# Chapter 2

# MOBILIZING THE INDUSTRIAL BASE

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## INTRODUCTION

The U.S. Army developed occupational health services during World War II in response to the need to maintain productivity in the civilian workforce. Programs were continued after the war, based primarily on the army's recognition that the manufacture and use of modern weapons pose significant and unique hazards to the health of those who use them. The army also recognizes that its civilian workforce is little different from the workforce in other industries, and that the health of its employees must be protected—both to safeguard productivity and to meet its legal and moral obligations to those employees.

Two major factors influence the occupational health needs of the army: the hazards associated with being a soldier, traditionally the basis for defining military medicine; and the nature of the army as a large, multifaceted industry, the basis for that specific part of military medicine that is occupational health. However, before occupational health in the army can be described, the army's occupational health needs must first be defined. This can only be done by examining the army not as military organization—with its missions of *readiness* (being ready for war), *mobilization* (assembling and preparing for war), *deployment* (assuming a strategic position in war) and *sustainment* (supplying the materiel and manpower necessary to prosecute a continuing war)—but as an industry. It is even more important to understand how mobilizing the industrial base influences the army's occupational health needs.

As an industry, the U.S. Army is a multifaceted conglomerate with over 1 million employees. All types of industry are represented: manufacturing, engineering, maintenance, supply, construction, energy, service, and knowledge. While base-support operations must be considered in determining the occupational health needs for a given installation, far more important is the installation's mission (its *product*). The nature of the product often has little to do with the base's industrial operations. For example, the mission of the Training and Doctrine Command (TRADOC) installations includes training (a major product of Fort Benning, Georgia, is trained paratroopers); the mission of the Forces Command (FORSCOM) installations includes readiness (a major product of Fort Campbell, Kentucky, is an air-assault division ready to go to war). Usually, an installation's mission is the major determinant influencing the healthcare services that the Army Medical Department (AMEDD) provides to that installation. Most FORSCOM installations are large and have correspondingly large dependent and active-duty populations, and therefore require a full-service, military-community hospital. The occupational health services provided to the civilian and military workers involved in traditional industrial operations are a very small part of these installations' total healthcare system. Usually, the state of readiness dictates the level of healthcare that is provided to any installation.

But every rule has at least one exception. In the case of the relative importance of industrial operations to an army installation's mission, that exception is the U.S. Army Materiel Command (AMC). The army's "industrial base" refers, for the most part, to the AMC. Because only two AMC installations, Redstone Arsenal and Fort Monmouth, have sufficient active-duty populations to require community hospitals, relatively few army medical personnel are ever assigned to AMC installations; therefore, few in AMEDD are familiar with the AMC. Before the occupational health needs of the army can be understood, the AMC, its operations, and its products —the army's industrial base—must be described.

## THE U.S. ARMY MATERIEL COMMAND

The AMC, headquartered in Alexandria, Virginia, was formed in 1962 with the amalgamation of the army's technical services: ordnance, transportation, the quartermaster corps, the signal corps, the chemical corps, and the Corps of Engineers. (The reorganization did not change the identity of the individual corps; it combined the services that had previously been provided by the individual units within those corps.) The overall mission of the command is to support the U.S. Army, the U.S. Army Reserve, and the U.S. Army National Guard through materiel systems research, development, acquisition (including manufacturing of some items), and maintenance of materiel readiness and reserve materiel storage. Although the AMC has undergone major reorganization since the Command Briefing used in May 1992 was written, the briefing papers still detail specific portions of the AMC's mission (Table 2-1).

The AMC workforce is composed primarily of civilian employees, with approximately 10 Department of

**TABLE 2-1**

**ARMY MATERIEL COMMAND MISSIONS**

| Mission | Function | Sample Output/Accomplishments |
|---|---|---|
| 1. Equip and sustain a trained, ready army | Determine supply and maintenance needs of soldiers | $3.2 billion annual army stock fund program |
| | Field new systems | 35 PEO and 71 AMC systems fielded |
| | Manufacture and procure ammunition | 695,000 rounds |
| | Procure, store, and distribute spares, tools, and other supplies to maintain equipment readiness | Fill 3.2 million requisitions |
| | Manage and perform depot maintenance | 97,000 major items rebuilt and repaired |
| | | 416,000 secondary items rebuilt and repaired |
| | | $1.5 billion funded depot maintenance program |
| | Perform postdeployment software engineering | $90 million program for software engineering |
| | | 52 million lines of code |
| | Calibrate and repair test equipment | 685,000 items calibrated |
| | | 74,000 items repaired |
| | Provide technical assistance and training to the field | 1,300 logistics assistant specialists worldwide |
| | Dispose of unusable equipment, supplies, and munitions | Screen $1.7 billion in supplies for non–DoD users |
| | | Dispose of $8 million in screened excess supplies |
| | Support other U.S. government agencies | Law enforcement, treaty compliance, and so forth |
| 2. Provide equipment and services to other nations through the security assistance program | Prepare and present FMS total package letters of offer | 7,000 projects currently managed for other countries |
| | | 500,000 requisitions per year |
| | Manage acquisition and delivery of materiel and services | $44.5 billion value current program |
| | | $24.1 billion undelivered orders |
| | Manage system fielding, training assistance, and follow-on logistics support for allies | 142 training teams in FY 1990 |
| | | Follow-on support cases worth over $3 billion to support what the U.S. sells |
| | Manage customer program, perform financial control, and conduct reviews | 124 countries and international organizations |
| | Develop, negotiate, and monitor coproduction agreements | $23 billion value for 28 programs |
| | Manage commercial export licenses for the army | 6,000 export licenses reviewed in FY 1990 |
| 3. Develop and acquire nonmajor systems and munitions | Develop, test, and evaluate equipment, systems, and munitions | 75 systems (does not include munitions) |
| | Manufacture, procure, and test equipment and systems | 197 systems currently funded and at AMC IPR level |
| | Provide software engineering support | 4 software centers support over 300 systems |
| | Provide for management, engineering, production, and testing infrastructure | 10 test centers conduct technical testing |
| | Support other government agencies | Drug Enforcement Agency communication and night-vision equipment |
| | | Ammunition procurement for other services |
| 4. Provide development and acquisition support to program managers (PEOs, PMs) | Facilitate the transition of future systems and munitions to and from PEO management | 9 systems from PEO to AMC in 1991 |
| | Provide functional support to augment PEO/PM offices | 10 PEOs and 117 PMs |
| | Provide general functional support | Procurement, legal, engineering, integrated logistic support (ILS) |
| | Provide software engineering support | 3 life-cycle software engineering centers support PEO ASM |
| | Provide for management, engineering, production, and testing infrastructure | AMSAA, White Sands Missile Ranges |
| 5. Define, develop, and acquire superior technologies | Identify technology requirements for the future army | Technology-based master plan |
| | Demonstrate advanced technologies; facilitate technology transition/insertion | Rotorcraft pilot's associate |
| | Conduct and sponsor basic research and exploratory development | 657 university contracts and grants—$89 million |
| | Influence/leverage independently funded U.S. and foreign basic research and exploratory development | 45 IR&D reviews |
| | | MOUs with 120 countries |
| | Support PEO/PM and Army/OSD with technology and technical assessments | 610 technology-based works packages |
| | | 161 PMs supported |
| | Provide technical advice and counsel | Soldier-as-a-system technology assessment |
| | | AMC FAST program |

**Table 2-1** (*continued*)

| Mission | Function | Sample Output/Accomplishments |
|---|---|---|
| | Support other national initiatives | Outreach programs to minorities and women<br>Youth-in-science research and engineering apprenticeship program |
| | Provide a research and development infrastructure | Ensure adequate training of scientists and engineers |
| 6. Maintain the mobilization capabilities necessary to support the army in emergencies | Develop and test mobilization and contingency plans | Developed and shipped 3 theater-level sustainment packages for Desert Storm that involved 5,870 requisitions for a total of $135 million |
| | Maintain standby supply depot capacity | Ammunition storage capacity plants 169,000 $ft^2$ total covered<br>Depots 419,000 $ft^2$ total covered |
| | Maintain standby depot maintenance capacity | 390,000 items for depot-level work for the remainder of FY 1991 |
| | Maintain inactive ammunition plants and test facilities | Maintenance of inactive industrial facilities—$67.8 million FY 1991<br>10 inactive army ammunition plants |
| | Maintain standby arsenal capacity | Rock Island Arsenal has 15% layaway capacity<br>Watervliet Arsenal has 3% layaway capacity<br>Number of pieces of equipment being retained is 1,986 |
| | Maintain war reserve stocks | 66% of worldwide ammunitions requirements on hand<br>106,000 secondary items for war reserves |
| | Maintain a manufacturing capacity to meet the threat of war | Layaway of industrial facilities<br>WTCV $33.2 million FY 1991<br>AMMO $22.2 million FY 1991 |
| | Augment government production facilities to meet wartime needs | Production base support projects to provide production facilities not commercially available for a total of $443.2 million |
| | Provide logistics training for active and reserve units | Provide training sites for approximately 285 reserve component units that involved 65,000 person days |
| 7. Continue to improve productivity and quality of life | Make productivity-enhancing capital investments | LOGSPARS ($2.7 million) with $150 million annual savings<br>SATCOM mission facility ($6.4 million) with $2.4 million annual savings |
| | Modernize industrial and RDT&E facilities | $61.6 million MCA program:<br>Toxicology research facility ($33.0 million) at APG<br>Directed energy weapons lab ($14.4 million) at Redstone Arsenal |
| | Implement total quality management | Over 55% of HQAMC managers have received TQM training<br>Over 800 process action teams within AMC and the number is growing daily |
| | Comply with EPA and state regulations | $83 million for environmental compliance FY 1990 (clean water, clean air, waste water)<br>$124 million for environmental restoration FY 1990 (HAZMIN, site cleanup) |
| | Achieve quality conditions in the workplace and living quarters | Yuma and Selfridge winners in Army Communities of Excellence competition |
| | Operate installations and facilities efficiently | $68 million productivity investment fund (PIF) at TOAD<br>$268.4 million RPMA programs (RDTE, OMA)<br>0.8% energy-reduction goal |
| | Maintain a valued and respected workforce<br>Provide command and control | |

AMSAA: Army Materiel Systems Analysis Agency
APG: Aberdeen Proving Ground
ASM: automated system management
FAST: field assistance in science and technology
FMS: foreign military sales
HAZMIN: hazardous waste minimization
IPR: in-process review
IR&D: in-process research and development
LOGSPARS: Logistics, Planning, and Requirements Simplification System
MCA: military construction, Army
MOU: memorandum of understanding
OSD: Office of the Secretary of Defense
PEO: Program Executive Officer
PM: Program Manager
RPMA: real property maintenance activity
RDT&E: research, development, test, and evaluation
TOAD: Tobyhanna Army Depot
TQM: total quality management
WTCV: weapon and tracked combat vehicle

Source: Briefing Papers. Army Materiel Command Headquarters, Alexandria, Va: 1991.

