NAVAL COMMUNICATIONS

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PREFACE

This book has been prepared to provide naval officers with general knowledge of communications in the Naval Establishment. Although designed to give a general knowledge of naval communications, it is sufficiently detailed to acquaint an officer with the specific duties of the shipboard communicator as well as duties performed by persons in communication billets ashore. The content and organization of this book is based upon that of *The Communication Officer*, NavPers 10780; however, material in this book has been updated and all classified information has been deleted.

Specific chapters treat such areas as basic radio theory, message preparation and format, visual signaling, training and security, and shipboard and shore station communications organization and operation.

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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CHAPTER 1
TAKING OVER

NAVAL COMMUNICATIONS

Naval communications today is a giant and complex enterprise with thousands of round-the-clock operating personnel and many millions of dollars worth of electronic equipment. It is a highly disciplined effort—the best of its kind in the world.

The term "naval communications" is comprehensive, and is used to denote the whole of the communication undertaking throughout the Navy. It refers to the concept of communicating, and is not to be confused with the Naval Communication System, which is a tangible network of communication channels that comprises only one part of the entire effort.

Naval communications is always in a condition of preparedness. In the event of hostilities the operating forces would be dependent on communication facilities in existence at the time, for it is unlikely that a next war would allow a period of grace for procuring vast amounts of electronic equipment and training thousands of men. Moreover, it is imperative that adequate means for prompt transmission of warning and intelligence be instantly available. For these reasons the Navy strives to keep its training level high, and maintains communication facilities that would not be warranted if the traffic load were the sole criterion of necessity.

MISSION

The mission of naval communications is to provide and maintain reliable, secure, and rapid communications, based on war requirements adequate to meet the needs of the Operating Forces, the Navy Department, and the Naval Shore Establishment; primarily to serve operations and secondarily, to facilitate administration.

POLICY

The policy of naval communications is:

1. To maintain and operate adequate, efficient and secure communications, fully capable of fulfilling the mission.
2. To cooperate with the military services and other departments and agencies of the U. S. Government and Allied nations.
3. To encourage development of those commercial communication activities (including amateur) which will enhance the military posture and other interests of the United States.
4. To maintain facilities for adequate communication with ships of the maritime trade, aircraft flying over the sea, and shore radio stations of the maritime service for the promotion of safety of life at sea and in the air.

THE RELIEVING PROCESS

The way you relieve an officer and assume new responsibilities will not ensure success, but it certainly will prevent many unnecessary headaches during the first months in the new job. This is particularly true for those officers who are starting without wide experience in the new billet. Since this is a text in basic communications designed to meet the needs of the new communicator, a few suggestions are in order.

It is conceivable that circumstances might require that you immediately assume the duties of communication officer of your ship. This could result from serious illness to the officer now assigned those duties or from some other untoward incident. In such event, little can be said except "Good luck." For our purposes, however, it will be assumed that you have a

reasonable time to consult with your predecessor. The ideal situation would permit about 2 weeks' turnover time, at least 1 week of which would be at sea. Unfortunately, such opportunities rarely occur.

Ship's Organization

Before concerning yourself with the details of your new job, study the ship's organization book to get the feel of the ship as a working unit. You will be able to judge the ship by the book. In a well-run ship the organization book is a living document. Generally the type commander promulgates a standard organization book which the individual commanding officers modify to meet the needs of their ships. The modifications should be limited in number to ensure uniformity throughout the class of vessel. In addition, each commanding officer prepares a group of ship's instructions covering the more common recurring problems. These instructions become an integral part of the book. The ship's leave policy, routine for airing bedding, procedures for dealing with public vendors, and many other evolutions are spelled out in detail. A few ships have an organization book which is broken out but once a year—for inspection purposes. The rest of the time everyone improvises. Each officer of the deck handles each problem in his own way, with the result that chaos generally prevails. Invariably, in such a ship, morale will be low. A good organization book, properly used, is worth its weight in gold. One point: it is a big book, so do not expect to master it in a few days. Refer to it often and you are on the way to a happy tour.

Your Men

Your sailors represent a good cross section of the American people. They come from all sections of the country and all levels of economic background. They are intelligent and quick to recognize insincerity. They will come through. It may be your lot to lead them into battle and they will go unflinchingly. More need not be said of any man.

Your success or failure as communication officer will, in large degree, depend on your petty officers. They know their jobs and, in some cases, they know much about your job. You are the boss and your petty officers expect you to take charge. Treat them fairly, and with respect, and they will give you their loyalty. Put on a pompous front and they will see through you in a minute.

Don't forget that your mission is to provide rapid and reliable communications for the ship. Ask your men for suggestions, but always apply the test of whether it contributes to your goal. If it does not—discard it; if it does—use it.

Know your men. Know their names. Their personal life is their own, but your interest should not be confined to their activities on board ship. When one comes to you with a problem, no matter how insignificant it may seem, remember that it is quite urgent to him. Do what you can to help. Everything you give will come back to you in time. Keep in mind, however, that it is as important to be able to say "No" as to say "Yes."

Departmental Organization

You must also familiarize yourself with the organization of the operations department. The operations officer will be your immediate superior, and from time to time will assign you tasks which will require a detailed knowledge of the whole department. It may well be that in his absence you will temporarily take charge of the entire organization.

This text treats the subject of communications within the context of a typical destroyer organization. Figure 1-1 shows the departmental organization for destroyers. Due to the limited number of officers available, there is much doubling up of duties. The executive officer may be navigator; the engineer officer may perform the duties of main propulsion assistant. On a large ship the communication officer has several assistants, such as a custodian of registered publications and a signal officer, but in a destroyer you will invariably have no officers to help you. Elsewhere in this book the specific tasks are spelled out in some detail, but it would be well to mention here the fundamental source with which you must be familiar. *U. S. Navy Regulations,* 1948, includes a chapter on the duties of each officer. Master the sections applicable to your job. Neither this book, nor any other, is a substitute for *Navy Regulations.*

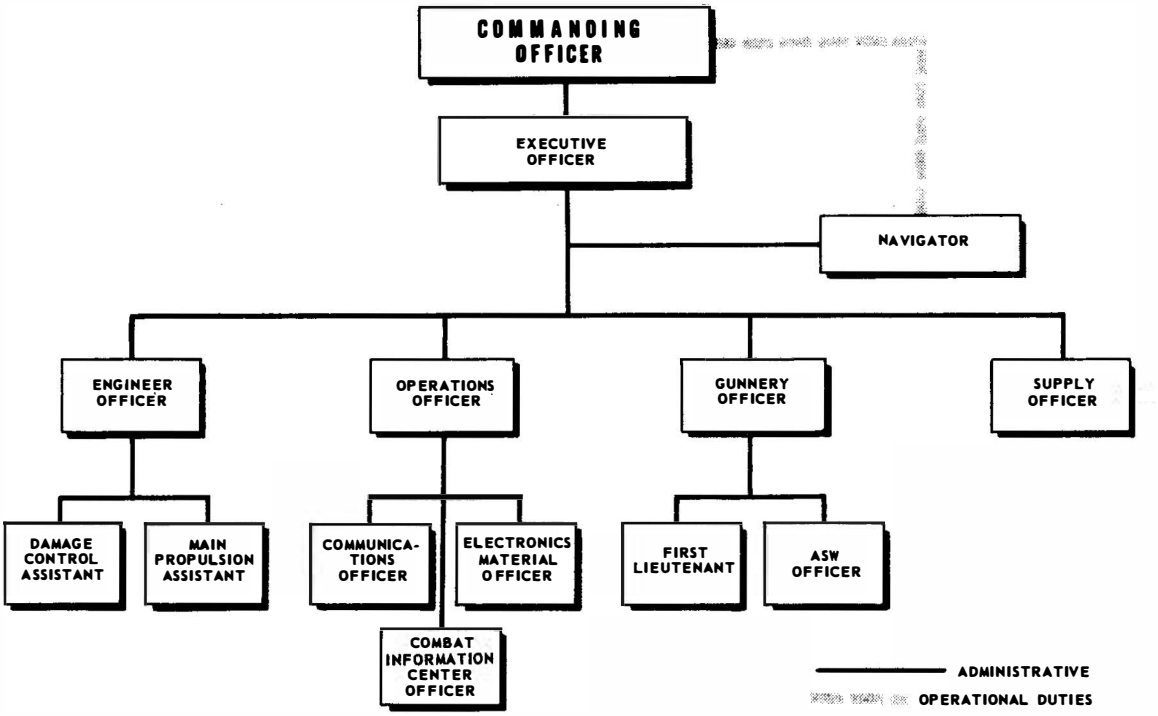


Figure 1-1.—Departmental organization for destroyers.

The operations officer may have prepared a departmental organization book containing the various sections of the ship's organization book applicable to the department. Such a manual is invaluable. It may also be supplemented by departmental instructions. Before proceeding with the detailed processes involved in relieving the present communication officer, be sure you understand the relationship of your division to the whole ship.

Administrative Checkoff Lists

Each type commander prepares a detailed administrative inspection checkoff list which is used to evaluate the ships under his command. Everything which the admiral thinks is important is covered by a question on the list. At intervals of approximately once each year you can expect to have a group of officers from another ship, supplemented by either the admiral's or squadron commander's staffs, come aboard and dig through your records and compartments, ask a thousand questions, and finally evaluate your division. No finer way to determine the administrative condition of a ship has yet been devised.

Get a copy of the checkoff list and go through it, item by item, with the officer you are scheduled to relieve. Sight everything! Mark up a copy with the location of each item for future reference. Assume that any record which you do not see is nonexistent. On schedules of daily, weekly, and monthly checks of equipment, close observation easily reveals whether the tests are in fact being performed, or whether someone is merely initialing the book.

Certain periodic reports require data which must be gathered systematically throughout the period covered by the report. Does your predecessor have a tickler system which effectively ensures that all reports are prepared and filed

on time? He may say he has, but check it and change it, if necessary. One of the most effective tickler systems is prepared by having your yeoman type the name of each report on the due date page of two calender pads. One may be kept in your office and one in your room. As you turn the page each day, the reports due are obvious.

Equipage

You may find that the officer you are scheduled to relieve has signed for equipage. This is material, usually of a pilferable nature, of such value that individuals having custody of it are required to sign a card which is retained by the ship's supply officer. Binoculars are an example of equipage.

Regulations specify that each department head sign the custody cards for all equipage allotted his organization. The department head may further require that subcustody cards be signed by the person having actual responsibility for each item. If you take custody of an item, ensure that it is kept in the secure stowage. Neither you nor your men can be expected to account for equipage unless there are adequate facilities to keep it protected when not in use. You will spare yourself much grief by looking into this problem early.

In the event equipage is lost or damaged, it must be surveyed. Essentially, this is an investigation of the cause and a citing of responsibility. Surveys can well result in disciplinary action against the responsible person. Take this problem seriously, like all the others facing the communication officer.

Registered Publications

Probably more young officers have gotten into serious trouble because of careless handling of registered publications than for any other reason. The subject is so important that a full chapter of this book (chapter 11) is devoted to it. Do not accept custody for the registered publications of your ship until you have mastered the regulations concerning them. It is most improbable that you would be ordered to do so without proper instruction. If you should receive such orders, however, inform your superiors that you are not yet qualified—then make every effort to learn the job as quickly as possible.

The basic instructions for custodians are contained in RPS 4. You should master each subject in that book to the extent that you know it as well as you know your own name. Even then, constantly review and restudy the material. Chapter 11 of this text is a fairly good condensation of the major instructions to know, but it is not intended as a substitute for RPS 4. Even if you are not assigned the duties of custodian, as long as you are connected even remotely with communications, you should be thoroughly familiar with the regulations governing the proper handling of registered publications.

