

CHAPTER 1

INTRODUCTION TO MINE WARFARE

LEARNING OBJECTIVES

Upon completing this chapter, you should be able to do the following:

1. Summarize the history of mines and their development.
2. Describe the types of mines and their categories.
3. Describe how mines are actuated.
4. Describe the methods of planting mines and the advantages and disadvantages of each method.
5. Describe the types and purposes of minefield.
6. Describe how the mine force fits within the larger structure of the U.S. Navy.
7. Describe how the mine force fits within the administrative organization of the Department of the Navy.
8. Describe how the mine force fits within the operational organization of the Department of the Navy.

A mine is specifically defined in the *Department of Defense Dictionary of Military and Associated Terms*, Joint Publication 1-02, as follows:

In naval mine warfare, an explosive device laid in the water with the intention of damaging or sinking ships or of deterring shipping from entering an area. The term does not include devices attached to the bottoms of ships or to harbor installations by personnel operating underwater, nor does it include devices which explode immediately on expiration of a predetermined time after laying.

Mines fill an important role in naval warfare. The mines discussed in this training manual are sea mines. You, as a Mineman, should be thoroughly familiar with the different mines and their uses. Therefore, this chapter provides you with a brief history of mines and their development; information on mine types; the methods of planting and the advantages and

disadvantages of each method; and the purposes of defensive, protective, and offensive minefield. This chapter also describes how the mine force fits within the larger structure of the U.S. Navy.

For additional information relating to the mine warfare program, consult the recommended reading list at the end of this chapter.

MINE HISTORY

The Chinese were the first people to use explosives underwater. After they discovered that explosives perform in the same manner underwater as they do underground, they placed charges under enemy riverboats to destroy them. Thus, the idea of mining became associated with underwater explosions.

A forerunner of the naval mine was devised by a Belgian engineer named Geanibelli, who was tasked to destroy the Bridge of Parma. He loaded an old ship with gunpowder and equipped the ship with a

clockwork ignition device, thereby making the ship, in effect, a floating mine.

In 1776, the first known sea mine was invented by an American, David Bushnell. Bushnell's mine was a simple, watertight wooden keg, shown in figure 1-1. Loaded with gunpowder and fitted with a gunlock and hammer, it hung from a float and, at that time, was called a torpedo. The device exploded by impact when the keg floated against a ship.

Although numerous incidents proved their destructive force, mines were considered too tricky, dangerous, and hard to handle to win a place with most early navies. The mines often exploded unexpectedly and at the wrong times. American ingenuity, however, found ways to refine the naval mine. Consequently, much of our naval history involves mines.

MINES BEFORE WORLD WAR II

Mines were first used in this country during the Civil War. After their successful use in that war, our country has used them in most subsequent conflicts.

Mines in the Civil War

During the Civil War, Robert Fulton, who was best known for his invention of the steamship, devoted a good part of his life to the successful experimentation with underwater mines. In the Civil War, the Confederates defended Vicksburg by floating mines down the Mississippi River.

The first recorded successful use of a mine occurred in 1863 when the gunboat USS *Cairo* was struck by mines in the Yazoo River. A year later, a field of 80 mines, which for the first time had safety devices, was laid to defend the city of Mobile, Alabama. The monitor USS *Tecumseh*, which led the Union fleet in attacking the city, was struck by a mine.

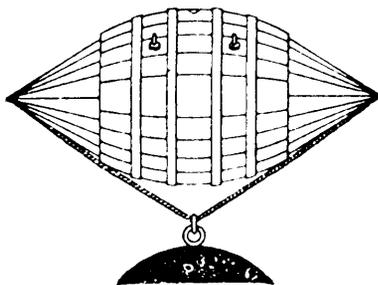


Figure 1-1.—Bushnell's keg mine.

This is the battle in which the victorious Admiral Farragut is famous for having said, "Damn the torpedoes [mines], Captain Drayton, go ahead! Jouett, full speed ahead!" History might have read somewhat differently but for the fact that, after the battle, the Federal forces discovered that the Confederate mines were inert due to immersion and wave action.

The Confederate mining efforts, on the whole, were remarkably successful. The record shows that of the ships sunk or damaged by mines during the Civil War, only one Confederate ship, the CSS *Albermarle*, was sunk by Union mines. Of the 35 ships sunk by Confederate mines, 3 were Confederate ships sunk by their own mines that had broken loose from their moorings.

