local/PSNS/.

Figure 3-13. *US Marine tactical and ground support vehicles are painted with a chemical agent resistance coating that contains isocyanate paint. Corrosion control involves washing vehicles such as depicted here and special corrosion control teams that paint vehicles periodically in spray booths and in temporary work locations to control corrosion as it occurs. Operations like this may require an industrial hygiene evaluation and monitoring, audiometric field testing, and respiratory protection*. Twenty-nine Palms, California. A 3rd Light Armored Reconnaissance Battalion Marine cleans off excess dirt from a light-armored vehicle equipped with a new anti-tank weapons system at the 3rd LAR ramp prior to operational testing on range 500 aboard the Combat Center, February 10, 2015. 3rd LAR has been training alongside 1st Tank Battalion and 1st LAR during operational testing of the new system. Official Marine Corps photo by Lance Cpl Medina Ayala-Lo (released).
Reproduced from: http://media.dma.mil/2015/Mar/02/2001019041/-1/-1/0/150210-M-RO214-648.JPG

training also covers the hazards of noise exposure, the nature of the hearing conservation program, and on- and off-duty practices that may minimize the possibility of hearing loss. Occupational health, audiology, industrial hygiene, and safety personnel all work in conjunction with worksite supervisors and noise-exposed employees to prevent the development of occupational hearing loss (see Figures 3-9 and 3-10). Early intervention and appropriate case management are key to preventing further hearing loss for the identified workers and their coworkers with similar noise exposures.

Audiometric data is collected via the Defense Occupational and Environmental Health Readiness System–Hearing Conservation module, which includes a DoD-wide data repository for all noise-exposed individuals. Computerization of the database facilitates management of this comprehensive program, allowing program managers to track important metrics such as compliance with annual audiometric testing and rates of abnormal exams indicating hearing loss, which facilitates early and focused intervention as well as optimal use of limited resources.

The Navy's hearing conservation program is guided by not only the OSHA law (29 CFR 1910.95),[31] but also by the relevant DoD and Navy instructions described previously.[15–17,20] In addition, the NMCPHC publishes a technical manual of program procedures,[28] and BUMED issues best practice guidelines.[32]

Worksite Visits

Worksite visits are a valuable tool for occupational medicine providers to ascertain firsthand information to assist supervisors with decreasing injuries and illnesses in their employees. Currently, BUMED requires all occupational medicine providers to complete 12 worksite visits each year. Ideally, the visits are partnered with safety or industrial hygiene, and they should focus on areas where employees are enrolled in medical surveillance programs. If injury or illness patterns are noted, the associated worksites may also be visited. During the worksite visit, the provider observes employees doing their job, including if and how any personal protective equipment is worn, and if safeguards are being used appropriately (Figures 3-11 to 3-13).

Program Self-Assessment and Process Improvement

NMCPHC also promulgates the Occupational Medicine Program Assessment (OMPA) as a self-assessment tool to assist both regional and local inspectors and local participants in evaluating the programs under their cognizance. The OMPA is a comprehensive overview of medical surveillance programs in place at an MTF. The OMPA also records clinic staffing, access, no-show rates, and completion of worksite visits. These assessments are completed annually for each MTF, with the results submitted via the regions to BUMED. For MTFs with subordinate branch health clinics, the occupational medicine program manager from the parent command collates and validates the OMPA submission prior to submission to BUMED via the region. Certain reviews are mandatory, such as medical recordkeeping, medical surveillance exams, certification exams, staffing, and hearing conservation. However, each occupational medicine program has different medical surveillance programs in place based on the hazards in the supported commands. The recurring process creates a living report. Each quarter, three to four programs are reviewed for compliance using the *Occupational Health Program Evaluation Guide (OHPEG)*[33] to guide record reviews.

The OHPEG is a tool designed to assist Navy OEM physicians and OHNs with performing a standardized assessment of quality and effectiveness of medical surveillance and certification programs. The OHPEG highlights many, but not all, of the programs defined by the medical matrix. Based on referenced regulatory requirements, the OHPEG is used to identify elements to be verified during program and medical record reviews. The OHPEG is formatted as a series of program self-assessment forms and medical record review forms. For example, the Asbestos Medical Surveillance Program section of the OHPEG consolidates the references of the pertinent regulatory requirements. OHPEG assessments are one component of the larger OMPA.