Material

Every division officer is responsible for the proper maintenance of the equipment and compartments for which he has cognizance. (Chapter 15 of this text treats the subjects of maintenance and overhaul.) In the course of assuming the duties of communication officer, in company with your predecessor, you should make a thorough inspection of all the areas of the ship for which you are about to assume responsibility. Many young officers fail to comprehend the standards of cleanliness which should be met. Yet, generally, they have lived all their lives in homes which are spotlessly clean. The standards of their homes are the standards of the ship. At home the kitchen floor was scrubbed with soap and water, and no better way has yet been found to clean decks aboard ship. Dust was not allowed to gather at home; nor should it be tolerated in your spaces. If you set high standards, your men will meet them. It does not take years of sea duty to recognize cleanliness, but don't be surprised if you hear the most fantastic reasons and excuses for dirty equipment and compartments. Do not be intimidated by a couple of hashmarks.

In the course of your material inspection, look into the corners and drawers. Get down on your knees and look under tables and transmitter foundations. If they are clean, you are taking over a good division; if they are not, you have much work ahead. The generators which supply the transmitters present a good insight

into the maintenance standards. If the zerk fittings are painted over or are dirty, you should be suspicious of the way the routine maintenance schedules are being carried out. Ask to see the portable vacuum cleaner for removing dust from radio equipment. It should be readily available. Look inside the searchlights for evidence of corrosion.

In your division's living compartment, check the lockers and bedding. Are they clean? Are the bunks arranged for head-to-toe sleeping?

A compartment cleaner should be assigned to take care of the berthing spaces on a semi-permanent basis. No system which rotates cleaning responsibility more often than once a month provides enough continuing incentive to ensure high standards. Arrange your schedule so that you visit the berthing spaces daily. Require your leading petty officers to take responsibility for the cleanliness of the living quarters of the division. It might be said that the cleanliness standard maintained in the division berthing spaces has a direct effect on all of the working spaces, for men cannot be expected to keep their shops cleaner than their living quarters.

Current Ship's Maintenance Project

The current ship's maintenance project (CSMP) is the written record of authorized and required alterations and repairs. This is explained in some detail in chapter 15. You probably will find that part of the CSMP is maintained by the electronics material officer and the remainder by the engineer officer. Each part will contain information of interest to you.

Go over the lists of repairs with both the officer you are to relieve and the EMO. Be sure you understand the effect the inoperable equipment will have on your ability to furnish the required circuits during fleet operations. Discuss the approved alterations with the engineer officer. It may well be that one which can considerably improve the communication capability of the ship can be completed by a tender or by ship's force personnel. If you are able to recognize the significance of such an alteration, and can expedite its completion, you will be making a considerable contribution to the combat effectiveness of the ship. Such opportunities come only to one who is willing to study and work.

Relief Letter

It is common practice for the officer being relieved to write a letter to the commanding officer, via the relieving officer and the executive officer, stating that he has been relieved and the condition of the department or division for which he has been responsible. All too often this letter is a formality which contains no information of value to the Captain. There are still too many officers who make a career of trying to prevent commanding officers from learning the true facts about the fighting ability of their ships. You, as relieving officer, however, should ensure that everything which you do not consider satisfactory is reported in your endorsement. You owe this to the Captain and to yourself.

Once all the unsatisfactory items have been brought to his attention, the commanding officer will naturally expect you to correct them as expeditiously as possible. There are those who do not report the facts for this reason alone. Others conceal the facts, relying on some foolish hope that their successor similarly will not reveal their shortcomings. The Navy is engaged in too important a business to be composed of officers dedicated to the continuance of a "mutual protective society." There undoubtedly will be some less-than-satisfactory items when you are being relieved. Include them in your own basic letter to the Captain at that time. If you have been conscientiously informing your superiors of all your problems from day to day, you should have no fear of any adverse reaction as the result of such a relieving letter. All of your superiors have served as division officers and department heads. They are familiar with the difficulties encountered in daily operations. No commanding officer, however, can be expected to forgive you for failing to keep him informed.

About 1 month after you have taken on the responsibilities of communication officer, prepare another letter to the Captain, again via the operations and executive officers, stating what you have done to correct the deficiencies you found on arrival. Include in this report any additional casualties which have occurred or difficulties which you are experiencing. It may well develop that you are writing a monthly letter to the Captain on the status of communications. Each such report may bring additional pressures on you to get the problems corrected.

Your superiors will appreciate the effort which you are making, and you may be sure that they will take appropriate cognizance of it. In addition to this, every evening at 8 o'clock reports, submit a list of all inoperable equipment to the executive officer.

GETTING THE JOB DONE

Problems do not solve themselves. Ideas and suggestions have no meaning unless followed by decisions. Attack each casualty, problem, and suggestion aggressively. Determine the facts and decide what has to be done. Then see that it is done. Telling a subordinate to do something does not ensure that your orders will be carried out. You must follow through until the final objective has been achieved.

You might receive a complaint from a department head that he is not receiving copies of incoming messages rapidly enough to prepare timely answers. Merely explaining that you have a routing system that should provide efficient service does not solve the problem. If the messages do not get to the man who must act on them, something is wrong. You may feel that having two or three more men assigned will solve all your problems. This might be true, but it is the least likely way you will solve the problem because the odds are that you will not get additional personnel. Do the job with what you have. Ask the communication officers of other ships how they handle the problem. Consult your superiors and use their experience where possible. Your leading petty officers might have the answer, or it is entirely possible that the sailor who has been routing the messages knows more about it than anyone else and is eager to try out some of his own ideas. When you have studied the problem thoroughly, make a decision, then carry out the decision aggressively.

Do not get bogged down in too many projects at the same time. Many officers spend hours working on ten different projects simultaneously and in the final analysis rarely complete any of them. Plan each day to work on the most important problems and carry each one through to completion. Wherever possible, establish a system which, after you have properly instructed your men, will run itself with a minimum of supervision from you. Delegate routine jobs.

Report results! Whenever you are assigned a task by a superior officer, report its completion. If you get into the habit of reporting back, it is likely that you will seldom forget an assigned job. Carry a pocket notebook and take notes. Check your notes several times a day. If you cannot do a job, report this fact, too, and request further instructions or advice.

ADMINISTRATION

Every business has its standard operating procedures, and the Navy is no exception. Correspondence is prepared in a standard way. You will prepare many official letters but, until you assume command of a ship, you rarely will sign one. This places an additional responsibility on you. It is your job to prepare each letter so that the Captain will be pleased to sign it. This is not to say that controversial subjects should be left out but rather that the facts are correct, and the conclusions or recommendations are well thought through. The letter should be in accordance with approved format. Most important, be sure that all correspondence forwarded to the Captain for his signature is grammatically correct and contains no misspelled words. Except in unusual cases, the letter should be typed smooth. The final test to be applied is: Would you be willing to sign the letter if you were commanding officer and your service reputation were at stake?

DEPLOYMENT

Most U. S. Naval ships are deployed periodically to overseas areas. When overseas, the normal supply channels are lengthened, complicating logistics. In addition, the various fleet commanders issue instructions and procedures covering a wide range of subjects which may differ in detail from those in effect while operating from the continental United States. Special crystals covering UHF frequencies may be required. All of these problems throw a heavy workload on the communication officer.

Generally, each type commander has an effective instruction wherein all of the predeployment requirements are delineated. Approximately 3 months prior to sailing, obtain a copy of this instruction from the ship's files and initiate action to obtain all required items.

In the case of the instructions, they usually are mailed to each ship in plenty of time to allow thorough study by interested personnel

prior to arrival in the forward area. Ensure that an accounting system is maintained for each instruction and notice because they must be returned prior to returning stateside. Do not intermingle them in the ship's regular file binders. Keep them readily available to operating personnel.

Don't wait until the problem arises to start checking effective instructions and publications for the correct procedures. Many times it is too late to correct mistakes after the ship is underway. Plan ahead! Advanced planning is necessary to insure a successful tour of duty as a communicator.

CHAPTER 2

TASK ORGANIZATIONS AND FLEET OPERATIONS

CHAIN OF COMMAND

The tasks and responsibilities assigned ships of the U. S. Navy are many and diverse. A ship may be steaming above the Arctic Circle one month, and crossing the equator the next. She may have been gathering hydrographic data last week, and plane guarding for a carrier today. Versatility of the ships is necessary because of the many jobs the Navy has to perform while waging war or preserving peace.

Since World War II, the tendency in ship design has been toward specialization. For example, several aircraft carriers of the CVA class have been converted to handle antisubmarine duties, then redesignated as CVS carriers. Again, in the antisubmarine specialty, several general-purpose destroyers have been converted to escort destroyers (from DD to DDE). Under the new construction program, nuclear powered submarine *Triton* has been designed and built as a radar picket submarine. Nonetheless, these specialists are required to perform many duties not necessarily in their particular field, but common to the type. A DDE, for example, is still capable of conducting shore bombardment.

The commands to which a ship may be subordinate are nearly as numerous as her individual duty assignments. Command in naval operations is exercised through communications, and naval communications are organized to parallel command relationships. Within a command, the communicator serves as the instrument of command.

Command Categories

There are two branches of command within the naval organization: ADMINISTRATIVE COMMAND and TACTICAL COMMAND. Although each ship of the U. S. Navy always belongs to some administrative command, she is not at all times part of a tactical command.

Administrative

An administrative command is usually a type command. Commander Cruiser-Destroyer Force, U. S. Pacific Fleet (COMCRUDESPAC), and Commander Amphibious Force, U. S. Atlantic Fleet (COMPHIBLANT) are administrative commands composed of ship types. CRUDESPAC forces consist of destroyer and cruiser types of the Pacific Fleet; PHIBLANT forces comprise the various amphibious types of the Atlantic Fleet.

Tactical

A tactical command is an organization formed from one or from several ship types, and therefore from different administrative commands. While the ships of a tactical organization remain under the administrative control of their respective types, they are now part of an operational (tactical) organization, and subject to a tactical chain of command as well. Thus, a destroyer under the administrative control of COMCRUDESPAC, but operating in the Western Pacific as a unit of the Seventh Fleet, is under the tactical command of Commander Seventh Fleet.

How Communications Follows Chain of Command

Communications in each branch of command can best be explained by an example. Consider, for our purposes, the general-purpose destroyer USS *Willard Keith* (DD 775), a unit of the Atlantic Fleet, and attached to Destroyer Squadron 22.

Willard Keith is one of eight destroyers comprising Destroyer Squadron 22. The squadron is further divided into two destroyer divisions, composed of four ships each. Squadron

flagship is USS *DuPont* (DD 941). *DuPont* is also flagship for the first division of the squadron, Destroyer Division 221. The other division of the squadron, Destroyer Division 222, has a commander also, but he is junior to the squadron commander. The flagship for the division commander (COMDESDIV 222) is USS *McGowan* (DD 678).

The entire squadron is under the administrative command of Commander Destroyer Flotilla 4 (COMDESFLOT 4) who in turn is under the administrative command of Commander Destroyer Force, U.S. Atlantic Fleet (COMDESLANT). To complete the administrative chain of command, COMDESLANT is responsible to Commander in Chief, U.S. Atlantic Fleet. Figure 2-1 shows *Willard Keith's* administrative chain of command.

A destroyer squadron commander is usually a senior captain. The next junior officer in the squadron is the other division commander, who most usually is a captain also. Whatever the rank, squadron and division commanders under flag rank are called "commodore."

Administrative Matters

Administrative matters forwarded by individual commands are sent via complete chain of command. Destroyers in Destroyer Division 221 forward controlled exercise reports to COMDESLANT via COMDESRON 22 and COMDESFLOT 4. Inasmuch as destroyers in DESDIV 222 have an additional link in the administrative chain of command, their controlled exercise reports are forwarded to COMDESLANT via COMDESDIV 222 as well as COMDESRON 22 and COMDESFLOT 4.

As an example, assume that the commanding officer of USS *The Sullivans* has a recommendation for a change to a communication publication. He forwards his request and reasons to the Chief of Naval Operations via COMDESDIV 222, COMDESRON 22, COMDESFLOT 4, COMDESLANT, and CINCLANTFLT.

Tactical Chain of Command

The mission of tactical command, as mentioned before, is to perform specific tasks. Let's place DESRON 22 in a tactical organization.

Figure 2-2 shows the tactical organization of Task Force 62. Four ships of DESRON 22 are included in the operation.