Although mine developments up to that time were important, they had little practical significance. However, those developments provided the background for the first effective use of mines in warfare.

Mines between the Civil War and World War I

Between the end of the Civil War and the beginning of World War I, very little happened in the United States to advance the development of mines. This country relied on buying obsolete mines from other countries.

Although the United States was not involved in the Russo-Japanese War of 1904, mines played a decisive role in that war. It was during that time that mines had their first use in a naval action at sea. The Japanese lured the Russian fleet through the Japanese minefield, resulting in the loss of the Russian battleship *Petropavlovsk*. Admiral Makaroff, who had refused to change course because he did not consider mines dangerous, lost his life in this minefield. The Russo-Japanese War, in which the Russians sank more Japanese ships by mines than by any other form of attack, proved that mines were formidable weapons.

Mines in World War I

The United States had done very little to advance mine warfare. However, in 1917 when the United States entered World War I, many American inventors proposed various mine schemes. One such scheme noted that when a steel ship came in contact with a copper wire, it produced a galvanic current that could be used to fire a mine.

Much enthusiasm developed in the Bureau of Ordnance (BUORD) for the mine project. The Secretary of the Navy (SECNAV) authorized the bureau to procure 100,000 Mk 6 mines, shown in figure 1-2, to be used in the North Sea barrage. The mines were assembled at the rate of 6,000 a week. (The original number of mines required for this operation was 300,000. However, with the invention of the galvanic antenna firing mechanisms, the quantity was reduced to 100,000 mines.)

Through 30 October 1918, the United States had planted 56,611 American-made mines, and the British had planted 16,300 of their mines. This barrage, the greatest in history, was about 230 miles long and 15 to 25 miles wide. The barrage contributed to the mutiny of the German Navy in the last days of the war. When the Germans surrendered in November 1918, the United States and Great Britain were left with large stores of mines. See figure 1-3 for the depiction of a World War I mine and the barrage.

Mines after World War I

In 1919, a building was set aside and an activity was created to improve mines. The BUORD was reluctant to designate this new organization as anything more than a building. However, 10 years

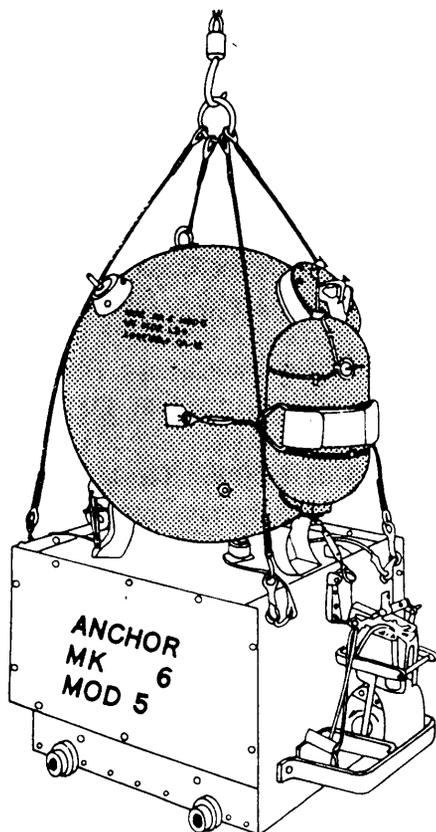


Figure 1-2.—Mk 6 mine.

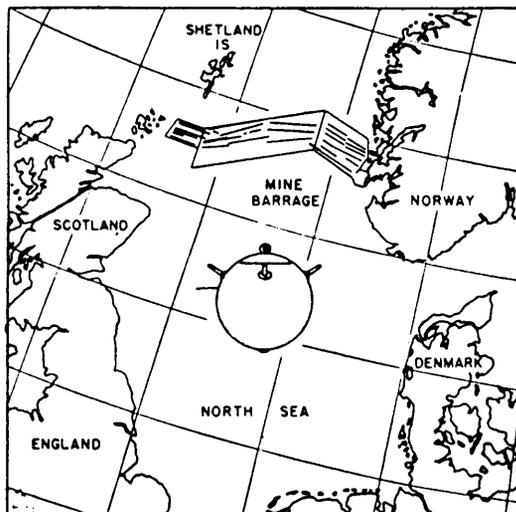


Figure 1-3.—World War I mine and North Sea barrage.

later, a small experimental ammunition unit was included in the organization, which was called the Naval Ordnance Laboratory (NOL). For the first time, the functions of material design, reliability, and explosive safety were the responsibility of only one activity. The tasks of the laboratory were to (1) investigate the magnetic and acoustic influences of ships, (2) design a magnetic firing device, and (3) design a 21-inch cylindrical mine that could be laid by submarines with standard torpedo tubes.