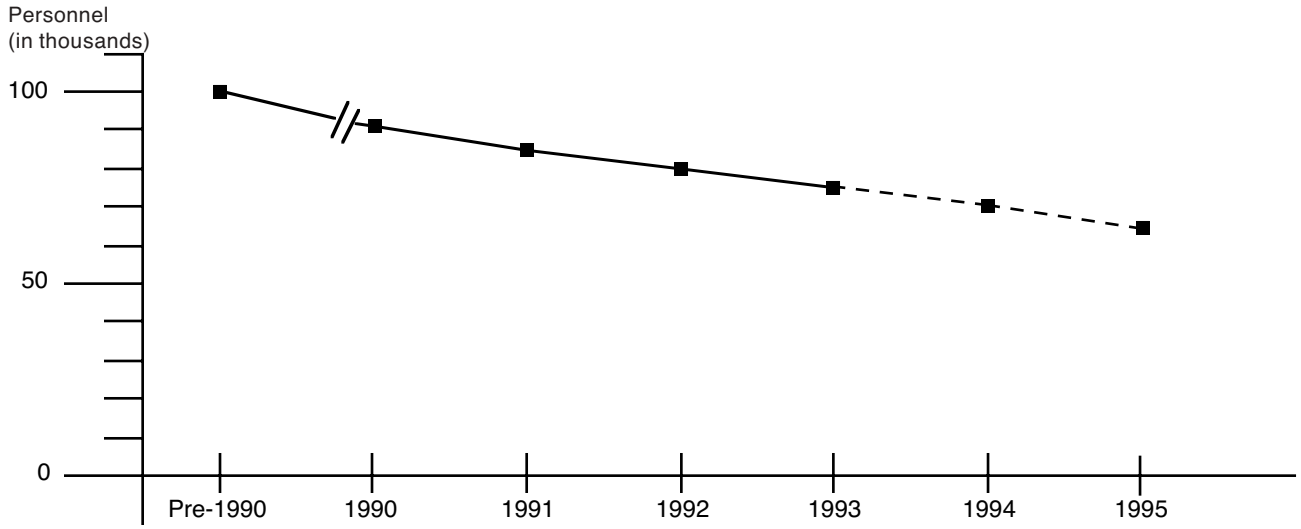



**Fig. 2-1**. Since it was organized in 1962, the number of employees of the Army Materiel Command has steadily decreased (except of course during the Vietnam era). This decline is projected to continue through 1995.

the Army Civilians (DACs) for each active-duty soldier. However, the actual size of the command is changing rapidly under the army's planned down-sizing (Figure 2-1). For example, in May 1990, AMC personnel consisted of approximately 100,000 DACs and 10,000 active-duty soldiers; by May 1992, the workforce had shrunk to fewer than 90,000 DACs and 8,000 active-duty.

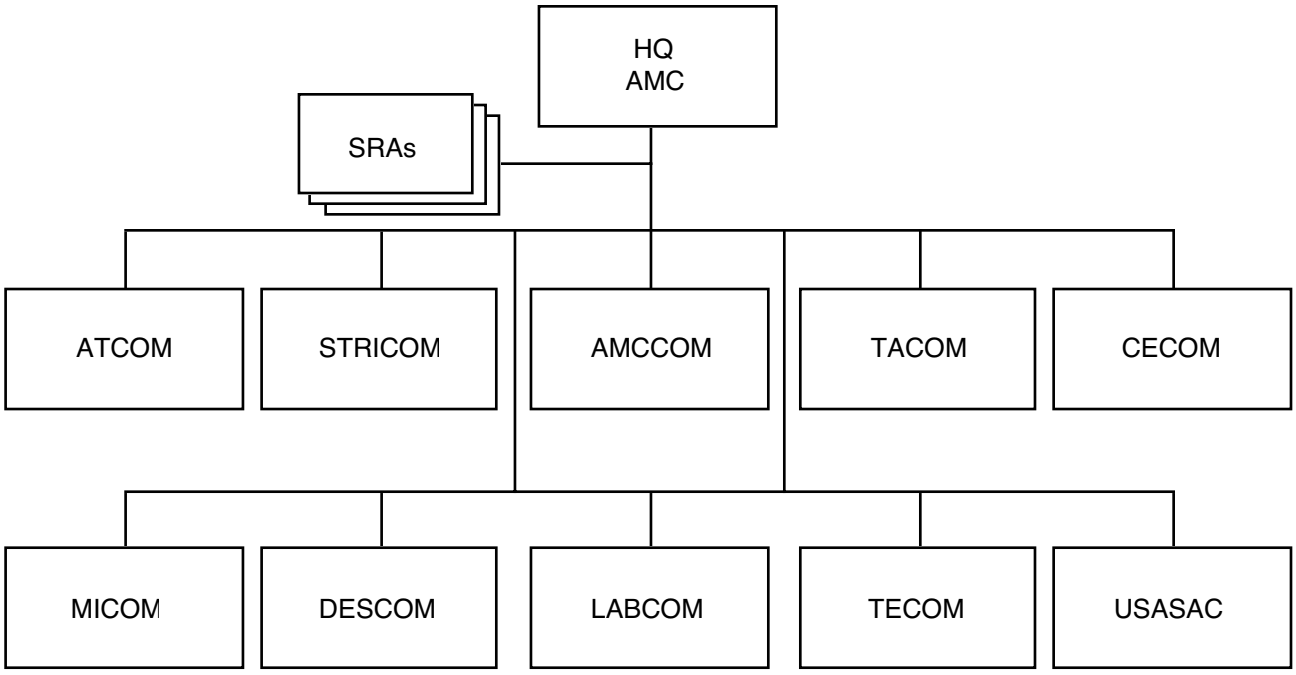
Defining the size of the AMC by looking at the size of the Department of Defense's (DoD's) peacetime workforce can be misleading. There are actually three types of AMC industrial activities:

- Government-owned, government-operated plants. These are staffed by federal employees, and are owned and operated by the AMC. Anniston Army Depot in Anniston, Alabama, is an AMC government-owned, government-operated plant.
- Government-owned, contractor-operated plants. These physical facilities and their missions and products are owned by the AMC, but the plant is operated by employees who work for a plant contractor. Sunflower Army Ammunition Plant, at DeSoto, Kansas, (2 military, 24 DACs, and 697 contract employees) is an active government-owned, contractor-operated plant.
- Contractor-owned, contractor-operated operations. Private-sector manufacturers build, own, and operate these plants, and sell the specified products directly to the AMC. An example of a contractor-owned, contractor-operated operation is the Defense Logistics Agency (DLA) contract with BMY Harsco Corporation, Maryville, Ohio, for the manufacturing of the M914 series heavy utility trucks.

These distinctions are very important because the type of industrial plant is a major determinant of the type of occupational health services that AMEDD is obligated to provide to plant employees. This distinction is discussed in detail in Chapter 3, Army Health Programs and Services. AMEDD provides medical support only to government-owned, government-operated installations.

During the summer and fall of 1992, the AMC underwent a major reorganization. The AMC is currently organized into a headquarters element and 10 major subordinate commands. Figures 2-2 and 2-3 and Exhibit 2-1, which are from the September 1992 AMC Command Brief, depict the command organization, location of subcommittee headquarters, and major missions.

Each major subordinate command has its own areas of responsibility, and is further divided into subordinate commands, which comprise the depots, arsenals, proving grounds, laboratories, ammunition plants, tank factories, and activities. The AMC is also responsible for a number of separate reporting activities (SRAs), which include schools such as the U.S. Defense Ammunition Center and School; and centers for packaging, storage, and containerization. Discussing the AMC organization as of September 1992 is fraught with difficulties. Quite simply, due to army down-sizing, the AMC organization structure is constantly changing. Major




AMCCOM: Armament, Munitions, and Chemical Command
ATCOM: Aviation and Troop Command
CECOM: Communications-Electronics Command
DESCOM: Depot System Command
LABCOM: Laboratory Command
MICOM: Missile Command
SRA: Separate Reporting Activity
STRICOM: Simulation Training Instrumentation Command
TACOM: Tank-Automotive Command
TECOM: Test and Evaluation Command
USASAC: Security Assistance Command

**Fig. 2-2**. The organizational structure of the Army Materiel Command as of September 1992.

restructuring activities include combining the seven laboratories under the former LABCOM into the Army Research Laboratory, similar to the combining of DESCOM and AMCCOM (which is discussed later in this chapter). As of September 1992, AMC activities consisted of 139 organizations (10 major subcommands), 43 program management offices, 29 separate reporting activities, 3 arsenals, 17 depots, 4 proving grounds, 7 laboratories, and 26 ammunition plants, which are located at 66 installations in 40 states and 6 countries.

In 1973, army leadership almost totally redirected its mechanisms for weapons development, manufacture, and acquisition, giving virtually all these responsibilities to the AMC. TRADOC became responsible for the development of doctrine and combat concepts for new materiel. TRADOC is, therefore, responsible for recognizing a perceived enemy threat and determining what weapon capabilities are needed to address that threat. These needs are then communicated to AMC, the command with the responsibility for translating requirements into acquired materiel.

Once TRADOC formulates the materiel requirements, the concept can progress through the research and development stages. Until 1987, the commanding general of the AMC was the authority for weapons development; however, a major shift was made giving decision-making authority to an individual in the civilian defense acquisition sector, who would have undisputed authority over the process. The oversight for the development of weapons systems has been merged into a single Industrial Operations Command, which will oversee base realignment and structures (Exhibit 2-2). The AMC is projected to be reorganized in 1996 (Figure 2-4).

The oversight for the development of weapons systems has been divided: the assistant secretary of the army for research, development and acquisition (SARDA) administers major systems, which are defined as those costing more than $200 million for research, development, testing, and evaluation; or $1 billion for procurement; the AMC administers the minor weapons systems.[1] The research, development,


**Fig. 2-3**. The location of the Army Materiel Command Headquarters as of September 1992.

and testing needed to produce a weapons system may be accomplished by a subordinate command of the AMC, by a contractor, or by a combination of the two. Once the system is fielded, the AMC provides maintenance assistance, major overhaul, and modernization.

Although AMEDD is responsible for providing occupational health services to all of the AMC, two major subordinate commands, DESCOM and AMCCOM, have required more medical services due to their size and the nature of their missions. These two warrant detailed discussion, as does the AMC Command Surgeon's Office.

**Depot Systems Command**

DESCOM, headquartered at Letterkenny Army Depot, Chambersburg, Pennsylvania, administers an annual operating budget of approximately $2.5 billion. These resources are dedicated to enhancing the army's readiness through overhauling, repairing, modifying, converting, storing, and distributing assigned commodities for the AMC, the Defense Logistics Agency, the General Services Administration, and other suppliers. DESCOM's maintenance mission helps to sustain the readiness not only of every unit in the army but of the other services as well (Figure 2-5).

DESCOM is the largest major subordinate command of the U.S. Army Materiel Command. It comprises almost 33% of AMC personnel assets. With more than 28,000 employees—most of them civilians—at 17 installations, DESCOM is equivalent to the country's 85th largest corporation.[2] DESCOM has command and control of 11 depots, 6 depot activities, and 13 other locations throughout the continental United States (CONUS), Germany, and South Korea (Figure 2-6).

As part of the Base Closure and Realignment Process, DESCOM will be transformed into the U.S. Army Industrial Operations Command during the mid-1990s. It will merge with the munitions portion of the U.S. Army Armaments, Munitions, and Chemical Command at Rock Island, Illinois, to streamline functions for industrial operations within the army. Other changes to the organic industrial base are likely.

***Anniston Army Depot***

Anniston Army Depot, Anniston, Alabama, is the prime depot for the maintenance of tracked combat vehicles and their components; small arms, and land combat missiles; the Army Tactical Missile System; and the Land Combat Support System. Anniston's early involvement as the Center of Technical Excellence made it the lead depot for the M1 Abrams tank. The depot also stores, maintains, distributes, and demilitarizes ammunition, missiles, and toxic chemical munitions. Anniston personnel also repair electro-optics and small arms (Figure 2-7).