Numbering System in Tactical Organization

Note that the numbering system of a tactical organization is orderly and follows a consistent pattern. It starts with the commander of the fleet, and further divisions carry the fleet number for identification throughout the breakdown. Task forces of the Sixth Fleet are numbered in succession as TF 60, TF 61, TF 62, etc. Fleets operating in or about the Atlantic Ocean areas have even numbers; those of the Pacific, odd numbers.

Task Force

The tactical chain of command within the force is headed by Commander Task Force 62, who is responsible (in our illustration) to Commander Sixth Fleet. Because of the scope of tasks to be accomplished, the task force usually is divided into task groups, and subdivided further into task units and task elements.

Assume that Task Force 62 is conducting a training exercise in the Western Mediterranean. The mission requires the efforts of large numbers of both combatant and supply ships.

Task Force 62 is divided into Task Group 62.1, Task Group 62.2, Task Group 62.3, Task Group 62.4, and Task Group 62.5.

Task Group

DESDIV 221 has been assigned antisubmarine duties, and is a component of Task Group 62.2. Commander Task Group 62.2 is COMCARDIV 14, embarked in USS *Wasp* (CVS 18). DESDIV 221 and DESDIV 342 comprise Task Unit 62.2, the screen unit organized to (1) screen the carrier, (2) act as plane guard, and (3) conduct offensive antisubmarine warfare.

Ships for a fleet exercise operation are assigned by their respective type commanders. Assignments are based on the requirements of fleet commanders, capabilities of the ships, and (in peacetime) training needs.

A ship usually makes two extended cruises during her training cycle. In the Atlantic, the deployment usually is to the Mediterranean; in the Pacific, to the Far East.

In our example, activation of Task Force 62 has made it necessary for COMDESLANT to assign destroyers to fill the needs of the force. We may assume that destroyers of DESRON 22 were

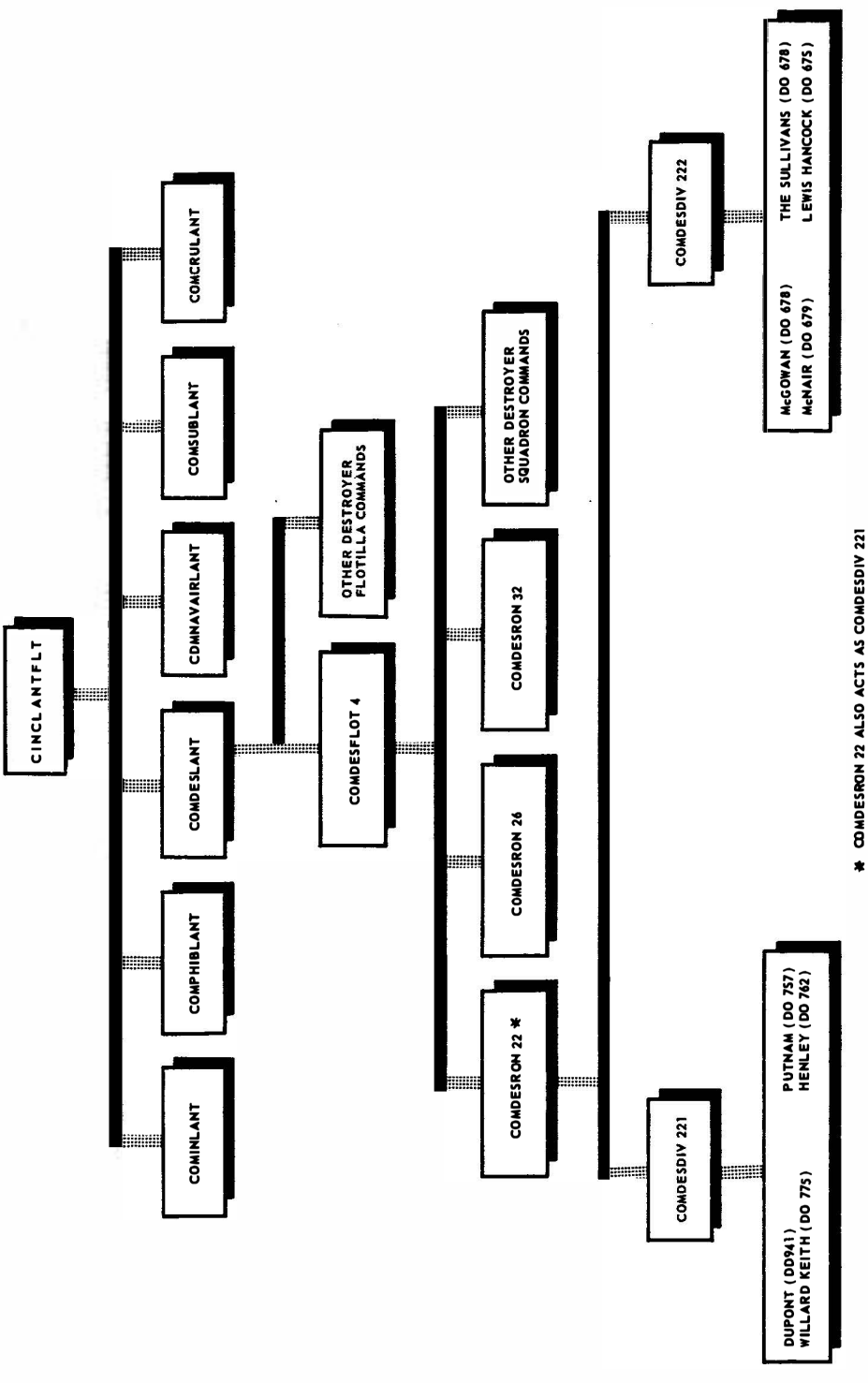


Figure 2-1.—Administrative chain of command.

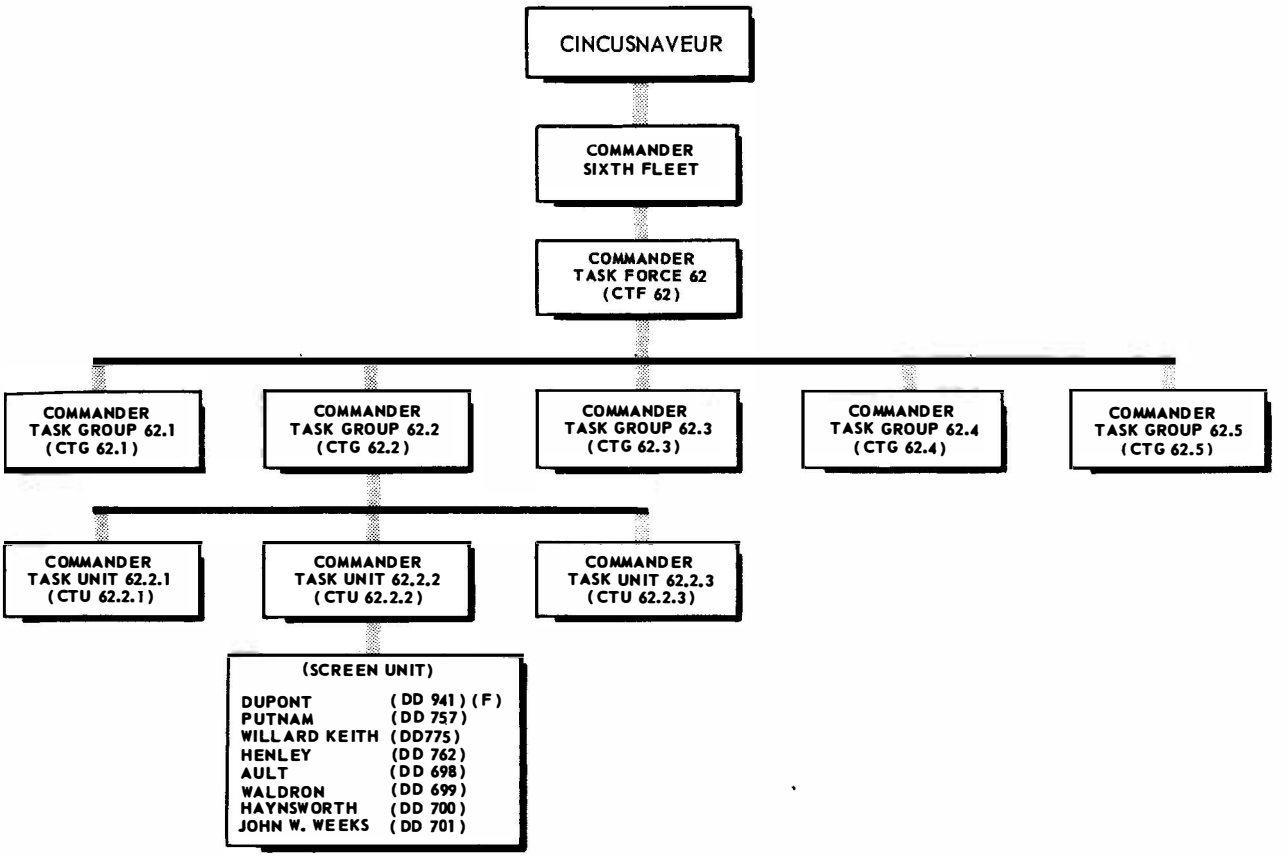


Figure 2-2.—Tactical chain of command, Task Force 62.

ready for extended operations, that the crew had completed a certain degree of shipboard training, and that the ship was materially ready for sea.

Within Task Group 62.2 there may be several type vessel commands. Commander Task Group 62.2 is also Commander of Carrier Division 14 (COMCARDIV 14), and flies his flag in the carrier in which he is embarked, i.e. USS *Wasp* (CVS 18) COMDESRON 22 is screen commander and flies his flag in his flagship.

Still further division of the fleet is possible through the formation of TASK UNITS or TASK ELEMENTS. Usually these divisions of the fleet are quite small, and may even consist of a single ship. In our example, the screen for Task Group 62.2 is designated Task Unit 62.2.2.

Task Element

A task unit may be further subdivided into TASK ELEMENTS, normally comprised of one or two ships. To illustrate, two destroyers, temporarily detailed from the screen to perform a special mission, may be designated as Task Element 62.2.2.1 until mission is completed. Subdivision into task elements is limited to the minimum required by essential operational tasks.

It should be noted that a task force may be subdivided into a maximum of ten self-contained TASK GROUPS (TG). A task group may in turn be subdivided into a maximum of ten TASK UNITS (TU). A task unit may be subdivided into a maximum of ten TASK ELEMENTS (TE).

FLEET OPERATIONS

Striking Force

The naval striking force, today composed principally of large aircraft carriers, guided missile ships, and screening vessels, represents a highly mobile and formidable weapons system for offensive and defensive naval operations. In official language, striking force operations may be divided into ATTACK CARRIER STRIKING FORCE (ACSF), or SURFACE ACTION STRIKING FORCE (SASF), or a combination of both. NWP 20 covers striking force operations in general.

Composition and Type

An attack carrier striking force may contain as many as five carrier groups. Our example, Task Force 62 (fig. 2-3), is made up of three attack carrier striking groups. As an optimum organization, this hypothetical task force could consist of 12 attack carriers, with accompanying aircraft, support ships, and screening destroyers, plus requisite destroyer, submarine, or shore-based airborne early warning (AEW) aircraft pickets. Bear in mind, however, that the concept of striking force operations is very fluid because of new weapons and weapon systems.

Carrier-based aircraft are the primary offensive weapon of the attack carrier striking force, with ships other than carriers acting to support and screen against air submarine threats.

When sustained naval operations are in progress, the striking force commander must coordinate his operations with those of other forces. Coordination requires communications as the voice of command. As an example, close coordination with underway replenishment groups is important for ensuring adequate logistic support. Close coordination is also important in carrying out striking missions designed to cover amphibious or airborne forces. *Allied Naval Maneuvering Instructions* (ATP 1) and *Joint Action Armed Forces* (JAAF) are guides to be followed in establishing and maintaining close liaison with other friendly forces. Policy in such matters is promulgated at the level of the fleet commander.

Chapter 9 of NWIP 16-1 contains principles and instructions regarding use of tactical communications in striking force operations.

Assault Force

The task organization of the amphibious task force must meet the requirements of embarkation, movement to the objective, protection, landing, and support of the amphibious troops. Inasmuch as standard organization is not applicable to all situations, the task organization is determined in accordance with the requirements of the particular operation. Flexibility of task grouping is essential. Task organization titles of the various task components are used exclusively for operational purposes. Administrative titles are retained for administrative reasons.