MINES IN WORLD WAR II

In 1940, the NOL decided to copy the mechanism of a German magnetic mine received from the British. Since the mechanism required a nonmagnetic case, the United States manufactured replicas of the German magnetic mine mechanism and placed them in aluminum mine cases. These devices were used early in World War II as Mk 12 mines.

Mines in the Pacific Theater

In October 1942, mines were laid in approaches to Bangkok, Thailand; Haiphong, (North) Vietnam; and the Hainan Strait, south of China. The mines, laid by submarines, immediately sank six ships and damaged six more. A total of 421 mines, planted by submarines in 21 areas, sank 27 ships and damaged another 27 ships.

About the same time that the Mk 12 mine was developed, the NOL initiated designs for several new mines that would respond to magnetic, acoustic, and/or pressure influences of ships. Other influences (such as gravitational, optical, cosmic ray, and electrical) were considered impractical and, therefore, were rejected. The mines were designed to be

launched from aircraft and to lie on the bottom after planting. Other features of these mines included (1) various sensitivity settings, (2) clock delay arming devices, (3) electrolytic sterilizers, and (4) ship counters.

The Mk 36 series mine contained 500 pounds of high explosives, while the Mk 25 series mine contained 1,000 pounds. Under the direction of the BUORD, the NOL started production of both mines in 1941. In 1944, the mines began to be delivered in quantities.

The Mk 25 and Mk 36 mines were used against the Japanese during Operation Starvation in the last 4 months of World War II. To carry out the operation, the Navy turned to the Army Air Force for the B-29 aircraft, which had the capability of carrying twelve 1,000-pound mines to destinations as far away as 1,500 miles (3,000 miles round trip).

On 22 December 1944, the Army Air Force issued orders for mining operations to begin on 1 April 1945. After the order was issued, the Navy moved a team of mine experts to Tinian Island in the Mariana Islands. One month later, the Navy had a mine assembly depot completed and in operation on the island.

The first minelaying in that operation occurred on 27 March 1945. The mines were planted in the Shimonoseki Strait, between the Japanese islands of Honshu and Kyushu. A total of 12,000 mines were planted in and around the Japanese main island of Honshu, and an additional 13,000 mines were planted in harbors and channels surrounding the newly extended Japanese Empire.

Mines in the Atlantic Theater

The British and the Germans also used mines during World War II, with devastating results. The British vessels sunk by German mines included 280 combatant and 296 merchant ships. The German fleet lost 250 combatant and 800 merchant ships to British mines. German mines destroyed 22 percent of the landing craft lost by the United States and British navies in landing operations in 1944 and 1945.

The Germans even planted 266 mines in the Atlantic Ocean along the eastern seaboard of North America, including 36 mines off Charleston, South Carolina. Nine ships were either sunk or damaged as a result of these mines.

MINES AFTER WORLD WAR II

After World War II, it was believed that the days of mine warfare were over, a conclusion that proved to be premature. Their usage again became apparent during both the Korean and Vietnam wars.

Mines in the Korean War

The North Koreans mined Wonson Harbor. The minefield consisted of 3,000 Russian mines, which included new ground mines, as well as moored mines of 1904 vintage. As in the past, mines proved to be very effective weapons.

Mine warfare in the Korean War was a shock to the U.S. Navy. As a result of the lesson learned in Korea, the Navy followed a more balanced approach to mine warfare in the 1950s. The development of the Mk 50 series influence mines with modular features provided the Navy with the 1,000-pound Mk 52 and 2,000-pound Mk 55 aircraft-laid bottom mines. These mines were sensitive to three influences of six variations. In the early and middle 1960s, two magnetic-influence moored mines became operational: (1) the aircraft-laid Mk 56, made of stainless steel; and (2) the submarine-laid Mk 57, made of fiber glass.