**EXHIBIT 2-1**

**MAJOR MISSIONS OF ARMY MATERIEL COMMAND HEADQUARTERS***

AMC Headquarters, Alexandria, Virginia
Provides functional support such as legal assistance and infrastructure management

CECOM, Fort Monmouth, New Jersey
Proponent for all Communication-Electronic Programs

TECOM, Aberdeen Proving Ground, Maryland
Tests and evaluates all types of equipment, from small soldier items to major weapons systems

Army Research Laboratory (previously LABCOM), Adelphi, Maryland
Exercises command and control over all army research laboratories; focuses on research, exploratory development, and analysis

USASAC (collocated with AMC Headquarters)
Proponent for all foreign military sales; receives functional support from the Program Manager (PM) and Program Executive Officer (PEO) offices on specific weapon systems

STRICOM (previously PM; Trade and PM; Instrumentation, Target, and Threat Simulation [ITTS]); Orlando, Florida
The army's focal point for simulation, training, and instrumentation

MICOM, Redstone Arsenal, Huntsville, Alabama
Manages the development, acquisition, fielding, and sustainment of all army missile systems

ATCOM, St. Louis, Missouri
Focuses on development, acquisition, and fielding of aviation systems and individual troop items

AMCCOM, Rock Island, Illinois
Primarily responsible for development of weapons, munitions, and chemical equipment

TACOM, Warren, Michigan
Equips the army with both tracked and wheeled ground mobility equipment

DESCOM, Chambersburg, Pennsylvania
Oversees all depot operations

*As of September 1992

**EXHIBIT 2-2**

**ARMY MATERIEL COMMAND RESTRUCTURING ACTIVITIES***

Close seven depots

Close seven ammunition plants

Create the Army Research Laboratory

Create the Army Industrial Operations Command

Create the Aviation and Troop Command

Create the Missiles, Armaments, and Chemical Command

*As of September 1992

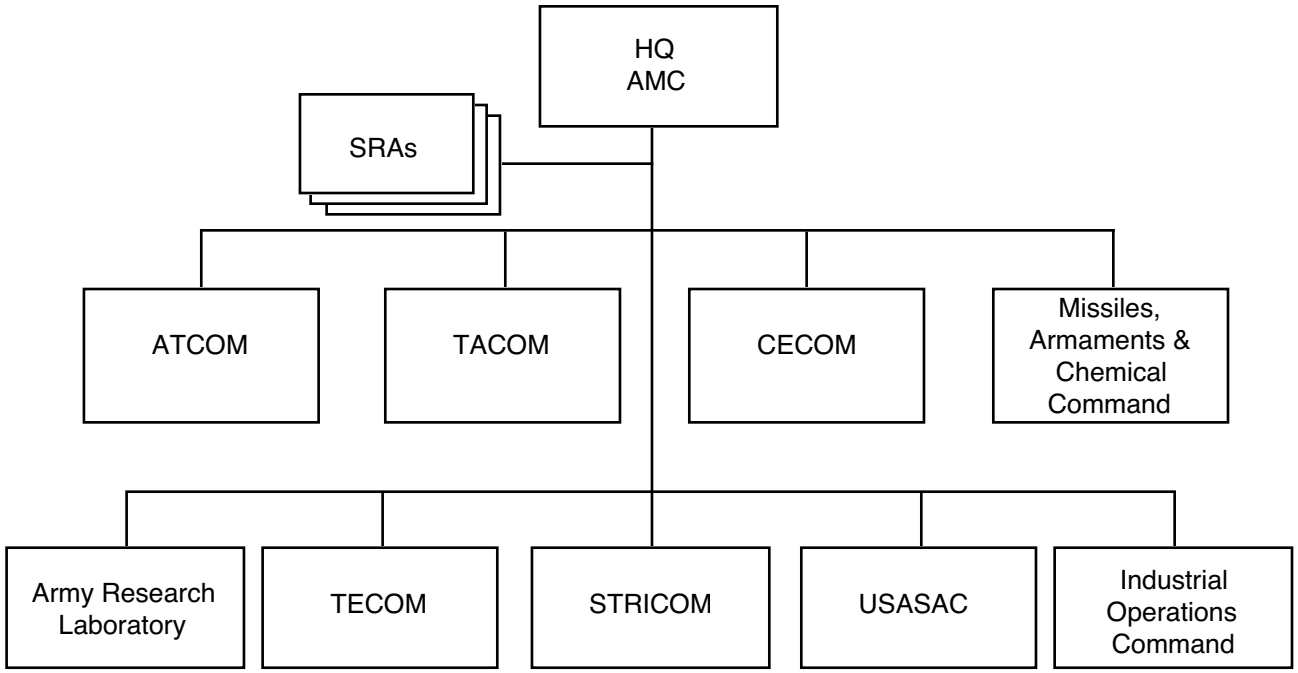



**Fig. 2-4.** The Army Materiel Command organizational structure projected for 1996 assumes that the restructuring activities shown in Exhibit 2-2 are implemented.

**Fig. 2-5**. U.S. Army reservists at a DESCOM depot activity ready U.S. Air Force bombs for shipment.


**Fig. 2-6.** U.S. Army Depot System Command installations. Source: Headquarters, DESCOM, Chambersburg, Pennsylvania.

**Fig. 2-7.** Abrams tanks damaged during Operation Desert Storm were repaired on this shop floor at Anniston Army Depot, Alabama.

### *Blue Grass Army Depot*

Blue Grass Army Depot, located near Lexington, Kentucky, overhauls communications security equipment and has an extensive mission for assembly of communications-electronics sets, kits, and outfits. The Blue Grass facility, 2 miles south of Richmond, Kentucky, is a storage site for conventional and chemical munitions and clothing and textiles. It also runs the army's only environmentally approved "washout" facility, which recovers explosives from munitions for future use. A government-owned, contractor-operated maintenance facility for communications and electronics materiel is also located at Lexington.

### *Corpus Christi Army Depot*

Corpus Christi Army Depot, located on the U.S. Naval Air Station in Corpus Christi, Texas, repairs, overhauls, and maintains the army's helicopters, including the UH-1 Huey, AH-1 Cobra, and UH-60A Black Hawk; the depot is DESCOM's Center of Technical Excellence for the AH-64 Apache attack helicopter. The depot's aircraft mission covers not only maintenance of helicopters but also associated aeronautical equipment. Corpus Christi Army Depot is the largest industrial employer in south Texas, with more than 4,000 employees. It was the first depot to establish a 24-hour aircraft maintenance "hotline" providing immediate, worldwide maintenance.

### *Letterkenny Army Depot*

Letterkenny Army Depot, Chambersburg, Pennsylvania, is the prime maintenance depot for self-propelled and towed artillery, light recovery vehicles, and air-defense guided missile systems such as the Improved Hawk, the Forward Area Alerting Radar, and the Patriot Air Defense Missile System. Employees there work on equipment supporting the Army's Patriot and Hawk air defense missile systems. Additionally, the depot assembles Sparrow and Sidewinder missiles for the U.S. Air Force. Letterkenny is also the prime overhaul depot for upgrades to the self-propelled howitzer. Letterkenny also provides procurement support to U.S. Army Europe and maintains, stores, and demilitarizes conventional ammunition in CONUS (Figure 2-8).

***Savanna Army Depot Activity.*** Savanna Army Depot Activity, Illinois, under the command and control of Letterkenny Army Depot, stores and ships conventional ammunition and war reserve materiel. The U.S. Defense Ammunition Center and School, a tenant at Savanna, is the only DoD school that provides ammunition train-ing to civilian, military, and foreign students.

***Seneca Army Depot.*** Seneca Army Depot, Romulus, New York, also under the command and control of Letterkenny Army Depot, stores, maintains, and demilitarizes ammunition. It is the army's only site for overhauling and upgrading DoD-owned industrial plant equipment.

### *Red River Army Depot*

Red River Army Depot, a multimission depot located in Texarkana, Texas, is the primary depot for the overhaul and repair of light armored vehicles (M113 family), M2 and M3 Bradley Fighting Vehicles, M901A1 Improved TOW (tube-launched, optically tracked, wire command, link guided) vehicles, Chaparral, Multiple Launch Rocket System, and M981 Fire Support Team Vehicles (Figure 2-9). In addition to its maintenance mission, Red River is an Area Oriented Distribution depot, providing supply support to the central United States. It also stores and maintains conventional ammunition.

### *Tobyhanna Army Depot*

Tobyhanna Army Depot, Pennsylvania, is the largest communications and electronics repair facility in the army. The depot maintains equipment such as radio and radar systems, airborne surveillance and navigation equipment, signal intelligence, and satellite communications systems used by all DoD activities, and is the U.S. Army's Center of Technical Excellence for tactical and strategic satellite communications systems, automatic test systems, and space communications. It is the only depot with an approved Ground Control Approach radar antenna pattern range able to support the radar requirements of all the armed forces.

### *Tooele Army Depot*

Tooele Army Depot, Utah, overhauls army tactical wheeled vehicles, power generators, rail locomotives, and Redeye antiaircraft missiles. Tooele stores and maintains both chemical and conventional munitions and is the home of the $64-million prototype Chemical Agent Munitions Disposal System, which safely disposes of lethal chemical munitions. The Ammunition Equipment Directorate designs and fabricates special-purpose ammunition handling and production equipment. Additionally, Tooele has two unique missions: it is the only DoD installation with the capability to repair and overhaul topographic equipment and military locomotives.

***Pueblo Army Depot Activity.*** Pueblo Army Depot Activity, Colorado, is commanded and controlled by Tooele Army Depot. Pueblo stores chemical munitions and is scheduled to be the location of a chemical

**Fig. 2-8**. Environmental specialists at Letterkenny Army Depot, Pennsylvania, seal a hazardous waste container.

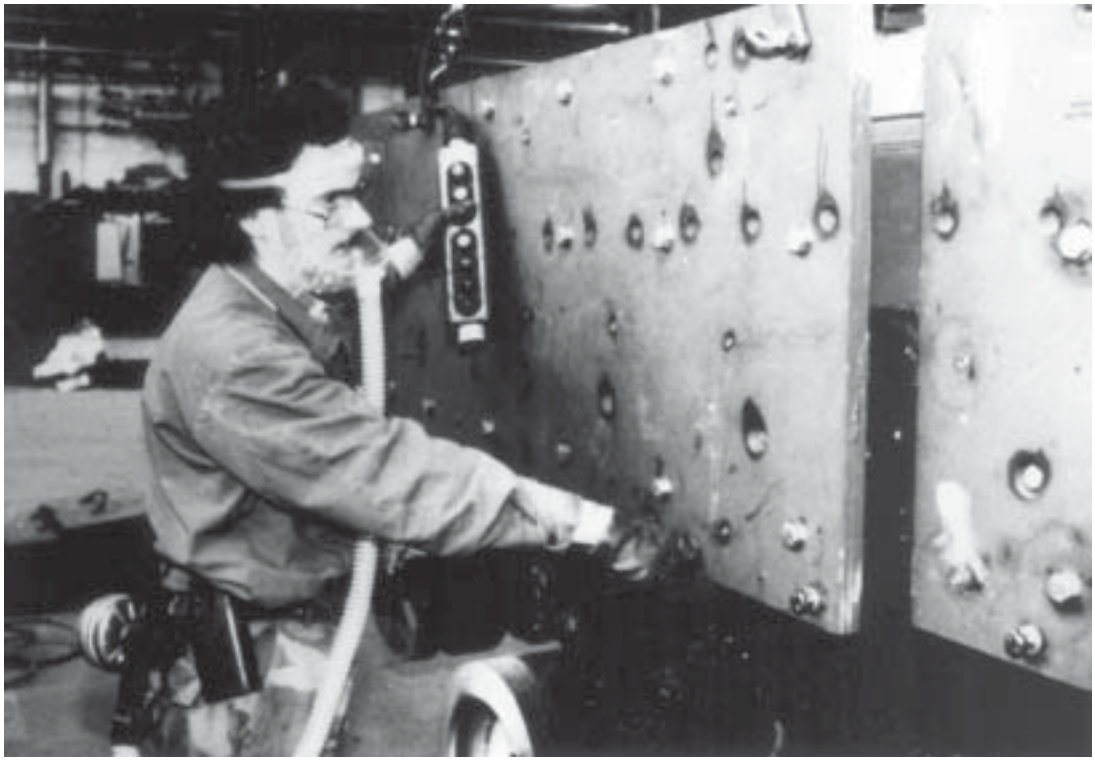


**Fig. 2-9**. A DESCOM worker upgrades a Bradley Fighting Vehicle from the M2A2 to the M2A3 configuration.

weapon demilitarization facility to destroy these weapons. The Pershing II missile system was demilitarized by the depot activity under the Intermediate-Range Nuclear Forces Treaty. The depot operates a repository for the storage of precious metals received from states west of the Mississippi River.

***Umatilla Army Depot Activity.*** Umatilla Army Depot Activity, Oregon, is also under the command and control of Tooele Army Depot. Umatilla stores chemical weapons and is scheduled to be the location of a chemical weapon demilitarization facility to destroy those weapons.

### *European Redistribution Facilities*

The European Redistribution Facilities (ERFs) are located at Boeblingen, Hausen, and Nahbollenbach, Germany. The ERFs' mission is to receive class IX (spare and repair parts) excess, serviceable and unserviceable, economically repairable materiel, including Automatic Return Items, and to distribute them to in-theater repair and storage sites, Defense Reutilization and Marketing Offices, or CONUS repair or storage depots.