The standard numerical designation system is used for naval forces in amphibious task force organizations. In the landing force organization, normally only the landing force is given a numerical designator. If separate attack groups are formed, however, the corresponding landing groups will be given numerical designations. Other major task groupings are numerically designated as necessary.

Extent and Type of Operation

Amphibious operations include planning, preparation of the objective, embarkation of troops, rehearsals, and movement to the objective area; landing troops, equipment, and supplies; support of the landing, and subsequent operations ashore for capture of the objective; and, finally, consolidation of the lodgement area. The operation may be conducted by forces of the naval establishment alone, or it may be conducted by such forces in combination with the other armed forces.

Naval forces in an amphibious operation include several components, as demonstrated

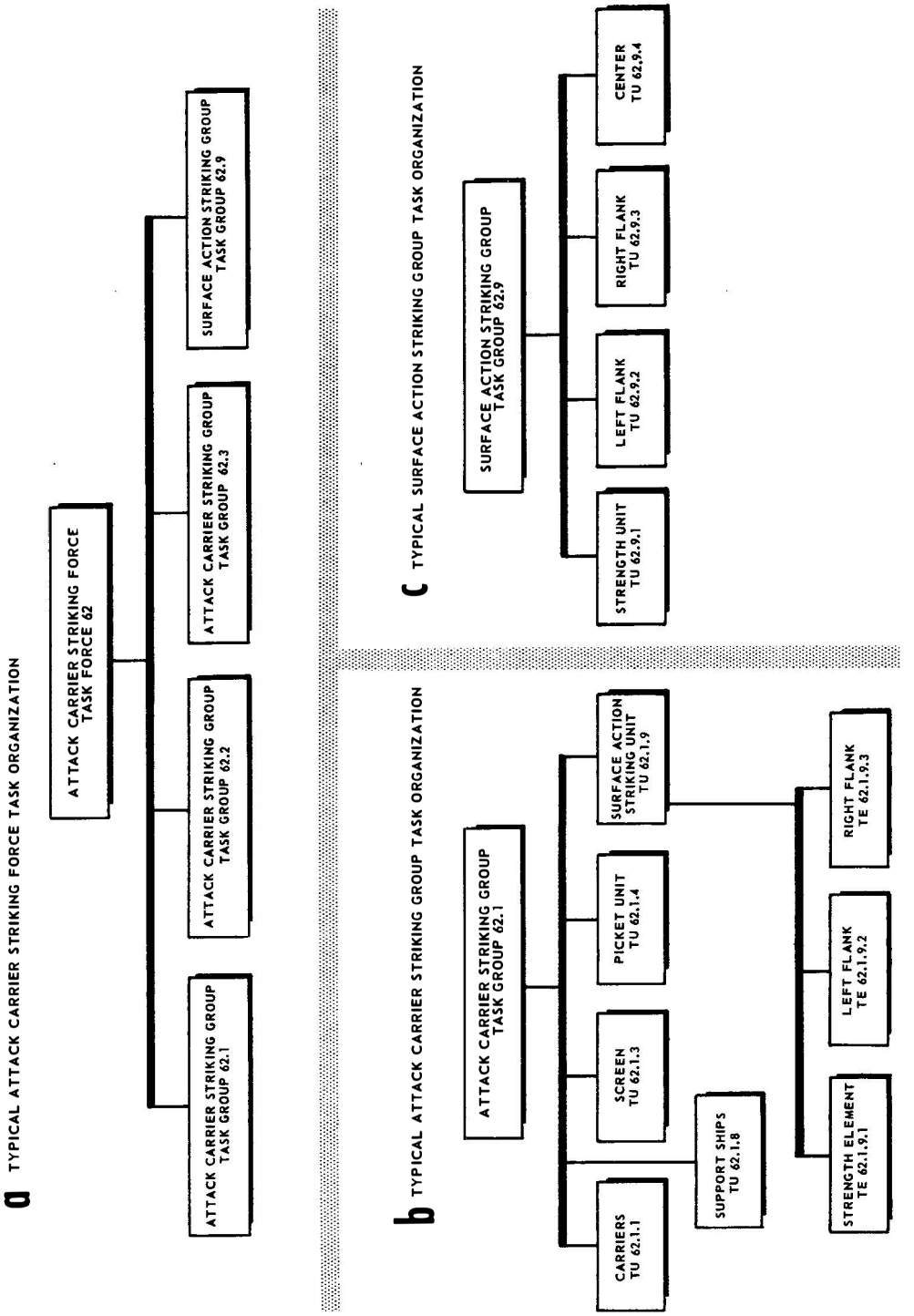


Figure 2-3.—Typical striking force organization.

in figure 2-4. Components to which destroyer-type vessels may be assigned are: gunfire support group, support carrier group, screening group, and close covering group. For simplicity and more effective control, two or more of these components may be combined or may be assigned dual functions. Destroyers in the gunfire support group may, for example, subsequently be assigned to the support carrier group screen.

The heterogeneous nature of an amphibious task force requires an elaborate and secure system of rapid communications to control and coordinate the action of the component forces. Communication requirements of amphibious operations are shown in figure 2-5. Communication security requirements may require adoption of one or more precautionary measures. Within various movement groups of the amphibious force, primary reliance usually is placed on VHF and UHF radio for tactical traffic. Administrative traffic, on the other hand, is passed by visual communication facilities, where practicable and feasible.

The communication plan for amphibious assault operations is predicated on the basic communication doctrine of NWP 16 and NWIP 16-1, as well as current communication directives and requirements.

Antisubmarine Force

Antisubmarine warfare (ASW) is part of a highly complex, over-all military strategy the ultimate objective of which is to destroy the ability of the enemy submarine force to wage war. The basic mission of the ASW, then, is to deny the enemy effective use of his submarine force by destroying not only the submarines themselves but also their supporting forces, operating bases, and building yards.

NWP 24 states that the principal A/S operations devised to carry out the offensive and protective tasks of antisubmarine warfare are as follows:

OFFENSIVE OPERATIONS: A/S strike operations; hunter/killer operations.

OFFENSIVE OR PROTECTIVE OPERATIONS: A/S mining operations; A/S search operations; A/S patrol operations.

PROTECTIVE OPERATIONS: naval control of shipping; A/S escort, screen, and support operations; A/S area and harbor defense operations.

Composition and Functions of A/S Surface Units

Surface ships may be used in various numbers and combinations for antisubmarine operations. The basic surface unit is the search-attack unit (SAU), normally composed of two or more ships capable of locating and destroying submarines. In an emergency, a single ship, capable of detecting and destroying a submarine, may be designated as the SAU. The actual number of ships making up each SAU is logically determined by force requirements of a particular operation and by the number of available ships.

The SAU may be organized for the specific purpose of conducting independent offensive operations, in which case it is an A/S force in itself. It also may be a unit of a force and, when required, be detached from that force to conduct A/S operations. The SAU achieves its greatest effectiveness when employed in combination with aircraft in hunter/killer operations.

Communication procedures for antisubmarine warfare are constantly under evaluation by the fleet and are subject to change. Current doctrine is set forth in NWIP 16-1.

Examples of A/S Forces

Any type or combination of surface, air, or subsurface A/S unit may be used for A/S search or patrol operations. They are the forces known as hunter/killer, escort, screening, and patrol operations.

Hunter/Killer Forces

A hunter/killer force is made up of surface and air elements. These elements, as concerns aircraft, usually are organized as search and attack units. In other words, an air element would be composed of a search aircraft and an attack aircraft. Surface ships, other than aircraft carriers, ordinarily are organized as search-attack units. In the latter case, the distinction is that the surface unit performs both the search and attack mission.

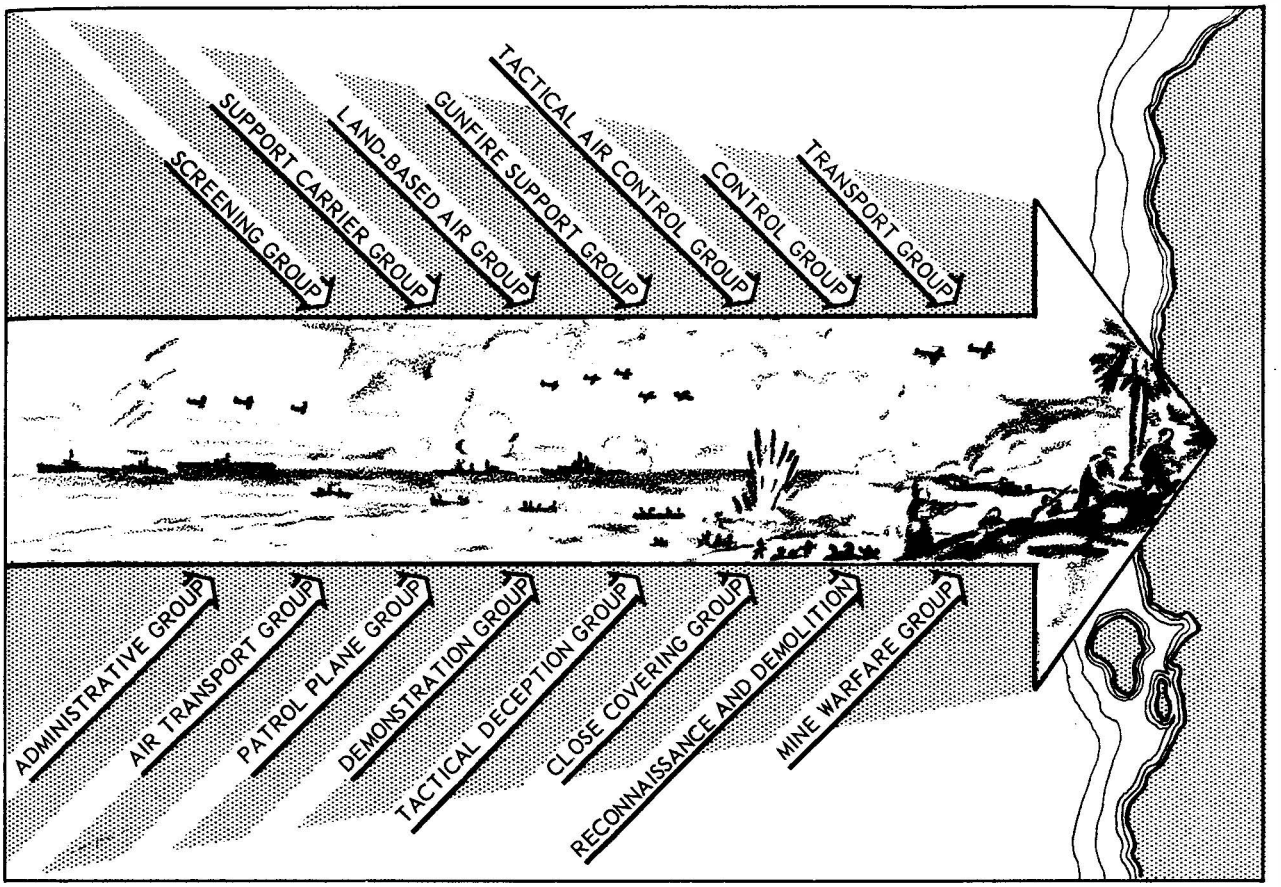


Figure 2-4.--Naval forces in amphibious operations.

Coordination and control of H/K operations are the responsibility of the officer in tactical command (OTC) who usually is stationed in the carrier because of her excellent control facilities for communications, operational intelligence, and the like. Lacking a carrier, the OTC probably would use as his flagship one of the destroyers in the group.

Antisubmarine Escort Forces

Surface and/or aircraft units make up the antisubmarine escort force. A combination of both, coordinated by an OTC, constitutes the most effective escort force. Escort forces operate primarily to afford protection to a convoy against submarine attack. Protection preferably is by direct aggressive action, in coordination with aircraft units. Effective communications are essential to this type of A/S work because the convoy is basically a logistic support force, and the success of any operation or of an entire war is directly related to adequate logistic support.