Mines in the Vietnam War

Mine warfare was next used in the war with North Vietnam, when the United States planted more mines than it did in all previous conflicts combined. Most of the mines used in Vietnam were modified versions of the low-drag aircraft bomb of the Mk 80 series. The modification was the result of the efforts of Gene Beach and Charles Rowsee at the White Oak Laboratory in Maryland, where the Mk 75 destructor adaption kit was developed. The kit permitted the conversion of the Mk 80 series bombs into magnetic mines known as destructors. The destructors could be used both on land and in the water. Ease in assembly permitted the use of over 250,000 of the destructors during the Vietnam War.

The destructors and other mines were used effectively in the mining of Haiphong Harbor and other North Vietnam ports. The mining operations were designed to prevent ships from leaving and entering the harbor and ports. Mining of Haiphong Harbor was accomplished with approximately 100 Mk 52 mines and 11,000 destructor mines. The

operation was successful and, once again, highlighted mine usage in warfare.

MINES TODAY

Today's mines are designed for deployment against many types of ships to achieve a variety of results. However, to meet the challenges of the missions that they may be called upon to perform, mines are becoming increasingly complex. Moreover, the number of these missions is so large that no one mine can serve all purposes. Therefore, the Navy stockpiles many types of mines with the necessary built-in versatilities to provide the options needed for a wide array of missions.

As previously mentioned, all mines discussed in this training manual are sea mines; i.e., those mines that are placed in deep or shallow waters, coastal areas, harbor entrances, rivers, canals, and estuaries. Sea mines also include destructors, which are general-purpose bombs containing influence-firing mechanisms.

Some mines with small explosive charges are designed only for use against riverboats and wooden vessels of small displacement. Some mines with large charges can destroy or damage most capital ships. Still, other mines are intended primarily for use against submarines.

Although mines are becoming increasingly complex (largely because of the intelligence built into their firing systems), the same technology that has made mines more complex in some ways has made them simpler in others. For example, the newer mines have features which make assembly, testing, and stowing much easier and safer than was possible with the older, less-complex mines.

The advantages of mines over other weapons include the following characteristics:

- Mines lie in wait for the enemy without accepting a return threat.
- Mines can win battles passively by influencing the enemy to retire without attacking.
- Mines can be successful in confining ships to a certain area where they can be attacked by other means.
- Mines can cause ships to take longer alternate routes.

- Mines are a continuous menace to enemy morale.

- Mines can attack targets that human controllers cannot see or hear.

- Mine effectiveness is measurable in delays caused to enemy operations.

- Mines can cause the enemy to expend effort and material on countermeasures that otherwise are not productive and would not be necessary.

- Mines are cost-effective in that their targets are very valuable. The cost to the enemy when a target is destroyed is often far greater than the combined cost of the mines and the laying of those mines.

MINE TYPES

When mines are classified according to the position they assume in the water, they fall into three categories: (1) bottom mines, (2) moored mines, and (3) drifting mines.

BOTTOM MINES

Bottom mines are most effective in comparatively shallow waters. A large negative buoyancy brings the bottom mine to rest on the ocean floor and keeps it there. In very deep waters, surface vessels may pass over the mine without actuating its firing mechanisms or, in the event of an actuation, without suffering much damage. Bottom mines planted in deep water are still effective against submarines.

MOORED MINES

Moored mines are used for deep-water planting and are effective against submarines and surface ships. The explosive charge and the firing mechanism in a moored mine are housed in a positive-buoyancy case; i.e., one that tends to float. A cable, attached to an anchor on the sea bottom, holds the case at a predetermined depth below the surface.

DRIFTING MINES

Drifting mines float freely at or near the surface. They have no anchoring devices, and their buoyancy is approximately neutral. The use of drifting mines was limited by the Hague Convention of 1907 and are no longer in the U.S. Navy's stockpile of mines.

MINE ACTUATION METHODS

Mines may also be described by their actuation, or detonation, methods. This description includes three types of mines: (1) contact mines, (2) controlled mines, and (3) influence mines. The U.S. Navy has no contact or controlled mines in service use. Therefore, the following paragraphs on contact and controlled mines are presented only for information.