### *DESCOM Support Activity, Far East*

Located in South Korea, the DESCOM Support Activity–Far East (D-SAFE) contracts with Korean industry to perform maintenance on combat vehicles, tactical vehicles, and communications-electronics equipment. It performs a variety of missions in the Far East including management of repair and overhaul contracts with private industry, coordination of the army's warranty and modifications work-order programs, and total-package fielding. D-SAFE also fabricates and repairs all sizes of pneumatic tires.

### Armament, Munitions, and Chemical Command

The AMCCOM, headquartered at Rock Island Arsenal, Illinois, is the second-largest of the AMC subordinate commands. It has command and control of 38 installations and activities in 25 states and employs more than 500 military, 18,000 DAC, and 20,000 contractor personnel (Figure 2-10). With an annual operating budget of over $5 billion and with assets worth over $44 billion, AMCCOM is equivalent to the United States's 72nd largest production corporation and the 8th largest in assets.[1]

AMCCOM's mission is to develop and produce the most advanced guns, bullets, and chemical weapons for United States and allied forces. This mission, accomplished through research, development, and engineering, has three levels of responsibility: total, primary, and support. When AMCCOM has *total* responsibility, the command manages the entire development, production, fielding, and support for the system. Examples of projects totally supported by AMCCOM include the M198 howitzer, the M16-series rifle, and the M40 chemical-protective mask. When AMCCOM has *primary* responsibility for a program, the command manages the overall program but obtains sup-

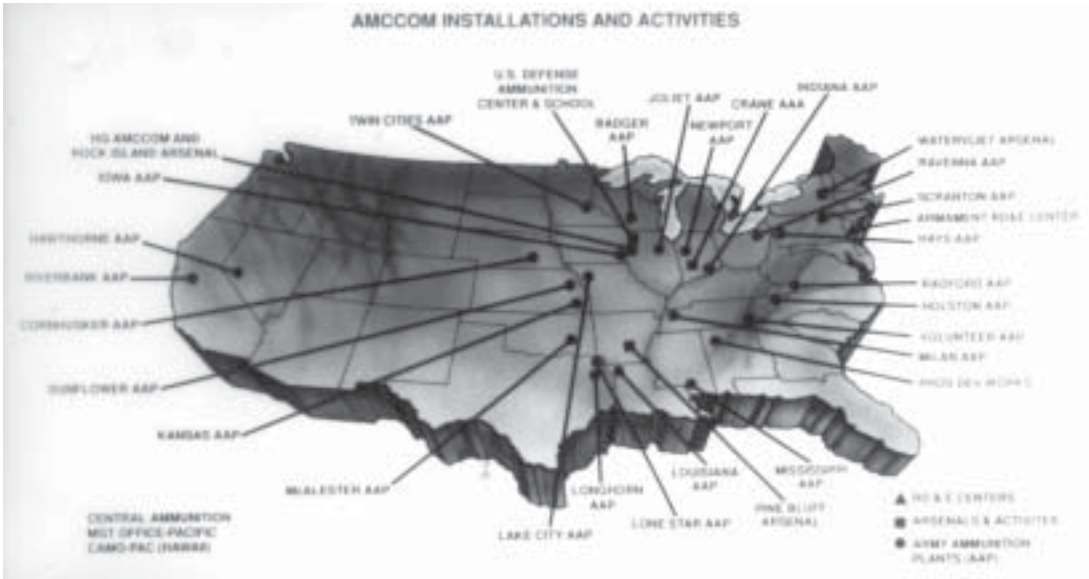



**Fig. 2-10.** The Armament, Munitions, and Chemical Command (AMCCOM) installations.

port from other commodity commands. The M109 self-propelled howitzers and the lightweight chemical decontamination system are two examples of weapons developed under AMCCOM's primary support. Finally, when AMCCOM has *support* responsibility, the command assists other AMC commodity commands in appropriate areas of expertise. Thus, for the Bradley Fighting Vehicle and the Abram's main battle tank, AMCCOM assisted the tank-automotive command by supplying the armament, fire control, ammunition, and related support equipment needed on these systems.[1]

### *Installations and Activities*

Two of AMCCOM's centers—the Chemical, Research, Development, and Engineering Center (CRDEC) and the Armament Research, Development, and Engineering Center (ARDEC) develop new weapons; the other AMCCOM installations sustain the readiness of combat forces. AMCCOM's three government-owned, government-operated arsenals—Rock Island, Watervliet, and Pine Bluff—perform a variety of manufacturing missions that are central to that effort.

***The Chemical Research, Development, and Engineering Center.*** CRDEC, located at Aberdeen Proving Ground, Maryland, is one of two facilities that incorporates advanced technology into the materiel that AMCCOM maintains. CRDEC develops chemical programs and smoke and other obscurant systems within the DoD. Current CRDEC projects include developing sensors that will detect and identify all known and projected types of biochemical agents, and will sound a warning alarm whenever such an agent is present. Specialists at CRDEC are also working on new protective gear that will be easier to wear and use, and will be fully compatible with the combat systems of the 21st century. In 1991, AMCCOM provided more than 290,000 chemical protective masks and the Fox Nuclear, Biological, Chemical Reconnaissance System to United States troops during Operation Desert Storm.

***The Armament Research, Development and Engineering Center.*** ARDEC, located at Picatinny Arsenal, New Jersey, is the second AMCCOM-maintained, advanced-technology facility. ARDEC performs research, development, and engineering on direct-fire, close-combat systems ranging from bayonets to tank cannons. The squad automatic weapon; Bushmaster 25-mm chain gun, used on Bradley Fighting Vehicles; and the M16A2 rifle are all systems developed by ARDEC. The center also works on indirect fire-support systems such as artillery and mortars, weapons and ammunition, mines, demolitions, and fire control for army weapons. ARDEC is the leader in the development of precision and "smart" munitions.

A ballistic test range at ARDEC is a safe, all-weather, environmentally acceptable facility for testing large-caliber ammunition. Technicians at the range can photograph a fired projectile, which aids in the study of its free-flight characteristics.

ARDEC's mission includes developing propellants, explosives, pyrotechnics, and fuzes, and supports the army and other services in armament science and technology. The center is also involved in liquid propellant and electromagnetic gun technology.

***Rock Island Arsenal.*** Rock Island Arsenal, located at Rock Island, Illinois, is the largest weapons manufacturing arsenal in the North Atlantic Treaty Organization (NATO) alliance. It produces recoil mechanisms and gun mounts for most of the howitzers and tanks now fielded and manufactures the carriage for and completely assembles the M119 and M198 howitzers. During Operation Desert Storm in 1991, the arsenal received orders for nearly 18,000 components, 60% of which supported the M198 howitzer.

The arsenal produces a prototype 105-mm recoil mechanism and cradle for the air force's AC130U gunship, and manufactures critical castings and forgings for the navy. It also assembles and ships most of the army's common and special tool kits and basic-issue-item sets to troops worldwide.

***Watervliet Arsenal.*** Watervliet Arsenal, located near Albany, New York, is the center for the production and procurement of cannons for tanks, howitzers, recoilless rifles, mortars, breech mechanisms, and spare parts. It houses a $15-million, computerized, flexible manufacturing system that is one of the most modern heavy-manufacturing facilities in the United States. This series of interconnected machining tools produces a finished breech block from a block of raw steel, using a unique rotary forge that turns out rough forgings in 10 minutes—rather than the previous 10 hours. Investments such as this have yielded the efficiency necessary for cost-effective, low-rate, peacetime production.

***Pine Bluff Arsenal.*** Pine Bluff Arsenal, located at Pine Bluff, Arkansas, has primary responsibility for the production of smoke, incendiary, and riot-control munitions. Its mission also includes the assembly, production, and renovation of various protective masks used by all services. This arsenal was the only source of protective masks during Operation Desert Storm; it rebuilt and refurbished more than 3,500 masks per week. Pine Bluff Arsenal has also been the site for both the production and the demilitarization of chemical weapons.

### *Subsidiary Activities*

AMCCOM's responsibilities continue after systems are produced or procured. The command remains

responsible for fielding, maintaining, and repairing materiel. Support in these areas is provided by the National Inventory Control Points and the National Maintenance Points located at command headquarters. The National Inventory Control Point for armament and chemical systems performs a variety of supply management functions ranging from data and inventory management to security assistance. More than 800,000 customer requisitions are processed yearly for equipment, repair, and secondary items (eg, a nonstandard radio antenna that was developed for special operations); the average processing time is less than 1 day. The National Maintenance Point for armament and chemical systems provides maintenance and engineering support, produces technical publications, conducts new-equipment training, prepares fielding plans, and manages maintenance and support activities. AMCCOM developed and shipped more than 78,000 copies of technical manuals to United States forces during Operation Desert Storm. The National Inventory Control Point, separate from the National Maintenance Point, manages ammunition and serves as the operational element of the *single manager* for conventional ammunition. (The single manager is a multiservice DoD concept; for example, AMEDD is the single manager for medical supplies.) These two organizations integrate materiel management, inventory management, maintenance engineering, fielding, malfunction investigation, and demilitarization of ammunition.

As the principal field-operating agency for the single manager for conventional ammunition, AMCCOM is responsible for the development and oversight of the budget for ammunition hardware, and for the procurement, production, supply, maintenance, and renovation of conventional ammunition for the other military services. For 1992, 80% of the AMCCOM production budget was allocated for ammunition.

The command is also responsible for the storage of 2.2 million short tons (ie, 2,000 lb; a long ton is 1,000 kg, or 2,240 lb) of ammunition, and for shipment and mobilization planning for all services. During Operation Desert Storm, AMCCOM (as the single manager) shipped more than 453,000 short tons of ammunition to troops in southwest Asia. Ammunition production is largely accomplished by AMCCOM's ammunition plant system. There are currently 27 such facilities, 16 of which are active. During the next 5 years, seven more plants will be inactivated. At some inactive plants, private contractors are being granted permission to use portions of the facilities for non-DoD work.

Two plants are government owned and government operated: Crane Army Ammunition Plant (CAAP) in Indiana and McAlester Army Ammunition Plant (MAAP) in Oklahoma. CAAP produces ammunition for the navy and is the only facility capable of machining 16-in. battleship projectiles. It also has the world's only plant for converting obsolete white phosphorus munitions into phosphoric acid. MAAP produces ammunition (primarily for the navy and air force); renovates, maintains, and demilitarizes ammunition; and operates depots. The plant is capable of producing explosive-loaded bombs ranging from 500 to 2,000 pounds. During Operation Desert Storm, McAlester shipped more than 45,000 short tons of bombs to southwest Asia.

Most AMCCOM ammunition plants, however, are government-owned and contractor-operated, and perform four functions: small-arms production; propellant and explosive production; metal-parts production; and loading, assembling, and packing (LAP) of finished rounds. Technology at the command's ammunition plants ranges from hand assembly to state-of-the-art modern automated systems.

Some plants perform unique functions for the DoD. For example, Lake City Army Ammunition Plant (LCAAP) in Missouri currently produces virtually all the army's small-caliber ammunition. LCAAP shipped over 320 million rounds of ammunition to troops in southwest Asia during Operation Desert Storm. Longhorn Army Ammunition Plant (LAAP) in Marshall, Texas, was one of the demilitarization sites for Pershing missile rocket motors. This mission, performed in accordance with a Soviet-American arms-control treaty, was accomplished September 1988 to June 1991.[3]

Another AMCCOM mission is to support the central management of significant acquisition programs. Two project managers report directly to the commander of CRDEC and four others report directly to the commander of ARDEC. *Matrix* support (specialists from many organizations working together as a team) is provided to many Department of the Army (DA) program executive officer PEOs). Since the PEO concept's inception, AMCCOM has supported the PEO armaments, which are located at Picatinny Arsenal. Recently, AMCCOM expanded its support to PEOs, project managers, major subordinate commands, and other military services by establishing an industrial base acquisition advocate. As the command's focal point, the advocate assists in formalizing the use of the industrial base—the arsenals and ammunition plants—within acquisition strategies.