Screening Operations

Other types of antisubmarine operations we are concerned with in this chapter include

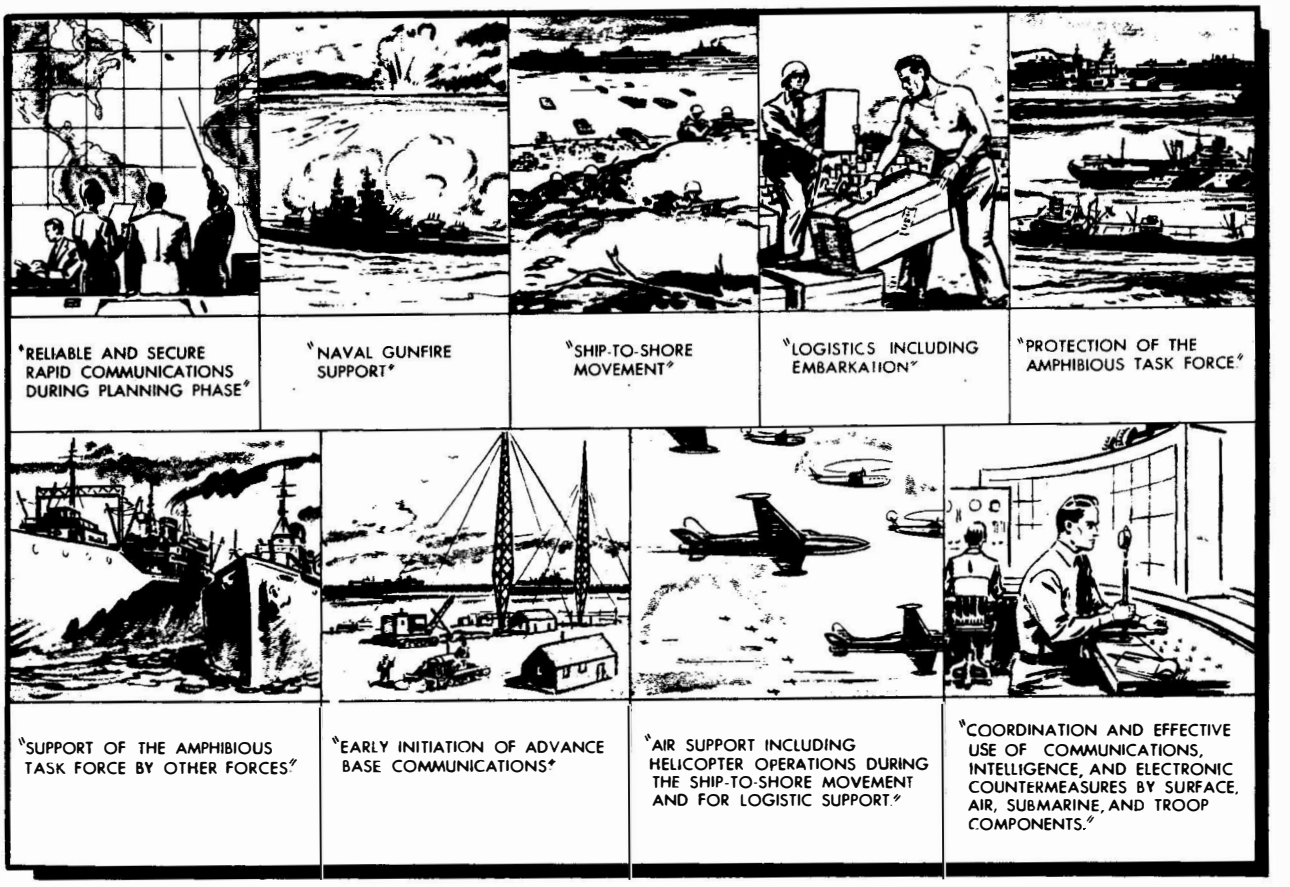


Figure 2-5.–Communication requirements of amphibious operations.

screening and patrol operations. Within any offensive seagoing force, provision must be made for protection of the main body—the most important, strategically speaking, unit in the composition. Protecting this important unit is the task of a smaller, more maneuverable, well equipped unit such as a destroyer. A screen is simply a protective shield placed around the main body by escort vessels.

It is difficult to say which is the best type of screen for a particular main body or unit. Screens vary in shape and size with sonar conditions, number of screening units available, and mission of the unit. Although actual screening is not considered at this point in the text, the important thing to remember about it is that a screening unit is one which offers protection to a more important, a less maneuverable, or a unit which may have difficulty in defending itself from submarine or airborne enemies.

Patrol Operations

Another type of protection screening vessels are normally called upon to provide is that of escorting a "heavy" such as a carrier out of a harbor. During this operation, the heavy is quite vulnerable to attack by submarines since it

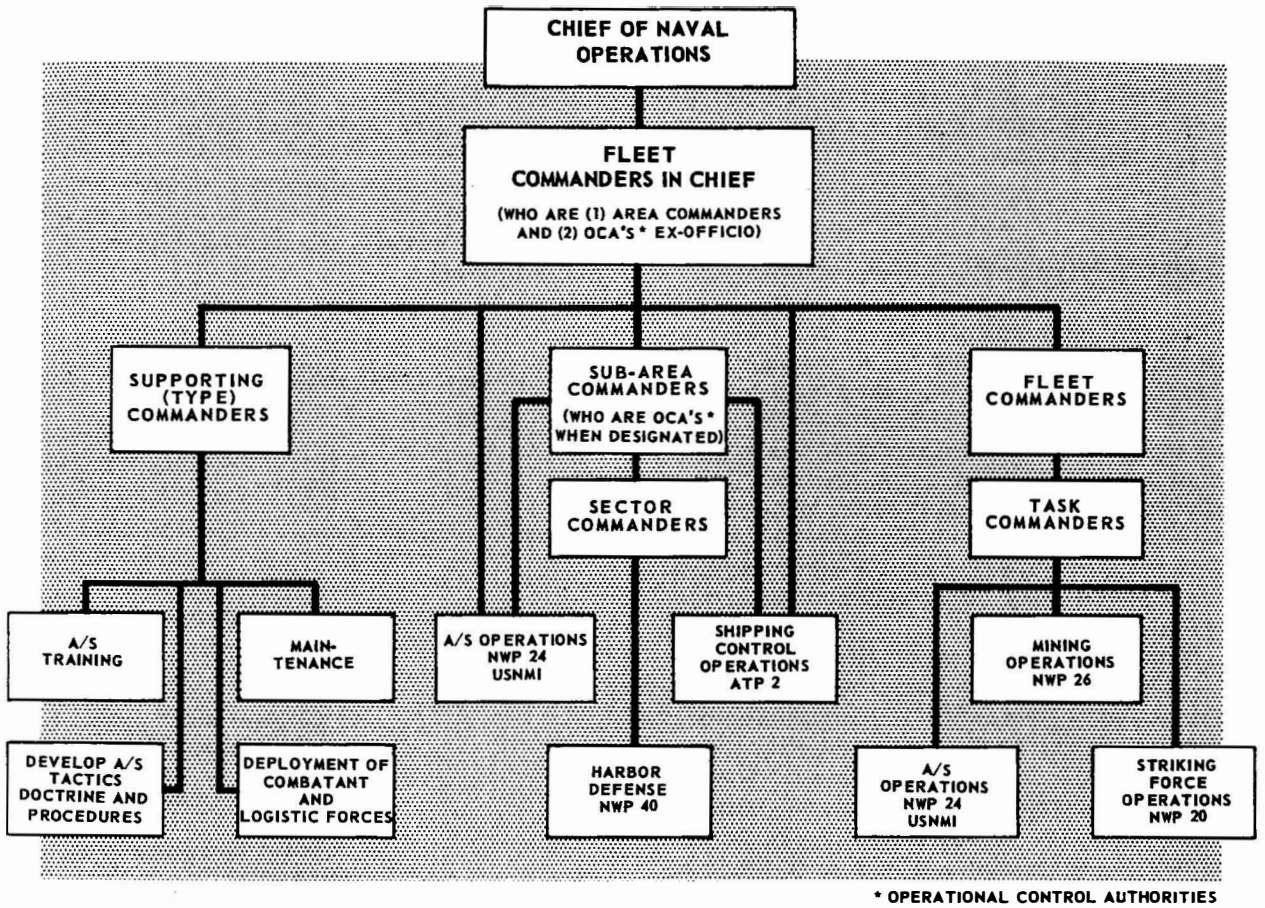


Figure 2-6.--Organization for A/S operations.

normally has to leave the harbor in a channel. Should a submarine sink a ship in the channel, the harbor could be tied up for an indefinite period of time. To counter this threat, screening forces normally patrol a harbor entrance, usually preceeding the heavy out of the harbor, screening the sea for submarines as they proceed to an assigned barrier station. At their station, they conduct a barrier patrol. Here again, the type of barrier patrol a screening vessel will be called upon to provide varies with the number available, conditions of the harbor, extent of mining operations, and availability of air cover.

There are three basic types of patrol, however. They are the fixed station, the linear, and the crossover.

The fixed station is the patroling of a particular fixed unit or area. The patroling ship circles this area throughout the assignment. The linear patrol is one in which the patroling ship moves back and forth, patroling some assigned area of the sea. The crossover patrol is shaped like an X with a closed top and bottom. The patroling ship starts the patrol say from the lower corner of one of the legs of the X, follows it to the top, crosses over to the other leg, follows that one down, crosses over to the first,

etc. A screening unit can be called upon to provide any of these types of patrol when on station.

There are variations to these three basic types of patrol. There are restrictions as to speed and length of the legs or shape of the patrol. There may be a coordinating patrol commander who orders all patroling units to execute turns at the same time. All of these things and more are encountered in patrol work. Your tactical publications and operation orders will provide you with specific patrol instructions for a particular assignment.

Fleet Exercises and Communications

The highly complex character of naval operations today and the urgency for accomplishing the required action have resulted in exigent demands for reliable communications. As a result of the speed with which situations develop, there also is a lessening of the former distinction between strategy and tactics. Communications, as a function of command, therefore, has reached the point where, under certain circumstances, speed may be considered equally as important as reliability.

The important purpose of the fleet exercise is to train personnel to produce the quality of communications demanded by the complexity of modern naval warfare. One can readily ascertain that the efficiency, communications-wise, at which the individual ship operates, is a major determining factor in the over-all operational performance of the ship. The sum of these individual performances makes or breaks the fleet operation.

A necessary step in achieving efficient communications is officer interest and supervision. Communication officers must give particular attention to the details of communication plans, practices, procedures, and the capabilities and limitations of the communication facilities of the ship concerned.

The communication demands of fleet operations or exercises entail the use of many circuits. A brief description of the categories and types of circuits aids the reader to understand basic requirements considered in establishing the communication annex of the operation order.

Communication traffic breaks down into three broad categories: (1) operational, (2) administrative, and (3) exercise. The latter is self-explanatory.

Administrative traffic includes such routine matters as personnel distribution, normal logistics, recurring administrative reports, and similar subjects.

Operational traffic, on the other hand, includes several circuits which may be subdivided by type and use as: (1) command, (2) common, and (3) functional nets. Examples of operational traffic are tactical communications, combat intelligence, strategic or vital weather reports, counter-measures, hydrographic information, combat logistics, and so forth. Figure 2-7 gives the breakdown of the normal operational traffic circuits which may be included in the communication requirements of the operation plan for a typical operation.

OPERATIONAL TRAFFIC CIRCUITS

COMMAND NETS: Task Force / Group / Unit Command

COMMON NETS: Task Force / Group / Unit Common

FUNCTIONAL NETS (Specific Operational Function):
- Shore Fire Control Spotting Net
- Combat Information (CI) Net
- Aircraft Coordination (AC) Net
- Fighter Air Defense (FAD) Net
- AA Gunfire Coordination Net
- Maneuvering and Waming (MN) Net
- Sonar Information (SI) Net
- Distress Nets
- SAU Nets

Figure 2-7.

Navy Communication Frequency Plan

As previously mentioned, task organization basic communication frequency plans are contained in the effective edition of JANAP 195. These frequency plans, for use when a U.S. Navy task force (or portion thereof) is formed, are based on the following principles:

1. Communications follow the established chain of command.
2. The number of circuits for functional purposes must be held to a minimum.