CONTACT MINES

Contact mines are actuated by the contact of the mine cases, or their attachments, with a target. They guard a narrower path than the influence mines and are generally more vulnerable to enemy counter-measures. Their principal advantage is logistic, as they can be produced more cheaply than influence mines. Although the U.S. Navy does not use contact mines, they are still used by some nations in situations where the disadvantages are acceptable, as in protective or unprotective minefield.

CONTROLLED MINES

Controlled mines can be rendered safe, or they can be armed or fired at will from a central control station. Control mines, intended for protective use, have a limited operational utility. The U.S. Navy does not use controlled mines, but some nations, particularly those in close proximity to restricted international waterways, retain controlled mines because of the mine's unique advantage of permitting positive target selection.

INFLUENCE MINES

Influence mines are actuated by the effects of targets on the physical environments of the mines. The major operational advantage of the influence mine is that the target need not contact the mine case, thus providing greater actuation range. The U.S. Navy has only influence mines in its arsenal.

MINE PLANTING METHODS

When mines are classified according to the method by which they are delivered, they again fall into three categories: (1) aircraft-laid mines, (2) submarine-laid mines, and (3) surface-laid mines.

AIRCRAFT-LAID MINES

Aircraft carry mines the same way they carry bombs or torpedoes, internally (inside the bomb bay) or externally (on wing stations). The following are some of the advantages of aircraft-laid mines:

- Aircraft can carry mines into enemy-held areas where minefield can be reseeded over a long period of time without danger to the aircraft from previously planted mines.

- Aircraft can plant mines in enemy-held shallow coastal waters where other planting methods cannot be used.

- Aircraft mine laying is an effective planting method for blockading enemy shipping lanes. However, a disadvantage is that this type of planting cannot be done in secrecy.

SUBMARINE-LAID MINES

Planting mines by submarine has an advantage over surface craft and aircraft, as mining operations can be done in secrecy and at a great distance from the homeport. A disadvantage of using submarines is that they can carry only a limited quantity of mines. In addition, submarines must avoid the mined area for the armed life of the mines. Therefore, it would be unsafe for submarines to enter and reseed an established minefield.

SURFACE-LAID MINES

The surface-craft method of laying mines is used where secrecy is not of primary importance. This form of minelaying is usually performed by high-speed minelayers. A surface minelayer can carry a large number of mines and can lay a large minefield in a relatively short time. At the time of this writing, the Navy has no surface minelayers in commission. However, the Navy does have several types of cargo ships that can be used to surface launch the Mk 60 mine.

MINEFIELD TYPES

Fundamentally, mining should achieve its objective by making an area unsafe for passage of traffic. A minefield is an application of the capability of available mines and delivery vehicles to the problem at hand. Mines are not normally used just one at a time, but are used as a group to establish a minefield. Each minefield is planted for a defensive,

protective, or offensive purpose. The design of a minefield depends on the purpose of the field, including (1) the expected enemy traffic, (2) the type and number of mines available, (3) the field's geographic location, (4) the amount of enemy countermeasures to which it will be subjected, and (5) the laying agents to be used.

DEFENSIVE MINEFIELDS

Defensive minefield are laid in extra-territorial or neutral waters, and are designed to hold back the opposition. We try to keep the enemy guessing at all times about our minefield, but in some cases, the defensive field is well advertised so that the enemy will know it is there. The field then becomes more effective, since the enemy may decide not to enter those waters because of the existing danger. We still use the mined waters for our own shipping, and we supply accurate charts to friendly ships that need them. Some of the reasons defensive minefield are used are to

- provide permanent defense of harbors and anchorages,
- protect coastal shipping lanes from seaward attack,
- protect assembly points for convoys,
- provide submarine traps, and
- protect against invasion.

PROTECTIVE MINEFIELDS

Protective minefield are laid in friendly territorial waters to protect our own and friendly terminal areas, shores, and their approaches. Therefore, the fields differ in purpose as well as in the likely degree of enemy opposition.

OFFENSIVE MINEFIELDS

Offensive minefield take the action to the enemy. They are planted in enemy-held or disputed waters to disrupt enemy shipping by destroying or damaging the enemy's ships or by making areas unusable because the threat of losses is too great. In contrast to defensive and protective mining, offensive mining poses the most direct threat to the enemy and, once completed, none to own forces. Whenever possible, offensive mining should commence early in the conflict with the most appropriate countermeasures-resistant mines available for two reasons: (1) to present an early danger, and (2) to lessen the need for hazardous early replenishment. The United States

used an offensive minefield very effectively in Haiphong Harbor during the Vietnam War.