AMCCOM's other major, field-operating elements perform varied services. For example, the Central Ammunition Management Office, Pacific, located at Fort Shafter, Hawaii, provides centralized ammunition logistics management for the Pacific Theater. The U.S. Army Defense Ammunition Center and School

(USADACS), located at Savanna Army Depot Activity, Illinois, provides training and career management for ammunition managers and quality assurance specialists ammunition surveillance (QASAS), and technical assistance and engineering services for the storage and transportation of ammunition. During Operation Desert Storm, QASAS personnel ensured that ammunition was transported, stored, issued, and used safely in southwest Asia. They also provided surveillance during the *retrograde* of ammunition (the return to CONUS of forward-deployed ammunition). More than 100 QASAS personnel served OCONUS to support United States troops in southwest Asia, and another 42 provided stateside support at ports, camps, and stations.

USADACS administers the Technical Center for Explosives Safety, which executes the army's explosives safety policies, programs, standards, and procedures to provide maximum protection to people and property.

AMCCOM's Customer Support Directorate's mission is to provide customer and materiel support in all issues that affect the field readiness of weapons systems. The Readiness Analysis and Customer Feedback Center gathers, assembles, and analyzes readiness information received from the field. They maintain an accurate, current, technical-support database, and track and report emerging trends (which are then coordinated with functional directorates for resolution). Customer Support also plans and executes materiel findings, and provides training on new equipment to support force-modernization programs. They distribute new equipment, which is delivered ready for immediate field use. State-of-the-art video equipment enables new-equipment training teams to provide soldiers with maintenance training programs.

Soldiers and civilians from the U.S. Army Technical Escort Unit, located at Aberdeen Proving Ground, Maryland, can provide emergency response for chemical-munitions and -agent incidents worldwide. Unit members also escort all DoD chemical agents. During the return of forces from Europe after Operation Desert Storm, Technical Escort Unit members were instrumental in planning for and safely removing more than 100,000 chemical artillery projectiles from Germany to Johnston Island in the Pacific.

**Office of the Army Materiel Command Surgeon**

AMEDD supports the AMC in three major areas: technical and professional input for specific AMC program areas, staff management of AMC medical programs, and delivery of healthcare services to military and civilian employees. Of the 41 AMEDD personnel assigned to the AMC, 33 have responsibilities primarily related to providing medical expertise for specific AMC program areas (Table 2-2). For example, the major duties of the occupational medicine officer assigned to the Program Management Office for Chemical Demilitarization include providing medical expertise for chemical demilitarization (eg, of surety agents). This occupational medicine officer is not responsible for providing healthcare services or managing health programs. Of the eight remaining medical personnel assigned to AMC headquarters staff, six are assigned to the Office of the AMC Command Surgeon, and one each is assigned as Command Surgeon for DESCOM and AMCCOM. Their duties are the same as the Office of the Command Surgeon, but on a smaller scale.

The AMC Surgeon is the principal officer responsible for advising the commanding general of the AMC and his or her staff on all health issues that affect the command (Figure 2-11). The command surgeon's office is also responsible for developing and implementing command policy, which assures the preservation of the health of the workforce and the prevention of disease and injury, addresses health issues within the health hazard assessment (HHA) process, provides for the control of pests and the preservation of war stocks, and ensures the medical portion of nuclear and chemical surety operations.

Most medical support for the AMC is provided by medical units not organic to the command. For example, the U.S. Army Medical Materiel Activity (USAMMA) provides logistics; the Medical Research and Development Command (MRDC) provides medical research and development; the U.S. Army Environmental Hygiene Agency (USAEHA) provides health consultation; and the Health Services Command (HSC) provides direct support (clinical, pharmaceutical, preventive medicine, and industrial hygiene). The creation of the HSC in 1973 greatly lessened the control of medical resources of both the AMC surgeon and installation commanders. All medical personnel and equipment were placed under the command of the newly designated medical centers (MEDCENs) and medical department activities (MEDDACs). Through these activities, the HSC operates 36 clinics and two hospitals on AMC installations (Table 2-3). The U.S. Navy supports one installation (Crane Army Ammunition Activity) and a contractor operates one clinic located at a depot (Corpus Christi Army Depot). Although on-site contractors may operate the clinics at the ammunition plants, the USAEHA provides occupational and environmental health services to these plants. However, the quality of healthcare that the

**TABLE 2-2**

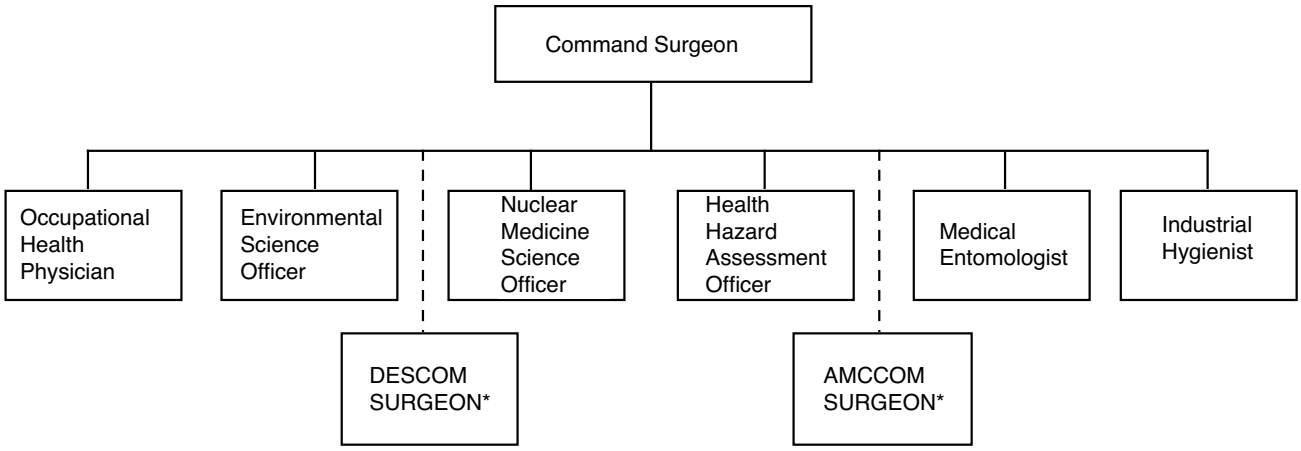
**ARMY MEDICAL DEPARTMENT STAFF ASSIGNED TO THE ARMY MATERIEL COMMAND**

| Location | Number on Staff |
|---|---|
| HQ AMC | |
| Office of the Surgeon | 6 |
| Environmental Quality | 3 |
| AMCCOM | 2 |
| Edgewood Research, Development, and Engineering Command | 5 (3 authorized) |
| AVSCOM/TROSCOM | 1 |
| Natick Research, Development, and Engineering Command | 5 (7 authorized) |
| Belvoir Research, Development, and Engineering Command | 1 |
| CECOM | 1 |
| DESCOM | 1 |
| LABCOM | 4 |
| Materiel Testing Laboratory | 1 |
| TECOM | 1 |
| Cold Regions Test Center | 1 |
| White Sands Missile Range | 1 |
| Science Technical Center, Far East | 1 |
| Science Technical Center, Europe | 1 |
| Program Manager, Saudi Arabia National Guard | 5 |
| US Army Chemical Materiel Destruction Agency | 1 |
| TOTAL | 41 |

contractor provides to his workforce is not a responsibility of the army. The physicians, nurses, industrial hygienists, and medical technicians, who provide direct patient care in clinical medicine and occupational health to the AMC workforce, report to a healthcare facility within the HSC. By monitoring these services and providing guidance regarding the command's medical policies and health priorities to HSC medical personnel and installation commanders, the AMC Surgeon is integral to occupational health.

It is detrimental to occupational health to use the same healthcare professional to provide both occupational health and clinical patient-care services. This doubling of responsibilities requires that a healthcare professional function both as staff officer and action officer. Because staff and action services are quite different, the mission would be better performed if the responsibilities were separated. Specifically, civilian and military physicians and nurses assigned to duties within the AMC usually have no special training in occupational health; however, they usually are very experienced in providing out-patient healthcare. Personnel untrained in professional occupational health who must perform staff functions (such as monitoring the effectiveness of occupational health programs and quality of healthcare) are put in the position of serving several masters (the installation commander, the MEDDAC commander, and the patient) whose interests could conflict. Furthermore, the current DoD system for assessing workload fails to provide any incentive for a medical staff to emphasize occupational health. Certainly, when the budget is stringent, personnel resources for direct patient care are more easily justified than those for occupational health; but then the installation commander, who is responsible for protecting the health of his or her employees, will have no one monitoring the programs related to occupational health.

Historically, the healthcare provided at AMC installations has been insufficient and fraught with problems. Most clinics are small and often are not staffed sufficiently to assure that both the primary healthcare




| Position | Duties |
|---|---|
| Occupational Health Officer | Medical advice and consultation<br>° Occupational and preventive medicine<br>° Clinical medicine<br>° Prophylactic immunizations<br>° Human use research protocols<br>Monitor health services provided by HSC for adequacy of services and staffing<br>Training of resident physicians |
| Environmental Science Officer | Health consultation<br>° Child development services<br>° Food service and personal sanitation<br>° Field and garrison water supply<br>° Wastewater, solid and hazardous waste disposal<br>° Health risk assessment in environmental contamination control<br>° Hazardous waste minimization<br>Occupational health partnership unit cost review<br>AMEDD health services support<br>AMEDD personnel management issues<br>Administrative officer for AMC surgeon |
| Nuclear Medical Science Officer | Radiological health consultation<br>° Ionizing and nonionizing radiation, including lasers<br>° Exposure control<br>° Waste disposal and contamination control<br>° Decontamination<br>° Health risk assessments<br>° Human use research protocols<br>Monitor AMEDD health services support<br>Compliance oversight<br>Nuclear surety inspections |
| Health Hazard Assessment Officer | Manage AMC Health Hazard Assessment program<br>Health consultation<br>° Health risks of developmental items<br>° Health risks of fielded items<br>° MANPRINT<br>° Health representation of system safety and technical integration working groups<br>Medical function area analysis |
| Medical Entomologist | Health consultation<br>° Pest surveillance and control<br>° Pesticide storage and disposal<br>° Pesticide war reserves<br>° Subsistence items development and storage<br>Monitor AMEDD health support<br>Monitor handoff and deployment of medically developed items |
| Industrial Hygienist | Industrial hygiene consultation<br>° Workplace exposures<br>° Hazard information<br>° Hazard identification and control<br>° Health risk<br>Monitor AMEDD health services support<br>Monitor compliance with OSHA, state, and army regulations<br>Technical oversight of compliance monitoring<br>Chemical surety hazard control |

*The dotted connecting line denotes a noncommand technical supervisory relationship

**Fig. 2-11.** Structure of the Army Materiel Command AMEDD staff.

**TABLE 2-3**

**HEALTH SERVICES COMMAND MEDICAL FACILITIES WITHIN THE ARMY MATERIEL COMMAND**

| Command | Facility | Command | Facility |
|---|---|---|---|
| AMCCOM | Rock Island Arsenal | DESCOM | Anniston Army Depot |
| | Pine Bluff Arsenal | | Corpus Christi Army Depot |
| | Watervliet Arsenal | | Letterkenny Army Depot |
| | McAlester Army Ammunition Plant | | Savanna Depot Activity |
| | Picatinny Arsenal | | Red River Depot Activity |
| AVSCOM/TROSCOM | St. Louis (2) | | Lexington Blue Grass Army Depot |
| | Natick Research, Development, and Engineering Center | | Sacramento Army Depot |
| CECOM | Ft. Monmouth (hospital) | | Seneca Army Depot |
| LABCOM | Harry Diamond Laboratories | | Tobyhanna Army Depot |
| | Materials Technology Laboratory | | Tooele Army Depot |
| MICOM | Redstone Arsenal (hospital) | | Ft. Wingate Depot Activity |
| TACOM | Detroit Arsenal | | Pueblo Depot Activity |
| | Selfridge Air National Guard Bureau | | Umatilla Depot Activity |
| | | TECOM | Aberdeen Proving Ground |
| | | | Dugway Proving Ground |
| | | | Jefferson Proving Ground |
| | | | White Sands Missile Range |
| | | | Yuma Proving Ground |

and the occupational health missions can be accomplished. During the spring of 1992, the commanding generals of the AMC and the HSC decided that entering into a new joint partnership was the only way to ensure that the occupational health services available are both appropriate and sufficient. This partnership provides for the AMC to contract with the HSC for specific occupational health services and then to transfer sufficient operating funds to the HSC clinic to provide adequate staffing. Brooke Army Medical Center (BAMC) at Fort Sam Houston, Texas, and the four AMC installations within the BAMC region (Corpus Christi and Red River Army Depots, McAlester AAP, and Pine Bluff Arsenal) will test this initiative.