3. Adequate and economical utilization must be made of the communication facilities available.

Frequency plans are for the purpose of providing a basic task organization communication plan which will afford all the communication channels required to perform the tasks assigned a tactical organization as soon as it is given a task organization number. JANAP 195 is intended to supplement NWP 16 which contains the basic fleet operational communication doctrine. DNC 5, another publication which supplements NWP 16, contains the basic communication instructions, and is suitable for use in war operations and training. It is effective worldwide.

The frequency plan has been devised for use by DIVIDED or UNDIVIDED task forces, groups, or units. A divided task force, group, or unit is one which is organizationally separated into task groups, units, or elements, and may or may not be geographically concentrated. An undivided task force (group) (unit) is one which is not organizationally separated into task groups, units, or elements, and normally is geographically concentrated.

This plan is based on the assumption that the task force will be the largest undivided tactical organization. In a divided task force, group, or unit which is geographically concentrated, it is the responsibility of the senior commander to prescribe only those organizational circuits provided in the plan which are essential while so concentrated. For instance, in a task group which is divided into three task units operating in company, the task group commander would prescribe those frequencies assigned on the group level; use of frequencies assigned for unit and element components of the group would not normally be used while in company.

Frequencies and Circuits

JANAP 195 includes both a frequency list and a list of circuits. The frequency list is a record of radio frequencies designated by the Chief of Naval Operations for Navy use, and indicates the circuit or notes where the particular frequency may be found. The list of circuits provides for each a designating symbol and descriptive title, a list of assigned frequencies (where available), and special instructions governing use of these frequencies.

Assignment of Frequencies

The assignment of radio frequencies is a function of command and, hence, control over radio frequency assignments is vested where possible in theater commanders in active theaters of operation and in the appropriate departments or ministries in other areas. For technical reasons, the greatest practicable degree of coordination is necessary in making frequency assignments, and the responsibility for ensuring such coordination rests upon the authorities stated above. The radio frequency spectrum available for military use is limited. Maximum economy in frequency usage is therefore essential and must be constantly exercised by assignment authorities. To prevent harmful interference through coordination of frequency usage is essential. Coordination of frequency usage, by international agreement, is a responsibility of the constitutional authority of the government concerned. In the case of active theaters of operations, however, when this authority rests with the theater commander or in other areas where the national authorities consider it expedient, coordination of military assignments is normally undertaken by frequency coordination committees. Committees have been established in areas throughout the world to effect speedy and satisfactory coordination of frequency assignments and clearance of interference. For those assignments proposed for use within one theater or area which are considered to be capable of harmful interference to assignments made in another theater or area, the frequency coordination committee concerned will coordinate frequency usage with the committees of the other affected theater(s) or area(s).

The frequency plan for a particular operation makes available groups of frequencies based on the tactical organization. Task forces (also task groups and/or task units) whose numerical designator exceeds 10 must use the frequencies assigned in the frequency plan to the task force (group) (unit) whose number corresponds to the last digit of the task organization numerical designator.

The frequency plan, as contained in JANAP 195, provides the following radio channels:

1. A chain of command net between the task force commander and his task group commanders.

2. A chain of command net between the task group commander and his task unit commanders.
3. A chain of command net between the task unit commander and his unit or the task element commander and his element. The net is, in effect, a functional net to be utilized as the mission of the unit (or element) requires.
4. Three functional nets for the entire task group, whether or not acting as a geographical entity. These nets are—
   a. A maneuvering net (MN) for maneuvering signals and flash warning for all units and commands in the formation.
   b. A combat information net (CI) for passing combat information between all units and commands of the formation.
   c. A ship-to-air net for communications between ships and aircraft of the task force.

Primary and Alternate Frequencies

In each group of frequencies assigned, one is designated primary, the other alternate. The former is in the UHF band, whereas the latter is in the MF of HF band. The primary frequency is used when within line-of-sight range; the alternate frequency, when additional range is required. Secondary frequencies are not assigned. When conditions prohibit satisfactory use of assigned frequencies, those of a similar, though differently numbered, tactical subdivision (not operating in the vicinity) are used unless other assignments are made.

Selection of Frequencies

The frequency selected from each channel is that of the most limited range which will attain the required range. The UHF frequency in each channel is the primary frequency; the medium frequency is the alternate. A series of MF/HF frequencies, necessary to provide communications over the greatest ranges visualized, are also available for use by task force commanders. The effective edition of JANAP 195 provides a basic plan, one that may be modified if necessary. Unless otherwise directed, however, a task organization utilizes the primary frequencies assigned, as soon as it is formed.

For the individual ship, the frequencies required for an operation are contained in the operation order itself—not JANAP 195. NWIP 16-1 and JANAP 195 are used when the operations in which the ship is participating are not governed by a specific communication plan issued for that particular operation.

COMBINED OPERATIONS

Communications in combined operations are in accordance with NWP 16 and NWIP 16-1, supplemented by pertinent JANAP's and ACP's. The effective edition of ACP 176, *Allied Naval Communications Instructions,* contains instructions to allied (or combined) naval forces dealing with basic doctrines and combined naval communications. This ACP is amplified by other publications of the ACP series prepared to facilitate communications between the armed forces of the allied nations of the free world. The purpose and goal of allied communication procedures is to have in effect a workable system so that lines of communication between naval allied forces of a heterogeneous nature can be readily maintained. Some of the problems encountered in allied naval operations are quite obvious: language, customs, differences in doctrine and procedures, and so forth. The sum of these problems represents a formidable barrier to the successful conduct of combined naval operations. Because of this barrier, the allied naval commands established since World War II have been working to produce a simple and workable set of communication procedures for allied operations. The Allied Communication Publications (ACP) series are the result of allied effort along these lines, and have proved satisfactory for the most part.

Basically, all allied naval operations are governed by the operation order issued by the commander of the operating forces. Thus, the communication officer of the individual ship simply must adhere to the proper communication plan effective for the operation in which his ship is a participating unit.

Analysis of Communications

An analysis of communications in combined fleet operations today reveals many errors

in such matters as procedure, authentication, and the like. This is partially attributable to the instability of the personnel situation and the attendant prevalence of a low level of communications experience—both officer and enlisted—in the fleet. Inexperience can be overcome, however, by a resolute determination to master the subject of naval communications in combination with an effective training program. Naturally, the inexperienced communication officer would like to know some of the pitfalls to avoid in preparing himself and his team for active participation as a unit of the Sixth Fleet or some NATO operation. Similar difficulties may be expected by units deployed to the Western Pacific.

Preparation for Allied Operations

Careful consideration should be given to the following training preparations prior to reporting for, say, a NATO operation.

1. Drill communication personnel in the correct procedures for proper routing and traffic-handling of all messages, including service messages.
2. Devote sufficient training time to use of cryptographic aids so that personnel are thoroughly familiar with systems to be employed in operations area.
3. Acquaint personnel with the types of communication countermeasures to which they may be subjected and ensure participation of ship in any local COMCM drills.
4. Ensure that all required ACP's are on board.
5. Ensure that all concerned are thoroughly indoctrinated in use of codress and authentication procedures.
6. Ensure that personnel are properly trained in recognition and identification procedures.

It is advantageous also for the communication officer to take proper cognizance of the following additional preparations.

1. Be prepared for frequent shifts of units from one task organization to another, and the resultant changes in voice calls and radio call signs and frequencies, with attendant confusion.
2. When assigned duty as rescue destroyer for carrier flight operations, guard land/launch frequency of carrier, conduct SAR on that circuit initially, shifting to other frequency when directed by task group commander.
3. Ascertain which unit has guard responsibility for fleet broadcasts and maintain alert communications.

CHAPTER 3

THE MESSAGE

A message is a written thought or idea, expressed briefly in plain or cryptic language, and prepared in a form suitable for transmission by any means of communication.

OPERATIONAL AND ADMINISTRATIVE MESSAGES

Operational Messages

Communications directing or affecting the actual movements of forces, ships, troops and aircraft to or in the area of combat, whether real or simulated, are operational. Weather and other vital reports affecting safety of lives, ships, forces, or areas also are operational. More specific examples are:

1. Tactical communications;
2. Combat intelligence messages, such as those dealing with reports on enemy disposition, movement, or employment of forces;
3. Communications dealing with control of communications; cryptography, deception, and countermeasures;
4. Hydrographic messages.

Administrative Messages

Administrative messages deal with routine matters, such as personnel transfer, ordinary reports, logistic requirements, and similar subjects.

ADDRESSEES

Most messages have at least one addressee responsible for taking appropriate action on the contents and for originating any necessary reply. Other addressees with an official concern in the subject of the message—but who do not have the primary responsibility for acting on it—receive the message for information. The term "information addressee" should not mislead the reader; though an information addressee is usually indirectly concerned with a message, he must very frequently take action of some nature within his own command. Some messages have only information addressees.

Messages are often categorized according to the way they are addressed. There are four types:

1. Single address;
2. Multiple address;
3. Book;
4. General.

A SINGLE ADDRESS message is destined for one addressee only.

A MULTIPLE ADDRESS message is destined for two or more addressees, each of whom is informed of the others. Each addressee must be designated either as action or information.

A BOOK message is destined for two or more addressees, and is of such a nature that no addressee needs to be informed of any others. Book messages are primarily the concern of shore stations. The station initially accepting a book message divides addressees into groups according to the relay stations which serve them. A separate message is prepared and transmitted to each relay station, the message changed only to omit addressees that are the concern of some other station. Upon receipt of a book message, a relay station may further reduce the number of addressees by making up single address messages for each of its tributaries addressed. Since many book messages are destined for scores of addressees, significant time and expense are saved by the shortened headings.

A GENERAL message has a wide dissemination according to a standard distribution list. There are many types, each of which carries an identifying title (fig. 3-1). Messages of given titles are sequentially numbered through the calendar year, as ALNAV 12-59, signifying the twelfth ALNAV sent during 1959. General messages are placed in a general message file, segregated according to type, and filed by serial numbers. They are kept until canceled or superseded.

The originator of a general message may designate it as a BASEGRAM if it is not of sufficient operational importance to justify immediate delivery to forces afloat by fleet broadcasts. The basegram system is used to reduce the number of messages transmitted by fleet broadcast so that the broadcast facilities are available for messages which must be delivered by rapid means. Forces afloat may obtain copies of basegrams from designated basegram authorities located in ports from which U. S. Navy ships normally operate.

You will see other general messages with titles not listed in figure 3-1. These are originated by sea frontier commanders, commandants of naval districts, and fleet, force, and ship type commanders to publish information within their respective commands.