U.S. NAVY AND MINE FORCE ORGANIZATIONS

The mine force plays a very important role within the Department of the Navy (DON). This section describes some of the major components of this department and shows how the mine force fits within this organization.

U.S. NAVY ORGANIZATION

The following paragraphs discuss the three major organizational components of the U.S. Navy that relate to the mine force: (1) the Navy Department, (2) the naval shore establishment, and (3) the naval operating forces.

Navy Department

The Navy Department refers to the central executive offices of the Department of the Navy located at the seat of the government. It is organizationally comprised of the Office of the Secretary of the Navy and the Office of the Chief of Naval Operations. The DON is separately organized under the Secretary of the Navy (SECNAV). It operates under the authority, direction, and control of the Secretary of Defense (SECDEF).

Naval Shore Establishment

The naval shore establishment is comprised of shore activities. These activities have defined missions approved for establishment by the SECNAV.

Naval Operating Forces

The naval operating forces comprise the several fleets and seagoing forces. In addition, the President or the SECNAV may assign other forces and activities to the naval operating forces.

MINE FORCE ORGANIZATION

The mine force organization has both administrative and operational chains of command. This section discusses those chains and describes the two major mine force commands.

Mine Force Chains of Command

The chain of command is the succession of the commanding officer or the officer in charge, from a

Table 1-1.—Designations and Locations of MOMAG Activities

ACTIVITY	LOCATION
Unit 1	Seal Beach, California
Unit 3	Colts Neck, New Jersey
Unit 5	Sigonella, Sicily
Unit 8	Guam, Mariana Islands
Detachment 10	Kadena, Okinawa, Japan
Unit 11	Charleston, South Carolina
Unit 12	Misawa, Honshu, Japan
Unit 14	Yorktown, Virginia
Unit 15	Ingleside, Texas

superior to a subordinate, through which command is exercised. There are two coexisting chains of command: (1) administrative, and (2) operational.

Before 1975, mine shops around the world were divisions of various naval magazines or ordnance

facilities. This arrangement frequently put the magazine's priorities above those of the mine shop's, resulting in Minemen often being assigned to divisions outside their rating. On 1 July 1975, the reorganization of the mine force resulted in the establishment of both the Commander, Mine Warfare Command (COMINEWARCOM) and the Commander, Mobile Mine Assembly Group (COMOMAG). This reorganization established MOMAG detachments and units located around the world. Table 1-1 shows the designations and locations of these activities.

ADMINISTRATIVE CHAIN OF COMMAND.— The mine force's administrative chain of command, as with all of the Department of the Navy, begins with the President. Then it flows to the SECDEF; the SECNAV; the Chief of Naval Operations (CNO); the Commander-in-Chief, U.S. Atlantic Fleet (CINCLANTFLT); the COMINEWARCOM; and ends with the commanding officers or officers-in-charge of individual mobile mine assembly units or detachments. See figure 1-4.