## MOBILIZATION AND DEPLOYMENT

Mobilization is the process of preparing for war or other emergencies by assembling and organizing national resources. It encompasses all activities necessary to move, systematically and selectively, from a normal state of peacetime preparedness to a wartime fighting posture. Deployment is the physical movement of a military force to the site of an actual or potential conflict. Both mobilization and deployment are resource intensive, especially of personnel. Any personnel-intensive action, especially one that must be performed expeditiously, requires medical support. Adequate and timely medical support can only be provided with appropriate planning.

How does the study of occupational health relate to mobilization and deployment? AMEDD personnel must understand the impact that total mobilization for war would have on occupational medicine. Mobilization during Operation Desert Storm was only partial; the United States has not been totally mobilized since World War II. Then, raw materials and food were rationed; jobs previously performed by healthy, experienced men were performed by women and men who were categorized 4F (partially disabled); and all major industries developed and produced materiel as rapidly, and in as great quantities, as possible. The army's current occupational health stance was developed during this period as a response to the need to keep the industrial workforce as healthy as is practicable.

### Mobilization as a Deterrent

The capability of the U.S. Army to mobilize and deploy its active force rapidly and efficiently is essential to deterring potential enemies and ensuring our

allies of our support. Coordination of mobilization planning is crucial to achieving such a goal. Potential enemies must be convinced that the United States can quickly mobilize and deploy active- and reserve-component combat forces in sufficient time to influence the early stages of conflict. The reserve components must be visibly able to mobilize in the required time, at the right place, and in the state of readiness necessary to meet the threat. The DoD has the responsibility for developing and executing plans for national defense. The secretary of defense and the joint chiefs of staff provide guidance to the commanders of the unified and specified commands charged with developing the capability plans to meet various potential threats.

Mobilization includes options for deterring war and, should deterrence fail, for enhancing force readiness, deployment, and sustainment. Force sustainment includes both transporting and maintaining materiel and personnel (providing medical care). The complexity and magnitude of the mobilization process make sound planning essential. The DoD's Master Mobilization Plan provides the framework for making and implementing mobilization decisions to support military operations. It also provides guidance for detailing plans to support the mobilization process for the DoD. This plan assigns responsibilities and describes activities and organizational relationships and the DoD's planning and execution process. Simply stated, this plan describes what is to be done and who is to do it. How the various tasks are to be done is explained in detail in the subsequent levels of planning, except that tasks that require the secretary of defense's decisions are in the DoD plan. The joint chiefs of staff, the uniformed services, and the defense agencies all develop their own planning systems, consistent with DoD guidance. The entire mobilization planning process will eventually be linked by a mobilization planning management system.

Of course, mobilization planning is only one small part of the planning process. Of the several unified commands with geographical responsibility (the European Command [EUCOM], the Central Command [CENTCOM], the Southern Command [SOUTHCOM], and the Pacific Command [PACOM]), a large part of the headquarters responsibilities is to prepare the operation plans for the most probable war scenarios in their regions. These plans are comprehensive: they address not only tactical operations but also the deployment, movement, and sustainment of troops and materiel. Many military operations plans require personnel and materiel resources greater than the active forces can field. This is where mobilization plans come into play: plans to mobilize reserve units, field war-reserve equipment, and mobilize all or part of the United States's industrial base to build new equipment.

### *Mobilization of the Reserve Component*

The deterrent value of the U.S. Army's reserve component is predicated on its combat power, readiness, and ability to mobilize and be deployed rapidly enough to influence the early stages of a conflict. An effective deterrent must be clearly evident to a potential enemy. The capability to mobilize rapidly is crucial to effective deterrence; it is the means by which political or military intent is translated into usable combat power. A ready mobilization capability demonstrates resolve and national commitment; it not only deters enemies but also assures allies that the United States has both the capacity and the will to stand by its commitments.

### *Readiness*

The deterrent value of mobilization resides not only in the readiness of the active and reserve components but also in the resolve and preparedness of military and civilian leaders to rapidly expand the military capability of the United States. Civilian manpower must readily be converted into military units, and civilian industrial production must readily be converted to wartime industrial capacities.

The United States must, first, have the will to sustain an expanded or protracted war against numerically superior forces and, second, be able to conclude the conflict on terms favorable to this country and its allies. To accomplish these goals, the military establishment places great confidence in the capacity of this nation to redirect its civilian economy to expand and sustain military power through the readiness of its transportation system, war reserve stocks and strategic stockpiles, personnel, and support base.

***Ready Transportation System.*** The United States must maintain civil and military land, sea, and air transportation systems that not only fulfill the nation's peacetime economic and military needs but are also capable of meeting and sustaining a mobilization surge. Constant study and planning must be conducted to ensure that new transportation facilities are provided and old systems rehabilitated in a manner that will enhance the nation's wartime mobilization transportation demands. The United States must have sufficient ground transportation to transport personnel and materiel to ports of embarkation within CONUS, and sufficient air and sea assets to transport them OCONUS to the area of conflict.

***War Reserve Stocks and Strategic Stockpiles.*** The United States must maintain enough *war reserves* (military equipment) and *strategic stockpiles* (raw materials that are not produced domestically in sufficient quantity to meet wartime demands) of critical resources in peacetime to last from the time that initial stocks are consumed until the industrial base can convert to wartime footing and sustain the needed flow of weapons, ammunition, equipment, and other essential implements of war.

***Personnel Resources.*** The United States must provide adequately for manned reserve components that are thoroughly trained and ready, with little or no notice, to engage in high-intensity warfare. It also needs enough pretrained individuals to fill active- and reserve-component units to wartime strength and to provide casualty replacements until the draft and the training base can provide trained personnel to sustain the wartime forces.

***Ready Support Base.*** Mobilization, deployment, and sustainment depend on an effective support base in CONUS. The United States's capability to convert to a wartime footing must be continuously assessed, and remedial action must be taken where necessary to ensure the most-rapid conversion to a wartime posture. The support base includes

- support from federal agencies (such as the Selective Service System),
- expansion of the CONUS transportation,
- expansion of the CONUS medical base,
- expansion of the personnel system,
- expansion of installations,
- support to and expansion of the training base,
- industrial expansion, and
- increased capabilities of the reserve component.

## The Mobilization Process

### *Premobilization*

Premobilization is a general term, apparently without specific definition. Premobilization can be considered to reflect a state of readiness only after a degree of mobilization has been achieved. Military planners think of the U.S. Army as always in a state of premobilization. If international conditions or national emergencies warrant, the president of the United States can activate the *Presidential 200K Call-up*. This authorizes that individuals of the selective reserve—up to 200,000 members from all services—be mobilized for up to 90 days to meet the requirements of a military contingency. Premobilization does not have a direct impact on the industrial base.

### *Levels of Mobilization*

The magnitude of the emergency governs the level of mobilization. As authorized by law or congressional resolution, and when directed by the president, the DoD mobilizes all or part of the armed forces. Concurrently, the DoD and other federal agencies marshall the national resources necessary to sustain the armed forces.

***Selective Mobilization.*** For a domestic emergency, either congress or the president can order expansion of the active armed forces by mobilization of reserve component units or individual ready reservists (IRRs), or both, if necessary to protect lives and federal property and functions, or to prevent disruption of federal activities. A selective mobilization normally would not be associated with the requirement for contingency plans involving internal threats to the national security.

***Partial Mobilization.*** For a contingency operation or war plan, or upon the declaration of a national emergency, congress or the president can order augmentation of the active armed forces, short of a full mobilization, by mobilizing up to 1 million members of the ready reserve for up to 24 months.

***Full Mobilization.*** Full mobilization requires that congress pass a public law or joint resolution declaring war or a national emergency. It involves the mobilization of all reserve component units, all IRRs, all skeleton units within the existing force structure, and the material resources needed to support and equip the expanded force structure.

***Total Mobilization.*** Total mobilization involves expanding the active forces by organizing or activating, or both, (*a*) additional units or personnel beyond the existing force structure and (*b*) all the national resources needed, including production facilities to complement and sustain such forces. The last time that the United States was totally mobilized was during World War II.

## Legal Basis for Mobilization of Reserve Components

The authority to order mobilization resides with the president, the congress, or both. The secretary of defense, on the advice and recommendation of the service secretaries and the joint chiefs of staff, recommends that mobilization authority be granted to support a contingency (a situation for which no specific plan exists), an operation plan (a plan previously developed by an unified command and approved by the National Command Authority), or other national emergency. The secretary of defense directs the mo-

bilization of reserve component units and manpower through the respective military departments.

### *Extension of Appointments, Enlistments, and Periods of Service (Stop Loss)*

Stop loss is the process by which the period of active-duty service of any member of the armed forces of the United States is extended involuntarily for the duration of a national emergency or declared war plus 6 months. There are three principal situations in which stop loss might be invoked:

- First, stop loss is automatically invoked and immediately effective if congress declares war or a national emergency. Enlistments are automatically extended. Reserve-component officers are appointed for an indefinite period and are held at the pleasure of the president. If congress is in session, the president must request congressional authority to extend enlistments in any situation other than a congressionally declared war or national emergency. If congress is not in session and the president decides that the national interest so requires, the president may authorize the secretary of defense to extend, for not more than 6 months, any individual's military status that expires before the 30th day after congress next convenes. (This process occurred during Operation Desert Shield.)
- Second, the joint chiefs of staff will recommend that stop loss be invoked for active-duty and reserve components when an involuntary mobilization of reserve components is being executed. Exceptions to this policy would be a presidential call-up of the national guard in a domestic emergency or a 90-day order for operational missions. Both these exceptions envision a very short term of active duty. State governments, however, may call up national guard units for local and state emergencies.
- Third, the need to draft soldiers through the Selective Service System must be considered in consonance with the mobilization of reserve components. Currently, the Military Selective Service Act provides that individuals can only be inducted as a result of an act of congress.[4]

### *Phases of Mobilization*

For ease in describing the process, the phases of mobilization can be described as (*a*) peacetime planning and preparation (premobilization), (*b*) alert, (*c*) mobilization, (*d*) deployment, and (*e*) sustainment. As a continuous process, mobilization can proceed at a deliberate pace from peacetime preparation to mobilization (M-day), deployment (C-day), and the beginning of the contingency operation or hostilities (D-day). The pace would be dictated by the deteriorating international relations. Alternatively, the process can proceed at an accelerated pace, collapsing the interval between peacetime planning and preparation and D-day. In the event of a surprise attack on the United States or her NATO allies, the process would proceed rapidly and D-day would precede or coincide with M-day.

### *Alert, Mobilization, and Deployment*

On receiving the order to mobilize, the army alerts the active force and simultaneously begins the selective, partial, or full mobilization of reserve-component units, manpower, and materiel within the approved force. The force, or portions of it, can augment an established theater of operations such as the European commands or, alternatively, can augment an emergency force such as the rapid deployment force (RDF) in contingency operations. In any case, under the general supervision of headquarters, DA, and using more than 50 available mobilization stations as necessary, active- and reserve-component units are brought to combat-ready status and are then deployed by air and sea to areas of operation. The services are responsible for providing healthcare support to the active mobilization stations. An already active medical unit can provide this support, or a reserve medical unit can be activated and assigned the task. This medical support is addressed in detail in the mobilization plan.

The initial resources sustain the deployed force until reinforcement and resupply can be affected, until the emergency is resolved, or until the industrial and training base assume a wartime footing. Active-component units that are in place in the theater of operations are called *forward deployed units*. Other active-component units, most of them CONUS–based, are earmarked to support one or more operational plans. Reserve-component units that are ordered to active duty can be earmarked either to support one or more operational plans or to become part of the CONUS base.