SUMMARY

This chapter has described the Navy Medical Department contributions to USN and USMC SOH programs. The many mutual overlapping missions of the USN and USMC require a flexibility of organization and use of resources to provide the optimal SOH program to protect the safety and health of the many people who contribute to the worldwide mission of the DoN. The topic of federal workers' compensation programs and how they apply to USN and USMC civil service employees will be addressed in Chapter 9 of this volume.

REFERENCES

1. Navy Environmental Health Center. *Navy Occupational and Environmental Medicine Field Operations Manual*. Portsmouth, VA: NEHC; April 2017. NMCPHC TM 6260.9A. http://www.med.navy.mil/sites/nmcphc/Documents/oem/OEM_FOM_05-April-2017.pdf. Accessed September 21, 2017.

2. Chief, Bureau of Medicine and Surgery. *Offices of the Surgeon General and Chief, Bureau of Medicine and Surgery Organization*. Washington, DC: Department of the Navy; June 15, 2011. BUMEDINST 5450.165B CH-2. http://www.med.navy.mil/directives/ExternalDirectives/5450.165B%20With%20Changes.pdf. Accessed August 25, 2016.

3. Chief, Bureau of Medicine and Surgery. *Bureau of Medicine and Surgery Organizational Manual*. Washington, DC: Department of the Navy; October 22, 2010. BUMEDINST 5430.8A.

4. Walter Reed National Military Medical Center Website. About us: celebrating two proud histories. https://www.wrnmmc.capmed.mil/About%20Us/SitePages/History.aspx. Accessed September 21, 2017.

5. Navy Bureau of Medicine and Surgery website. Navy Medicine around the globe. http://www.med.navy.mil/SiteInfo/Pages/default.aspx. Accessed August 25, 2016.

6. Navy Environmental and Preventive Medicine Unit Five website. NEPMU Five command history. http://www.med.navy.mil/sites/nepmu5/Pages/history.aspx. Accessed August 25, 2016.

7. US Army Medical Department. *Medical Department, US Army, Preventive Medicine in World War II, Volume VI: Communicable Diseases, Malaria, Part VIII, New Hebrides, Solomon Islands, Saint Matthias Group and Ryukyu Islands*. Washington, DC: Department of the Army, Office of the Surgeon General; 1963. http://history.amedd.army.mil/booksdocs/wwii/Malaria/default.html. Accessed September 21, 2017.

8. US Navy Medical Department. History of the Medical Department of the United States Navy in World War II. The Solomons Campaign. http://www.ibiblio.org/hyperwar/USN/USN-Medical/I/USN-Medical-2.html#Solomons. Accessed August 25, 2016.

9. Peterson RV, Wooster MT, Need JT, Hoffman E. History of Navy entomology, 1941–2011. http://www.med.navy.mil/sites/nmcphc/Documents/nece/history-of-navy-entomology.pdf. August 25, 2016.

10. Gillooly PF, ed. History of Navy Industrial hygienists, monograph prepared for the 50th anniversary of the formation of the Navy Medical Service Corps (unpublished document, 1997). Navy Department, Bureau of Medicine and Surgery, Washington, DC.

11. Stephenson CS, Burton OL. Industrial hygiene program of the US Navy. *Am J Public Health.* 1943;33(4):319–323.

12. Navy Medical Service Corps website. Navy medicine history showcase. http://www.med.navy.mil/bumed/nmhistory/Pages/Showcase.aspx. Accessed October 12, 2017.

13. Navy and Marine Corps Public Health Center website. Our history. http://www.med.navy.mil/sites/nmcphc/about-us/Pages/our-history.aspx. Accessed August 25, 2016.

14. Secretary of the Navy. *Department of the Navy Policy for Safety, Mishap Prevention, Occupational Health and Fire Protection Programs*. Washington, DC: Department of the Navy; October 26, 2005. SECNAVINST 5100.10J.

15. Department of Defense. *DoD Safety and Occupational Health (SOH) Program*. Washington, DC: DoD; October 14, 2014. DoD Instruction 6055.01 http://dtic.mil/whs/directives/corres/pdf/605501p.pdf. Accessed August 25, 2016.

16. Department of Defense. *Occupational and Environmental Health (OEH).* Washington, DC: DoD; November 11, 2008. DoD Instruction 6055.05. http://www.dtic.mil/whs/directives/corres/pdf/605505p.pdf. Accessed August 25, 2016.