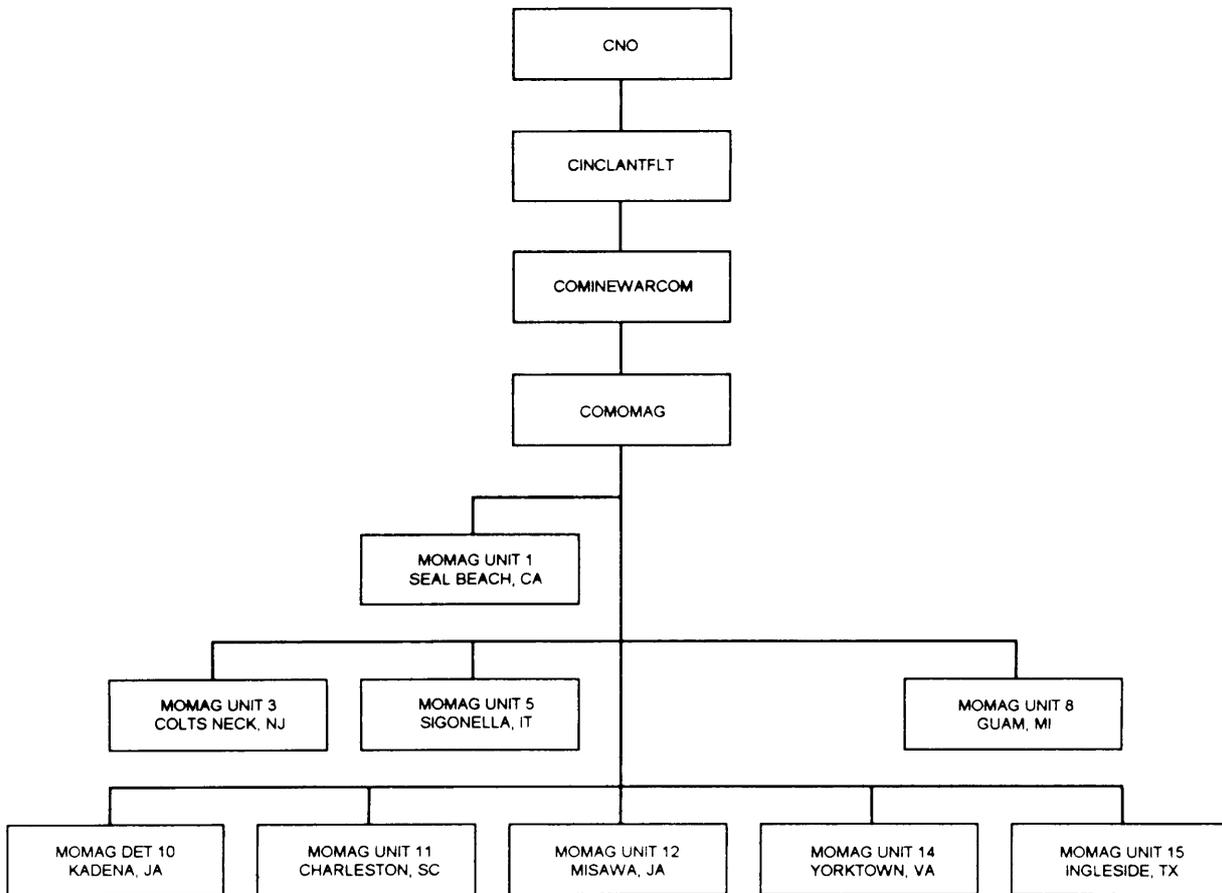


Figure 1-4.—Mine force administrative chain of command.

OPERATIONAL CHAIN OF COMMAND.—

The operational chain of command, or task structure, comprises forces from one or more warfare types, which are organized to accomplish an assigned task or function of an operational nature. The operational chain of command for the mine force begins with the President and the SECDEF, as the National Command Authority (NCA), and continues through the CNO, the fleet commanders-in-chief (FLTCINCs), and ends with the commanding officers or officers-in-charge of the individual mobile mine assembly group units or detachments. See figure 1-5.

Commander, Mine Warfare Command

The Commander, Mine Warfare Command (COMINEWARCOM), under the direction of the CINCLANTFLT, acts in all matters that affect mine warfare readiness, training, tactics, and doctrine for active naval forces and corresponding Naval Reserve programs. The COMINEWARCOM is the technical advisor for mine warfare to the CINCLANTFLT, the Commander-in-Chief, U.S. Pacific (CINCPACFLT);

and the Commander-in-Chief, U.S. Naval Forces, Europe (CINCUSNAVEUR).

Commander, Mobile Mine Assembly Group

The Commander, Mobile Mine Assembly Group (COMOMAG) is under the administrative and operational control of the COMINEWARCOM. MOMAG units and detachments are under the administrative control of the COMOMAG and are under the operational control of the CINCPACFLT, the CINCLANTFLT, or the CINCUSNAVEUR, as appropriate. The MOMAG mission is to maintain the material readiness of CINCPACFLT, CINCLANTFLT, and CINCUSNAVEUR pre-positioned war reserve material stock (PWRMS) service mines. In performance of this mission, the COMOMAG is required to provide a reservoir of trained personnel, organized in mobile units and capable of rapid deployment for final mine preparation, surface launch, and setting changes of pre-positioned mine stocks to support mining operations.