TYPES OF GENERAL MESSAGES

ALCOAST	Originated by the Commandant, Coast Guard. ALCOAST is the Coast Guard equivalent to ALNAV. The Navy is responsible for delivery to Coast Guard units operating directly with the Navy.
ALCOM	(To all commands) Originated by the Chief of Naval Operations (usually DNC). ALCOM designates those general messages which were designed for, but not restricted to, the promulgation of communication information. ALCOMs will not be sent by rapid means to naval missions, advisory groups, aid groups, attaches or liaison officers unless specifically requested by the the drafter or releasing officer. When distribution of a classified ALCOM to any of the above activities is considered unnecessary or undesirable, the drafter or releasing officer will specifically indicate this fact and an unclassified filler sheet rather than the ALCOM will be mailed to the nonreceiving activity.
ALCOMLANT	Originated by the Chief of Naval Operations (usually DNC). ALCOMLANT is a subdivision of the ALCOM series for the Atlantic-Mediterranean areas.
ALCOMPAC	Originated by the Chief of Naval Operations (usually DNC). ALCOMPAC is a sub-division of the ALCOM series for the Pacific area.
ALDIST	Originated by the Commandant, Coast Guard, to provide instructions including those of policy level, or information of limited applicability, primarily to Coast Guard district commanders.
ALJAP	Originated by Communications Electronics Directorate/Joint Staff. ALJAP designates those general messages which promulgate information pertaining to CED/JS-adopted publications when rapid dissemination to all branches of the armed forces is required. (Ordinarily, when information from the CED/JS is peculiar to a single service,

TYPES OF GENERAL MESSAGES (Continued)

	such information is promulgated by the service concerned).
ALLANTFLT	Originated by CINCLANTFLT. ALLANTFLT is the equivalent of the ALNAV or NAVOP within the commands under CINCLANTFLT.
ALMAR	Originated by the Commandant of the Marine Corps to all Marine Corps activities.
ALMARCON	Originated by the Commandant of the Marine Corps to Marine Corps activities within the continental United States.
ALNAV	Originated by the Secretary of the Navy (SECNAV). ALNAVdesignates those general messages which normally concern the functions of the Naval Establishment, including the Marine Corps. ALNAVs are unclassified.
ALNAVSTA	Originated bythe Secretary of theNavy. ALNAVSTA designates those general messages, similar to ALNAV in content, which require wide dissemination to the shore establishment of the Navy and Marine Corps, including the shore-based elements of the operating forces. ALNAVSTAs are unclassified.
ALPACFLT	Originated by CINPACFLT. ALPACFLT is the equivalent of the ALNAV or NAVOP within the commands under CINCPACFLT.
ALSTACON	Originated by the Secretary of the Navy. ALSTACON designates those general messages which contain administrative information requiring wide dissemination to all stations within the continental U.S. ALSTACONs normally are unclassified.
ALSTAOUT	Originated by the Secretary of the Navy. ALSTAOUT designates those general messages which contain administrative information requiring wide dissemination to all stations outside the continental U.S. ALSTAOUTs are unclassified.
FLTOP	Originated by the Chief of Naval Operations. FLTOP designates those general messages concerning fleet units and their operational commanders.
JANAFPAC	Originated by CINCPAC. Addressed to U. S. commanders within the Pacific Command on matters of joint interest. Redistribution is accomplished at the discretion of the receiving U. S. Major Commands.
LANTOS	Originated by the Commander, Eastern Area, Coast Guard, to disseminate information to all Coast Guard ocean station vessels in the Atlantic Ocean.
NAVACT	Originated by the Secretary of the Navy. NAVACT designates those general messages which are similar to ALNAV in content except the Marine Corps is excluded.
NAVOP	Originated by the Chief of Naval Operations. NAVOP designates those general messages which are similar to ALNAV in content except attaches, missions, observers and minor shore activities, which are excluded.

TYPES OF GENERAL MESSAGES (Continued)

PACOS	Originated by the Commander, Western Area, Coast Guard, to disseminate information to all Coast Guard ocean station vessels in the Pacific Ocean.
MERCAST	Originated by the Chief of Naval Operations. MERCAST is the merchant ship equivalent to an ALNAV. Distribution: Ships guarding MERCAST schedules, MSTS, naval port control officers and NCSOs.
MERCASTLANT	Originated by CINCLANTFLT. MERCASTLANT is the merchant ship equivalent to an ALLANTFLT.
MERCASTPAC	Originated by CINCPACFLT. A MERCASTPAC is the merchant ship equivalent to an ALPACFLT.

Figure 3-1.

CALL SIGNS AND ADDRESS GROUPS

Call signs and address groups are both used to identify addressees and to assist in the transmission and delivery of messages. Call signs are used to identify activities having their own communication facilities; address groups are normally used where no communication capability is immediately assigned. In the case of call signs the basic purpose is to establish and maintain communications although the same group is used as an address when the activity also has need to send and receive messages. Address groups, on the other hand, are normally used to facilitate the sending and receiving of messages and are assigned to all activities having such a need.

Call Signs

Call signs—letters, letter-number combinations, or one or more pronounceable words—identify a communication activity. This is true in both civil and military usage, but military call signs may also designate the command(s) served by the station. There are several categories of call signs. Some belong to more than one category.

1. INTERNATIONAL call signs are assigned radio stations of all countries—civil and military, fixed and mobile—according to international agreement. The first letter, or first two letters of an international call indicate the nationality of the station. The United States is allocated the first half of the A block (through ALZ) and the whole of the K, W, and N blocks. The United States portion of A block is reserved for Army and Air Force use. The W and K blocks are assigned by the FCC to commercial and private stations, merchant ships, and others, and the N block is for exclusive use of the Navy, Marine Corps, and Coast Guard. Naval shore communication stations have 3-letter N calls; naval vessels have 4-letter N calls. EXAMPLES:

NAVCOMMSTA, San Francisco. . . NPG
USS *Dukes County* (LST 735) . . . . NGCY

2. COLLECTIVE call signs represent two or more facilities, commands, authorities, or units. EXAMPLE: NSS transmits NATA to address "all U. S. naval ships copying this broadcast."

3. INDEFINITE call signs represent no specified facility, command, authority, or unit, but may represent any one or any group of these. EXAMPLES:

NQO . . . . .Any or all U.S. naval shore station(s).
NERK . . . .Any or all U.S. naval ship(s).

4. NET call signs represent all stations with a net. EXAMPLES:

YAPD . . . . . .All stations on this (radiotelegraph) circuit.
OVERWORK . . .All stations on this (radiotelephone) circuit.

5. TACTICAL call signs are composed of letter-numeral combinations, or pronounceable words. They identify tactical commands or communication facilities.

6. RADIOTELEPHONE call signs are words or combinations of words—such as SUNSHINE or REDSKIN—used exclusively in radiotelephone communication.

7. VISUAL call signs are groups of letters, numerals, special flags and pennants, or combinations of any of these, intended for use in visual communications.

Address Groups

Shore based commands assigned address groups are commands, authorities, or activities not normally served by their own communication facilities, such as the following: (1) senior commands and commanders ashore, as SECDEF, SECNAV, bureaus and offices of the Navy Department, and district commandants; (2) fleet, type, or force commanders ashore; (3) elements of operating forces permanently ashore who are in frequent communication with forces afloat; and (4) elements of the shore establishment (such as weather centrals) having a need for direct addressing and receipt of messages.

Commands assigned address groups are not invariably ashore; all commands afloat (other than individual ships) are assigned address groups which are also used as call signs.

Address groups, like call signs, are divided into types.

1. COLLECTIVE address groups represent two or more commands, authorities, activities, units, or combinations of these. The address group shall be construed to include the commander and his subordinate commanders. EXAMPLE:

DSWN . . . . . DESRON 16

2. CONJUNCTIVE address groups are used only in conjunction with one or more other address groups. The conjunctive address group DRHG, for example, represents the naval control of shipping officer at ____. This particular group must be followed by a geographic address group.

3. GEOGRAPHIC address groups represent geographical locations or areas, and are always preceded by conjunctive address groups. Assuming the geographic address group for Kodiak, Alaska, to be SAAN, the naval control of shipping officer there would be addressed DRHG SAAN.

4. Address INDICATING groups represent a specific set of action and/or information addressees. The originator may or may not be included. YRHF is the AIG for eight oilers as action addressees and COMSERVPAC and COMSTS as information addressees. The originator is COMSTSPAC.

TIME IN MESSAGES

All naval personnel whose work brings them in contact with communications must have a thorough knowledge of the communicator's use of time.

For reckoning time, the surface of the globe is divided into 24 zones, each bound by meridians of 15° of arc, and each 1 hour of time apart in longitude. The initial time zone lies 7-1/2°E and 7-1/2°W of the Greenwich (England) meridian. It is called ZONE ZERO because the difference between the standard time of this zone and Greenwich civil time is zero. Each zone, in turn, is designated by the number which represents the difference between the local zone time and Greenwich mean time (fig. 3-2).

The zones lying in east longitude from zone zero are numbered from 1 to 12 and are designated minus because for each of them the zone number must be subtracted from local time to obtain Greenwich mean time. The zones lying in west longitude from the zero zone are also numbered from 1 to 12, but are designated plus, since the zone number must be added to the local zone time to get GMT. In addition to the time zone number, each zone is also designated by letter with the letters A through M (J omitted) corresponding to the minus zones, and the letters N through Y indicating the plus zones.

The twelfth zone is divided medially by the 180th meridian, the minus half lying in east longitude and the plus half in west longitude.

The number of a zone, prefixed by a plus or a minus sign, constitutes the zone description. In the vicinity of land, zones are modified to accord with the boundaries of the countries or regions using corresponding time.

So that a standard time may be kept throughout the service, GMT is used to indicate the time of origin of most naval messages. This eliminates any doubt as to which time the originator is using. The designating letter for GMT is Z.

The approved method of expressing time in the 24-hour system is with the hours and minutes expressed as a 4-digit group. The first two figures of the group denote the hour and the second two the minutes. Thus 6:30 AM

Figure 3-2.—Time zone chart of the world.

becomes Ø63Ø (canceled ciphers are used for zero in all naval messages to avoid confusion with the letter o); noon is 12ØØ; and 6:30 PM is 183Ø. Midnight is expressed as ØØØØ—not as 24ØØ—and one minute past midnight becomes ØØØ1. The time designation 1327Z indicates 27 minutes past 1:00 PM, GMT. Numbers are prefixed to the time to indicate the day of the month; in other words, to form a DATE-TIME GROUP (DTG). The DTG 171327Z means the 17th day of the current month plus the time in GMT. Dates from the first to the ninth of the month are preceded by the numeral Ø.

Local time is sometimes used in the text of a message, but must be accompanied by the zone designating letter—as in the DTG 17Ø812Q. If a local time is referred to frequently in the text, the suffix may be omitted provided a covering expression is used, such as ALL TIMES QUEBEC.

When it is necessary to indicate a date alone in a message, it is expressed by the day of the month, the 3-letter abbreviation of the month, and (if necessary) by the last two figures of the year: 3 FEB or 3 FEB 59. A night is expressed by the two dates over which it extends: NIGHT 3/4 FEB 59.

PROSIGNS

Procedure signs, or prosigns, are single- or multiple-letter groups which convey in standard condensed form certain frequently sent orders, instructions, requests, and the like relating to communications. There are almost two score authorized prosigns, some of which will be encountered in the next two sections and others in subsequent examples of message construction. Some prosigns are borrowed from various commercial procedures. Others are arbitrary coinages or simply abbreviations of the words they represent. An overscore means that in radiotelegraph and flashing light the prosign is sent as a single group—that is, without pause between letters. (It is, of course, impossible to observe overscores when sending by teletypewriter or semaphore.) Most prosigns have radiotelephone counterparts, called prowords, which we will meet later, in chapter 6.

Among the most important of the prosigns are the precedence prosigns.

PRECEDENCE

Precedence indicates to communication personnel the relative order in which a message should be handled and delivered, and, to the action officer, the relative order in which he should note its contents. Precedence is assigned by the originator on the basis of message content and how soon the addressee must have it. Because precedence begins as soon as the message is drafted, the originator and releasing officer should handle the message with the same speed they expect from communication personnel.

No message should be given higher precedence than will assure its reaching the addressee in time for action. Unfortunately for communication efficiency, this rule is all too often disregarded. Originators should be reminded by communicators that misuse of precedence tends to destroy the value of all precedence designators.

BASIC MESSAGE FORMAT

With a few exceptions, military messages sent by electrical telecommunications are arranged according to a standard joint form called the basic message format. The form is substantially the same whether the message goes by radiotelegraph, radiotelephone, teletypewriter, or by automatic tape equipment, although the format exists in four versions—one adapted to the special requirements of each of these primary transmission media.

All messages in joint form have three parts: heading, text, and ending. Of the three, the most complex is the heading, which often uses as many as 10 of the format's 16 lines. Headings are, however, formulated according to logical principles, and with a little study most communicators soon learn their construction and interpretation.

To begin, it is well to consider each item in the heading independently, for each has a special meaning and its relative position is significant. The prosigns (or prowords), call signs, address groups, and other elements that make up a typical heading must always appear in the order specified for the means of transmission.