## THE MOBILIZED INDUSTRIAL BASE

Current mobilization and operations plans primarily address the AMC's and AMEDD's support of deployed combat and combat-support units. It is possible that detailed documentation of contingency plans for AMC installations during total mobilization do not exist. Few if any plans describe how AMEDD will support the mobilized industrial base. What is known is that (*a*) most of the army's medical assets will be either deployed within the combat zone or assigned to CONUS medical facilities to care for evacuated casualties and (*b*) AMEDD personnel assigned to the AMC installations will be responsible for supporting the industrial workforce. If plans to support the mobilized industrial base—especially in the fields of preventive medicine and occupational health—are inadequate, then medical support to these installations is likely to be inadequate. Inadequate medical support could well make the difference between a healthy, efficient workforce and an unhealthy, inefficient workforce; it could, potentially, even make the difference between effective industrial operations that provide needed materiel support to the war fighters—and defeat. To provide this support we must know two things: what the mobilized industrial base will look like and what AMEDD can do to protect the health of the force.

Of this entire volume, the sections that follow were perhaps the most difficult to prepare. The difficulty was due, primarily, to the lack of pertinent, authoritative sources of information. Only two fairly adequate sources were found: (1) the transcript of a U.S. Army Preventive Medicine symposium held in September, 1987, which dealt with occupational health support for the mobilized industrial base; and (2) the report of a survey conducted by USAEHA industrial hygiene personnel at an inactive army ammunition plant in 1988. What follows is not a factual, detailed discussion of what the mobilized industrial base would be, nor what specific occupational health program services would be required. Rather, it is a general discussion of those factors that are likely to be important for consideration if AMEDD is called upon to support a fully mobilized industrial base.

For purposes of this discussion, the term *industrial mobilization* refers to the conversion of peacetime production capabilities to full-scale production of military items. Industrial mobilization would affect not only the AMC industrial base but also private-sector manufacturers of every type. Mobilization, if required today, would be characterized by

- radical changes in the qualitative and quantitative nature of processes and products;
- the use of old, out-dated, and possibly unsafe production processes;
- the development of new, untested methods and products; and
- major demographic alterations in the workforce.

### Changes in Industrial Processes

Upon mobilization, AMC's government-owned, government-operated plants and government-owned, contractor-operated plants would increase production as rapidly as possible. Full production would require the lengthening of workshifts to as much as two 12-hour shifts, 7 days per week. Production would also be increased significantly by adding key production lines. A number of the plants already have floor space designated for these additional lines, and the production machinery is kept in storage.

Increased production would be accompanied by four important occupational health concerns. First, engineering controls already in place (especially exhaust ventilation) are probably designed for current production levels. Increasing the rate of production or the number of lines might exceed the capability of the controls to maintain airborne levels of potentially hazardous substances within acceptable limits. Second, increasing the number and length of workshifts would place workers at increased risk from both safety hazards (tired workers are more likely to be careless) and toxicological hazards (the workers are exposed for longer times). For example, during World War II, the push for increased production in ammunition plants led to increased exposure to toxic hazards (such as TNT) and significant increases in job-related diseases from that exposure. Third, stored equipment is less likely to have up-to-date safety features, and equipment operators would be less likely to be adequately familiar with its operation. And fourth, increased production and increased numbers of shifts would require a larger workforce, most of whom would be inexperienced and possibly inadequately trained, thereby increasing their risk of injury.

Mobilization would also have an impact on private-sector manufacturers. For example, automobile manufacturers in the United States have agreements with the United States government that they will produce military vehicles if requested. A mobilized automotive plant might begin to produce tanks. Some industries would be asked to make even more radical changes in production. For example, seven complete plant-equipment packages for the production of cannons are stored at various locations throughout the United States. During mobilization, these packages would be brought out of storage and set up at private-sector factories. Such radical changes in product would be likely to pose significant risks to the workforce.

The AMC maintains a number of mothballed ammunition and other production plants. These plants would probably be reopened if the United States were to enter into a protracted, full-scale war. The occupational health concerns associated with reopening older facilities are addressed in detail later in this chapter.

**Development of New Technology and Products**

The drive for increased production has always led to advances in technology and modernization of factories. When an adversary employs new weapons systems, nations either perish or respond by developing similar or better weapons and adequate defenses. Often, the need to develop new technologies quickly overrides the need to assure that safe and adequate processes and products are developed. For example, in response to Operation Desert Shield, the AMC stepped up the development of, and prepared to manufacture and deploy, more than 40 new major items. One of these was a lightweight, chemical-protection overgarment, developed in response to the possibility that chemical weapons would be used in a hot, desert environment.

Fortunately, processes were in place to thoroughly review the product's efficacy and safety before the garment was purchased and deployed (the HHA process, which is the subject of Chapter 6, Health Hazard Assessments). Had the garment been fielded without an HHA, we would have learned quickly that not only did it not provide adequate chemical protection, but in the desert heat it also provided no heat-stress advantage. Specifically, lightweight protective clothing needed to meet two requirements: (1) the protection provided needed to equal or exceed the currently fielded Battle Dress Overgarment and (2) the garment needed to provide at least a 20% reduction in heat stress in the desert environment. The recommended garment did neither.

**The Expanded and Inexperienced Workforce**

Total mobilization will change the nature of the workforce, much as it changed during World War II. Obviously, the size of the workforce would have to increase dramatically to staff additional shifts, new productions lines, and newly opened plants. Most of these new employees would be inexperienced and require job training. The degree of urgency for the product would be the primary factor influencing the time available to assure adequate job training. A largely untrained, inexperienced workforce would be likely to experience significant injury and illness rates if the occupational safety and health staff are not sufficiently prepared and vigilant.

The demographic characteristics of the workforce would also be changed. The selective service draft would probably be reinstituted, and during its initial stages, young, healthy males would be entering military service and not be available to the industrial base. A large number of older men and women, not necessarily eligible for the draft, would probably volunteer for military service, which would remove this population from the industrial base also. Thus, demographically, the remaining industrial workforce would be older, less healthy, and contain more women who, at least temporarily, would be additionally burdened by being single heads of households.

**Medical Support of the Mobilized Industrial Base**

All the characteristics of the mobilized industrial base described above would affect the need for quantitative and qualitative changes in the medical support provided by the AMEDD. Ideally, every AMC installation would have an up-to-date mobilization plan, as is required by Army Regulation (AR) 700-90, *The Army Industrial Base Program*.[5] Included in this plan would be a detailed discussion of anticipated changes in both processes and the workforce. Attached to this plan should be the HSC clinic's plan for supporting the mobilized installation. Unfortunately, this is probably not the case.

Although the nature of the occupational health services provided might change, the greatest impact would probably be in the amount of services needed. Each HSC clinic has what is known as a mobilization Table of Distribution and Allowances (TDA), which describes required staffing levels. Because the planning at AMC and HSC has not been well coordinated, some TDAs for clinics are likely to be inadequate, if not wholly unrealistic:

- The mobilization mission at one AMCCOM installation requires that it increase its patient load up to 3-fold. Its mobilization TDA calls for increasing medical officers by five. However, the same TDA increases the clerk typists by *only two*.
- Another HSC clinic, which could also be expected to increase its workload up to 3-fold, has a mobilization TDA that is *exactly the same* as its peacetime staffing.

Clearly, if total mobilization were to be implemented under these TDAs, it is highly probable that healthcare services provided by the installation medical facility would be substantially inadequate.

## U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY MOBILIZATION STUDY

To ascertain the potential for occupational health problems during mobilization, the USAEHA conducted a survey of an inactive U.S. Army ammunition plant in May 1988.[6] The survey is included in this textbook because it is the only report of its kind available. The findings that follow may or may not be representative of the problems that exist throughout the army's industrial base, or even at plants similar to the one surveyed. Even so, the report offers interesting insights.

Although the plant was classified as inactive, three production lines were in operation at that time. The primary mission of the plant was to manufacture metal parts for various types of ammunition, which most recently had consisted of 40-mm and 60-mm projectiles, 81-mm mortar bodies, and grenade bodies. The secondary missions included the operation and maintenance of active and layaway facilities; the procurement, storage, and issue of necessary supplies and materials; and industrial preparedness and mobilization planning.

The process flow of individual production lines was divided into two major areas—mortar shells/case cartridges and grenade bodies—although the production processes were very similar. The metal bar stock was first cut into billets, blasted with an abrasive material, and then heated in an induction furnace. The billets were then surface-treated in processes such as acid pickling or alkaline cleaning before they passed through a series of progressive forging operations. The metal parts then progressed through metal-machining and heat-treating operations before the final painting, inspection, and packaging phases. In addition to the process outlined, the grenade-body production line included machining operations with chlorinated oil, wet-vibratory deburring, and nondestructive testing, such as ultrasonic crack testing. The USAEHA survey team ascertained the potential health hazards associated with each phase of the ammunition production process (Table 2-4).

### Survey Findings

To project problems in mobilization, the USAEHA had to make several assumptions before reaching any conclusions. The agency assumed that the ammunition plant's mission during mobilization would continue to be the manufacturing of metal parts for various types of ammunition. Of course, production rates would increase during mobilization from an 8-hour workday and 40-hour work week to a 10-hour workshift with two shifts per day. To adequately protect workers from overexposures, permissible exposure levels (PELs) had to be calculated to compensate for the increased production rate. The agency also assumed that federal and DA occupational safety and health regulations would not be waived during mobilization. These assumptions directed the USAEHA to make several discoveries relating to (*a*) personal protective equipment (PPE), (*b*) the respiratory protection program, (*c*) the hazard communication program, (*d*) the asbestos management plan, (*e*) the hearing conservation program, and (*f*) occupational health and industrial hygiene support.

#### *Personal Protective Equipment*

The survey reported that those who worked on the active production lines were provided applicable PPE such as safety glasses, steel-toed shoes, and hearing protection. If mobilization were to occur, the increased workforce would also require PPE, the assignment of which presumes medical evaluations and clearances and necessitates a formal training and fitting program.[7] Without the services of adequate planning and support personnel such as occupational health professionals, the potential for mobilized workers to be assigned tasks without first receiving proper PPE, training and fitting instructions, or medical evaluation increases.

**TABLE 2-4**

**ANALYSIS OF HAZARDS IN AN AMMUNITION PLANT**

| Operation | Potential Health Hazard |
|---|---|
| Abrasive Blasting | |
| Blasting parts with steel shot | Total nuisance dust<br>Total respirable dust<br>Various metals and oxides<br>Noise |
| Dip-Tank Cleaning | |
| Treating parts in $H_3PO_4$ solution | $H_3PO_4$ mist |
| Surface Preparation | |
| Surface treating parts in $H_2SO_4$ or NaOH | $H_2SO_4$<br>NaOH |
| Plating | |
| Treating parts in $H_2CrO_4$ solution | $H_2CrO_4$ mist |
| Metal Finishing | |
| Vibrating parts in abrasive stone and weak alkaline water solution | Various metals and oxides<br>Noise |
| Painting | |
| Painting parts (electrostatic, brush, or roller) with lead and chromate primer, top coat (lacquer, enamel), and drying in oven | Chromates<br>Lead<br>Noise<br>Various solvents |
| Forging (Cold or Hot) | |
| Forging parts with hydraulic presses | Noise<br>Heat stress<br>Oil mists |
| Heat Treating | |
| Annealing parts in liquid-propane gas furnace containing an $N_2$ atmosphere, and may also contain various salts of $CaCl_2$, Ba, Na, or K | NOx<br>Heat stress<br>CO<br>Soluble Ba compounds<br>Asbestos<br>Crystalline silica |
| Induction Heating | |
| Heating parts in electric furnace | Heat stress |
| Machining | |
| Machining parts using cutting fluids | Noise<br>Oil mists<br>Metal Ox |
| Shearing | |
| Shearing or cutting metal bar stock | Noise |
| Part Lubrication | |
| Coating parts with graphite lubricant | Graphite |
| Phosphate coat | |
| Coating parts with $Zn_3(PO_4)_2$ or $Na_3PO_4$ | None noted |
| Nondestructive testing | |
| Ultrasonic testing of metal parts | None noted |

Source: US Army Environmental Hygiene Agency. *Industrial Hygiene Mobilization Survey. Riverbank Army Ammunition Plant, Riverbank, Calif.* Aberdeen Proving Ground, Md: USAEHA; 1988. Survey 55-71-0033-891.