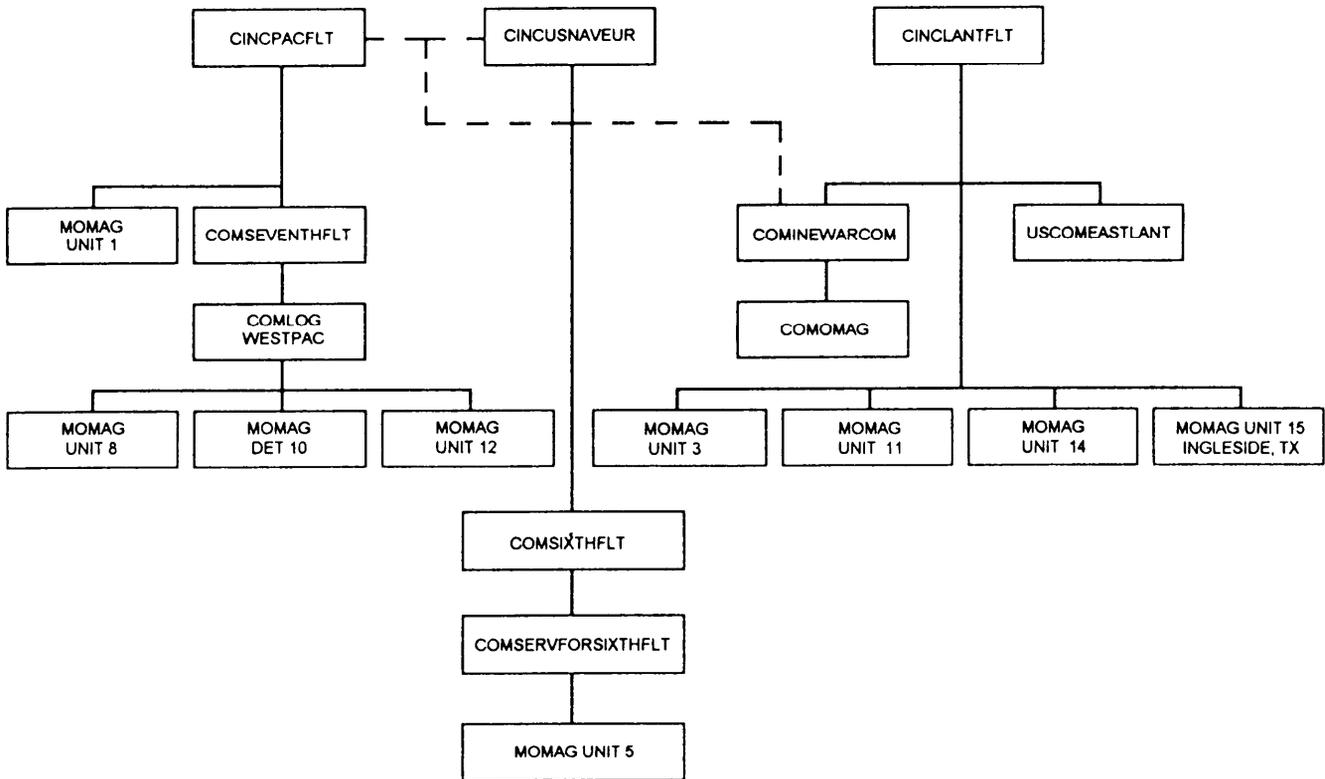


Figure 1-5.—Mine force operational chain of command.

RECOMMENDED READING LIST

Note: Although the following references were current when this TRAMAN was published, their continued currency cannot be assured. Therefore, you need to be sure that you are studying the latest revision.

Commander, Mobile Mine Assembly Group (COMOMAG) Mission and Functions and Statement of Operating Procedures and Employment of the Mobile Mine Assembly Group

(MOMAG), COMINEWARCOMINST 5450.2G, Commander, Mine Warfare Command, Charleston, S.C., 1992.

Mining Operations, NWP 27-4(A), Chief of Naval Operations, Washington, D.C., 1985.

Standard Organization and Regulations of the U.S. Navy, OPNAVINST 3120.32A, Chief of Naval Operations, Washington, D.C., 1979.

United States Navy Regulations, 1990, Secretary of the Navy, Washington, D.C., 1990.