17. US Navy, Chief of Naval Operations. *Navy Safety and Occupational Health Program Manual*. Washington, DC: Department of the Navy; December 30, 2005. OPNAVINST 5100.23G.

18. Department of the Navy and Headquarters, US Marine Corps. *Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual*. Washington, DC: Department of the Navy; January 7, 2005. OPNAVINST 5102.1D/MCO P5102.1B.

19. Executive Order 12196, 45 FR 12769, 3 CFR. Occupational safety and health programs for federal employees. October 1, 1980.

20. US Navy, Chief of Naval Operations. *Navy Safety and Occupational Health Program Manual for Forces Afloat*. Washington, DC; Department of the Navy; May 30, 2007. OPNAVINST 5100.19E.

21. Commandant of the Marine Corps. *Marine Corps Occupational Safety and Health Policy*. Washington, DC: Headquarters, UCMC; May 15, 2006. Marine Corps Order (MCO) 5100.8. http://www.marines.mil/News/Publications/MCPEL/Electronic-Library-Display/Article/899091/mco-51008/. Accessed October 12, 2017.

22. Navy Bureau of Medicine and Surgery. *Navy Radiation Health Protection Manual*. Washington, DC: BUMED; February 2011. NAVMED P-5055. http://www.med.navy.mil/directives/Pub/5055%20(Feb%202011).pdf. Accessed August 25, 2016.

23. The Occupational Safety and Health Act of 1970. Pub L 91-596, with amendments. December 29, 1970.

24. Commandant of the Marine Corps. *Marine Corps Safety Program*. Washington, DC: Headquarters, UCMC; July 28, 2011. Marine Corps Order (MCO) 5100.29B. http://www.marines.mil/Portals/59/Publications/MCO%205100.29B.pdf. Accessed September 21, 2017.

25. Navy and Marine Corps Public Health Center website. Forward deployable preventive medicine unit (FDPMU). http://www.med.navy.mil/sites/nmcphc/expeditionary-platforms/fdpmus/Pages/default.aspx. Accessed August 25, 2016.

26. Navy Bureau of Medicine and Surgery. *Mission and Functions of Navy and Marine Corps Public Health Center and Its Subordinate Commands*. Washington, DC: Department of the Navy; October 16, 2008. BUMEDINST 5450.157B. http://www.med.navy.mil/sites/nmcphc/Documents/policy-and-instruction/Governance-and-National-Health-Initiatives/BUMEDINST_5450_157B.pdf. Accessed August 25, 2016.

27. Navy Bureau of Medicine and Surgery. *Bureau of Medicine and Surgery Safety and Occupational Health Program*. Washington, DC: BUMED; June 2015. BUMEDINST 5100.19F. http://www.med.navy.mil/directives/ExternalDirectives/5100.13F.pdf. Accessed September 21, 2017

28. Navy and Marine Corps Public Health Center. *Medical Surveillance Procedures Manual and Medical Matrix*. 11th ed. Portsmouth, VA: NMCPHC; July 2011. Technical Manual NMCPCH-TM OM 6260.

29. Navy and Marine Corps Public Health Center. *Navy Medical Department Hearing Conservation Program Procedures*. Portsmouth, VA: NMCPHC; September 2009. Technical Manual NMCPHC-TM 6260.51.99-2.

30. Department of Veterans Affairs. Fiscal year 2013 Annual Benefits Report. http://www.benefits.va.gov/REPORTS/abr/ABR_FY_13.asp. Accessed August 25, 2016.

31. 29 CFR, Part 1910.95. Occupational noise exposure.

32. Navy and Marine Corps Public Health Center. *Best Practice Guidelines for Hearing Conservation Program Managemen*t. Portsmouth, VA: NMCPHC; March 2007. http://www.med.navy.mil/sites/nmcphc/Documents/oem/best-practices-hcp.pdf. Accessed August 25, 2016.

33. Navy and Marine Corps Public Health Center. *Occupational Health Program Evaluation Guide (OHPEG).* Portsmouth, VA: NMCPHC; August 2009. http://www.med.navy.mil/sites/nmcphc/Documents/policy-and-instruction/oem-occupational-health-program-evaluation-guidance.pdf. Accessed August 25, 2016.