### *Respiratory Protection Program*

The ammunition plant maintained a respiratory protection program, which would require drastic expansion in resources on mobilization. However, if engineering controls similar to those on active production lines were to be operational throughout the facility, respirators would probably not be required. Prior to this determination, sampling would be imperative to document airborne contaminant exposure levels. No comprehensive airborne sampling had ever been conducted to demonstrate workplace exposures. During the survey, the local exhaust ventilation systems on the inactive production lines were found to be either absent or not in operable condition due to frozen bearings, removed belts, or disconnected electrical power. Much of the equipment had been cannibalized or removed and placed in storage.

### *Hazard Communication Program*

In accordance with Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1910.1200, *Hazard Communication*, employers are required to fully inform every employee who is potentially exposed to a workplace hazard of all that is known about that hazard.[8] This is the essence of hazard communication. The ammunition plant contractor had ensured that the air-pollution-control technician provided plant workers with hazard communication training. However, just as the respiratory protection program would require more attention during mobilization, so the hazard communication program must also expand with increased workforce and production rates. To maintain compliance with OSHA's hazard communication standard, frequent training must be conducted both as new workers enter the workplace and as increased production increases the possible hazards.

### *Asbestos Management Plan*

No written asbestos management plan was available at the plant during the survey. Although material suspected of containing asbestos was observed within both active and inactive areas, it appeared to be contained and nonfriable. However, suspect asbestos-containing material found outdoors on above-ground steam and water lines was damaged and friable.

### *Hearing Conservation Program*

No master list or diagram of hazardous noise areas within the plant was available during the survey. This was unfortunate because this document would have aided significantly in estimating the resources required for a hearing conservation program (for example, the type, amount, and cost of hearing protective devices necessary; and the number of potentially exposed workers requiring training and medical surveillance). The accumulation of noise data to establish a historical record of noise levels must be accomplished over time, as inactive lines are activated. In the interim, extrapolations can be made between similar active and inactive operations to predict hazardous noise areas.

### *Occupational Health and Industrial Hygiene Support*

The agency discovered that the contract between the DA and the contractor, as well as the industrial readiness plan (IRP), the industrial preparedness plan (IPP), and the mobilization master plan (MMP) lacked stipulations for industrial hygiene and occupational health services.[9,10]

### Survey Recommendations

Based on survey findings and predicted mobilization requirements, the agency provided several recommendations for the ammunition plant to help protect both contractor and government personnel, and to ensure regulatory compliance. Although government contractors are obligated to adhere to federal regulations, the USAEHA maintains that all applicable U.S. Army regulations, as specified in the recommendations that follow, be incorporated in the contract:

- Address the availability, procurement, and issue of applicable PPE, and required training, fitting and medical evaluation of personnel in mobilization plans and timetables, as required by Title 29, Code of Federal Regulations (CFR), Section 1910.132(a), *Personal Protective Equipment*[11]; and AR 385-10, *The Army Safety Program*.[7]
- Perform industrial hygiene evaluations and document air sampling of the inactive production lines, once they are activated for mobilization or premobilization, to identify the need for PPE and engineering controls, as maintained by Title 29, CFR, Section 1910.1000(e), *Air Contaminants*[12]; AR 40-5, *Preventive Medicine*[13]; and Technical Bulletin, Medical (TB MED) 502, *Occupational and Environmental Health Respiratory Protection Program*.[14]
- Perform occupational noise evaluations of inactive production lines, once they have been

activated for mobilization or premobilization, to establish a master list and a diagram of hazardous noise areas and to evaluate PPE and engineering controls, as maintained by Title 29, CFR, Section 1910.95(c) and (d), *Hearing Conservation*[15]; AR 40-5[13]; and TB MED 501, *Occupational and Environmental Health Hearing Conservation*.[16]
- Establish an asbestos-management program to preclude both worker exposure and asbestos-fiber release into the environment, as maintained by Title 29, CFR, Section 1910.1001, *Asbestos, Tremolite, Anthophyllite, and Actinolite*[17]; and TB MED 513, *Occupational and Environmental Health Guidelines for the Evaluation and Control of Asbestos Exposure*.[18]
- Modify the existing contract between the DA and the contractor to include occupational health support, as maintained by AR 40-5.[13]
- Maintain engineering controls that protect the workers' health.
- Modify the AMCCOM 319-R, *Current or Backlog of Deficiency Identification and Industrial Preparedness Measure of the IPP*,[19] to include a more specific breakdown of occupational safety and health deficiencies into two separate categories: occupational safety and industrial hygiene.
- Modify the IPP mobilization manpower requirements to include clerical support for the government safety office, and staffing requirements for industrial hygiene, optometry, occupational health nursing, clinical laboratory X-ray technicians, and occupational health professionals.
- Modify the responsibilities of the government safety office and the contractor's health and safety administration office in the IPP to include industrial hygiene services.

**Survey Implications for Mobilization Preparation**

According to the USAEHA, occupational health support is absolutely necessary during mobilization. The need to maintain a viable workforce to meet production quotas, while complying with federal and DA health and safety regulations, requires a professional staff supporting a comprehensive occupational health program. The survey found potential occupational health problems that are common for recently mobilized depots and army ammunition plants. For example, the ammunition plant's industrial preparedness plan indicated that safety and health mobilization manpower requirements for government personnel included a chief safety manager and two safety specialists. However, manpower for contract personnel included a safety and health administrator and a nurse. Surprisingly, the plan did not identify the need for an occupational health physician, an occupational health nurse, industrial hygiene support, or even clerical support for the safety office.[10]

***Occupational Health Manpower Indicators***

The amount and type of occupational health professionals necessary to support mobilization are partly dependent on the installation's population (Table 2-5). The occupational health professionals necessary to support mobilization of an ammunition plant include occupational health physicians, occupational health nurses, optometrists, and industrial hygienists. Quantifying the exact number of occupational health professionals necessary to support operations also depends on other variables, including (*a*) the estimated workforce, (*b*) the occupational health regulations in effect, (*c*) the production and control processes, and (*d*) the requirements for raw materials and *end products* (the finished products).

***Workforce.*** The composition of the workforce determines the amount of time per worker required of each occupational health profession. Industrial operators, for example, will require more preemployment medical screening than a clerk-typist, whose physical condition to withstand the physical and chemical insult of the metal-working industrial environment is not a determinant of the ability to perform clerical duties. Likewise, the industrial hygienist will spend more time with industrial and production workers than with administrative personnel.

***Occupational Health Regulations.*** Occupational health regulations tend to become more numerous and complex; there is no indication that this trend will slacken in the future. The more stringent and numerous the regulations become, the more occupational health support will be required to maintain existing programs such as hazard communication, medical surveillance, evaluation of engineering controls, and PPE, and any programs dictated by future regulations. Because these regulations cannot be waived during mobilization, the number of occupational health professionals needed to maintain the regulations' directives are a factor in determining manpower requirements.

***Production and Control Processes.*** Production and control processes at an ammunition plant may range from inactive production lines with cannibalized or malfunctioning engineering controls to active production lines with adequate engineering controls. The condition of the production and control processes also, in part, determine the level of occupational health

**TABLE 2-5**

**OCCUPATIONAL HEALTH PROFESSIONALS REQUIRED PER AMMUNITION PLANT**

| Position | Installation Population | Installation Population Increase Determining Additional Position |
|---|---|---|
| Part-time occupational health physician* | < 2,000 | — |
| Full-time occupational health physician* | > 2,000 | 3,500 |
| Full-time occupational health nurse* | > 350 | 750 – 1,000 |
| Part-time optometrist*† | < 10,000 | — |
| Full-time optometrist*† | > 10,000 | — |
| Full-time clinical laboratory/X-ray technician‡ | > 2,500 | — |
| Full-time industrial hygienist‡ | > 1,000 | 1,000 – 1,250 |
| Full-time industrial hygiene technician‡ | > 750 | 750 – 1,000 |
| Full-time clerk/typist | — | > 1,000 |

*Source: Zenz C, ed. *Occupational Medicine, Principles, and Practical Applications.* Chicago: Year Book Medical Publishers; 1984: 77–82.
†Source: Brown ML. *Occupational Health Nursing, Principles, and Practices.* New York: Springer Publishing Co; 1981: 224–226.
‡Source: USAEHA unpublished data.

support necessary. With continuing developments in new end products and manufacturing techniques, the level of occupational health support will be influenced by the production and control processes existing at the time of mobilization.

***Raw Materials and End Products.*** Like production and control processes, the types of raw materials and end products affect the level of occupational health support required. Manufacturing a new end product means changes in raw materials and processing techniques, which, in turn, alter the types of contaminants generated. The types and levels of health hazards associated with the raw materials and contaminants generated in manufacturing help to determine occupational health manpower requirements.

### *Mobilization Duties*

Not only are occupational health professionals necessary, the USAEHA also suggests that they be incorporated into the mobilization workforce as early as possible. If full-time occupational health services are not necessary at a specific installation, or are time and cost prohibitive, the USAEHA recommends using independent, or fee-for-service, occupational health professionals from the local community. It is also imperative to consider, even before mobilization, the clerical and technical support, equipment, analytical and chemical laboratory support, X-ray capability, installation transportation, and other services and supports necessary for occupational health professionals to accomplish their jobs. Even before operations begin, an industrial hygienist should make a preoperational inspection of the industrial facility to determine the occupational health hazards and requirements. This process would include a facility walk-through, where the industrial hygienist—with a list of raw materials, intermediate products, final products, byproducts, and hazardous materials—scrutinizes product flow, equipment placement, and every other aspect of the industrial operation. Occasionally, all machinery is in place and operable, but at other times, some of the equipment is in storage or is inoperable; then the industrial hygienist must attempt to visualize it as a fully functioning operation with all its equipment in place. Nevertheless, the industrial hygienist must first determine the adequacy of engineering controls to protect workers from occupational exposures and then, if necessary, select the necessary PPE. While the facility is being readied for production, occupational health professionals need to (*a*) provide new employees with preemployment medical evaluations where baseline data are required, (*b*) train and fit-test for necessary PPE, and (*c*) train for chemical hazard communication, as authorized by OSHA.

Once the facility is operational, it will still take time for the occupational health professionals to assimilate the specifics of the industrial operation. Industrial hygiene personnel, for example, will require firsthand knowledge of the operation's physical-agent sources such as noise, vibration, and heat energy; and chemical-agent sources such as gases, mists, and vapors. This knowledge is necessary to evaluate the effectiveness of existing engineering controls, develop abatement actions, and analyze administrative controls to further reduce exposure.

## SUMMARY

The U.S. Army must be able, at a moment's notice, to defend the nation and support its foreign policy; the army must also be able to mobilize and deploy its reserve component. This mission cannot be taken lightly. The U.S. Army operates one of the largest industrial bases in the nation, most of which is under the command and control of the AMC. Divided into 10 subordinate commands, the AMC has more than 100,000 employees, and operates more than 40 industrial installations throughout the world.

The responsibility for providing adequate medical support to the army's industrial base falls squarely on the shoulders of AMEDD. Adequate support can only be provided if the services are based on a thorough evaluation of installation needs. Medical personnel must understand the organizational structure of the army's industrial base and the nature of the industrial processes. At the installation level, assigned medical-staff personnel must know who the workers are and what they do. Only through a full understanding of both worksite and workers can cost-effective, appropriate occupational health services be provided.

Should the United States ever again be totally mobilized for war, the army's industrial base will also mobilize. This means that government-owned and -operated plants will dramatically increase production, mothballed plants will be brought into production, and private-sector industries will begin to produce military equipment. All these actions will result in a workforce that is substantially increased, inexperienced, and demographically different—a workforce quite likely to be exposed to new and more significant job-related hazards. If AMEDD is to fulfill its mission of providing adequate occupational health services and protecting the health of army workers, we must anticipate the needs of the mobilized industrial base, know how to respond to those needs, and develop superior occupational health plans and programs that ensure adequate services.

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