It should be understood that there is no relationship between format lines and typed or

PRECEDENCE TABLE

Prosign	Designation	Definition and use	Handling requirements
Z	FLASH	A FLASH message must be short and must deal with an emergency situation of vital proportions. The precedence is reserved for (1) initial enemy contact reports, and (2) special emergency operational-combat traffic originated by specifically designated high commanders, or by operational commanders of units directly affected.	FLASH messages must be hand-carried, processed, transmitted and delivered in the order received, and ahead of all other messages. Messages of lower precedence are interrupted as necessary until the FLASH message is cleared. Note: In automatic systems where automatic interruption of lower precedence messages is not provided, adequate procedures are to be prescribed to ensure that FLASH messages are not delayed.
Y	EMERGENCY	Reserved for messages which demand immediate delivery to the addressee, such as those meeting one or more of the following qualifications: (1) amplifying reports of initial enemy contact; (2) emergency communications which affect current implementation of a tactical action; (3) distress traffic; and (4) messages which gravely affect the national security.	EMERGENCY messages are processed, transmitted, and delivered in the order received and ahead of all messages of lower precedence. If possible, messages of lower precedence will be interrupted on all circuits involved until the handling of the emergency message is completed. Note: In automatic systems where automatic interruption of lower precedence messages is not provided, adequate procedures are to be prescribed to ensure that EMERGENCY messages are not delayed.
O	OPERATIONAL IMMEDIATE	Used only for messages whose value depends on prompt delivery, such as (1) tactical messages pertaining to operations in progress; (2) traffic concerning immediate movements of ships, aircraft, or ground forces; and rarely (3) important administrative messages bearing directly on tactical operations.	OPERATIONAL IMMEDIATE messages are processed, transmitted, and delivered in the order received, and ahead of all messages of lower precedence. Processing and transmission of lower precedence messages already in progress will be interrupted unless interrupting and canceling the lower precedence transmission will take longer than repeating it.
P	PRIORITY	Reserved for important messages which must have precedence over routine traffic. This is the highest precedence which normally may be assigned to messages of an administrative nature.	PRIORITY messages are processed, transmitted, and delivered in the order received and ahead of all messages of lower precedence. ROUTINE messages being transmitted should not be interrupted unless they are very long.
R	ROUTINE	Reserved for all types of messages which are not of sufficient urgency to justify a higher precedence, but must be delivered to the addressee without delay.	ROUTINE messages are processed, transmitted, and delivered in the order received and after all messages of higher precedence.
M	DEFERRED	To be employed for all types of messages which justify transmission by rapid means, but which will admit of the delay necessary for prior transmission of messages of higher precedence.	DEFERRED messages are processed and transmitted in such order as will clear traffic with due regard for messages of a higher precedence.

Figure 3-3.

handwritten lines. Format line 12, for example, is the text of the message and may consist of many written lines.

The form of the message and its transmission requirements dictate the components and elements to be used in the heading. Format line 1 is reserved to teletypewriter and tape relay work, and is omitted in radiotelephone and radiotelegraph. The abbreviated plaindress heading may omit any or all of the following: precedence, DTG, and group count. Many messages not in abbreviated plaindress will omit such elements as transmission instructions, information addressee prosigns, and final instructions because there is no occasion for them. But the sequence of elements actually used will always be in accordance with the proper message format.

Construction of message headings to meet all transmission needs is outside the scope of this chapter. Doctrinal communication publications are available to the active communicator, and are the best reference sources for extremely detailed communication information. A few sample messages will be discussed here for the instruction of beginners and inactive communicators who do not have access to doctrinal publications. The parts of a radiotelegraph message are shown in figure 3-4 and the format for construction of the message text is shown in figure 3-5.

Radiotelegraph Message

Radiotelegraph communication is usually established by a callup prior to transmission of the message. The station with a message to transmit identifies itself as follows to the station for which it has a message—if in direct communication—or otherwise, to the station that will effect relay or delivery of the message:

NACH DE NKKC K

From the previous discussion of call signs it is apparent that this transmission is sent from one U. S. navy ship to another. A check of the call sign book shows that NACH is USS *Hailey* (DD 556), and NKKC is USS *Lewis Hancock* (DD 675). This callup translates literally, "*Hailey* from *Hancock*, go ahead and transmit." From the very fact *Hancock* is attempting to establish communication, *Hailey's* operator knows *Hancock* has a message to send. Accordingly he inserts a message blank in his typewriter and tells *Hancock* to go ahead:

NKKC DE NACH K

BASIC FORMAT FOR THE RADIOTELEGRAPH MESSAGE

Parts	Components	Elements	Format line	Contents
	Procedure		1	Not used.
H		a. Call	2 3	Station(s) called; prosign XMT (exempt) and exempted calls. Prosign DE (from) and designation of station calling.
E		b. Transmission identification c. Transmission instructions	4	Station serial number. Prosign T (relay); G (repeat this transmission back to me exactly as received); F (do not answer); operating signals; call signs, address groups, address indicating groups, routing indicators; plain language.
A	Preamble	a. Precedence; date-time group; message instructions.	5	Precedence prosign; date-time group and zone suffix; operating signals.
D		a. Originator's sign; originator.	6	Prosign FM (originator of this message is); originator's designation expressed as call sign, address group, or plain language.

BASIC FORMAT FOR THE RADIOTELEGRAPH MESSAGE (Continued)

Parts	Components	Elements	Format line	Contents
I	Address	b. Action addressee sign, action addressee(s).	7	Prosign TO; action addressee designation(s).
N		c. Information addressee sign; information addressees.	8	Prosign INFO (this message addressed for information to); information addressee designation(s).
G		d. Exempted addressee sign; exempted addressee(s).	9	Prosign XMT; exempted addressee designation(s).
	Prefix	a. Accounting information; group count; SVC.	10	Accounting symbol; group count; SVC (this is a service message).
S E P A R A T I O N			11	Prosign $\overline{BT}$ (break).
T E X T	Text	a. Subject matter	12	Internal instructions; basic idea of the originator.
S E P A R A T I O N			13	Prosign $\overline{BT}$.
E	Procedure	a. Time group	14	Hours and minutes expressed in digits and zone suffix, when appropriate.
N D 1 N G		b. Final instructions.	15	Prosigns B (more to follow); $\overline{AS}$ (I must pause); C (I am about to correct a transmission error in some foregoing part of this message); operating signals.
		c. Ending sign	16	Prosign K (go ahead and transmit), or $\overline{AR}$ (end of transmission no reply expected).

Figure 3-4.

FORMAT FOR THE CONSTRUCTION OF MESSAGE TEXTS

1. FORMAT FOR MESSAGE TEXT

Classification (5 spaces) Special Handling (if required)	CONFIDENTIAL NOFORN
Passing Instructions (if required)	COMTWELVE PASS TO FADM SMITH
Subject, concise and untitled	REVISED CONFERENCE SCHEDULE
Reference, identified by letter	A. MY 091700Z
Reference, (continued as necessary)	B. COMTHIRTEEN 131530Z
Text	1. REQUEST DESIGNATED COMMITTEE ARRIVE COMTWELVE 24 HOURS PRIOR CNO.
a. Paragraphs are numbered.	2. AGENDA:
b. Subparagraphs are indented and lettered or numbered as appropriate.	A. ADD "LOGISTICS OF PROJECT."
c. In a one-paragraph message, the subparagraphs are lettered.	B. DELETE "POSSIBLE LOCATION FACILITIES."

3. CNO ITINERARY, 19 AUG, TIMES UNIFORM:

ETA	ETD	LOCATION
0900	1300	SEATTLE
1515	1800	SFRAN
2300		WASHDC

2. EXCEPTIONS

a. The subject line may be omitted if its use will: (1) require an otherwise unclassified message to be classified, (2) noticeably increase the length of an otherwise brief message, or (3) increase commercial charges when the message is addressed to activities served by commercial communication facilities.

b. In a short message requiring only one paragraph, the paragraph need not be numbered and where there is only one reference the reference identification may be included in the body of the paragraph. For example:

UNCLAS
YOUR 190915Z. BUDGET APPROVED SUBJECT CNO CONCURRENCE

3. CHARACTERS AND SPACES. The number of characters and spaces on each teletypewriter line shall be limited to 65, except semi-automatic off-line decrypted messages which are subsequently relayed on-line may use a maximum line length of 69 characters and spaces.

4. TABULATED ENTRIES. A substantial reduction in message preparation and transmission time can be attained by the judicious arrangement of columnar material. In the sample message text above, note the arrangement of the first column at the left margin and succeeding columns spaced to the right of the first. The last column should be for entries of varying lengths, such as place and proper names.

5. PUNCTUATION. Punctuation shall be used when essential for clarity. The use of the letter "X" is discontinued. The punctuation marks used in the drafting of naval messages normally shall be limited to those symbols listed below which have Morse equivalents and appear on the standard typewriter and teletypewriter keyboards:

NAME	SYMBOL	ABBREVIATION	MORSE
Apostrophe	* '		.----.
Colon	:	CLN	---...
Comma	,	CMM	--..--
Hyphen	-		-....-
Parenthesis	( )	PAREN	-.--.-
Period	.	PD	.-.-.-
Question Mark	?	QUES	..--..
Quotation Marks	* " "	QUOTE/UNQUOTE	.-..-.
Slant sign/Virgule	/	SLANT	-..-.

The following symbols, which appear on the standard typewriter and teletypewriter keyboards may be used although they have no Morse equivalents:

Ampersand	* &
Dollar Sign	* $

*These symbols are not agreed for Allied use.

Figure 3–5.

With communication established, *Hancock* commences clearing traffic. The transmission may be analyzed as follows:

Format line	Transmission	Explanation
2 and 3	NACH DE NKKC	*Hailey* from *Hancock*
5	–M–	DEFERRED precedence.
55	222345Z–	DTG, indicating that this message was originated at 2345 GMT, on the 22d day of the month.
10	GR 10	Group count. This message has nine groups in the text. (A plain language word counts as one group.)
11	$\overline{\text{BT}}$	Break. Separation between heading and text.
12	UNCLAS GUARD MAIL FOR YOU PD RECEIVE AT FIRST LIGHT	Text.
13	$\overline{\text{BT}}$	Break. Separation between text and ending.
16	K	Go ahead and transmit.

On hearing the prosign K, *Hailey's* operator checks the message and counts the groups. If it appears to be correctly received, he gives *Hancock* a receipt for all of his last transmission, and indicates the exchange is at anend:

NKKC DE NACH R $\overline{\text{AR}}$

If, on the other hand, *Hailey's* operator is in doubt about some portion of the message, he can secure repetitions, as below. These transmissions are strictly between operators; they are not messages and have nothing to do with the format.

NKKC DE NACH . . . *Hancock* from *Hailey.*
$\overline{\text{IMI}}$. . . . . Repeat.
WA FIRST . . . . . Word after "first." *Hancock* replies.
NACH DE NKKC WA FIRST — LIGHT K

Prosigns are also available meaning "word before," "all before," and "all after." If *Hailey* missed some substantial portion in the middle of the message, he could have framed the request $\overline{\text{IMI}}$ GUARD TO LIGHT.

In the above example two ships are in direct communication and *Hancock's* call sign has served to address the message to that ship. A message that must undergo relay to reach the addressee will require a somewhat longer and differently constructed heading, inasmuch as it must be apparent to every station handling the message (1) who originated the message; (2) who receives the message for relay purposes; and (3) to whom the message is ultimately destined.

Assume that USS *Leyte* (CVS 32), steaming off Cristobal, Panama, has completed her mission of qualifying carrier pilots and wishes to so report to COMAIRLANT, Norfolk. Communication is established with NAVCOMMSTA, Balboa—the nearest U. S. Navy radio station—and transmission of the message commences. Address groups in subsequent examples are fictitious.

Format line	Transmission	Explanation
2 and 3	NBA DE NHRB	Radio Balboa from *Leyte.*
4	NR2	Station serial number. This is the second message sent to Radio Balboa from *Leyte* during current 24-hour period. (Station serial numbers are used only between ships and shore stations, and between shore stations.)
4	–T–	This message is for relay.
5	R–	ROUTINE precedence.
5	Ø11234Z	DTG.
6	–FM NHRB–	Originator, USS *Leyte.*
7	TO CABR	Action to COMAIRLANT.
10	GR7	Group count.
11	$\overline{\text{BT}}$	Break.
12	UNCLAS CARQUALS COMPLETED PD ETA GTMOØ314ØØZ	Text. Certain authorized abbreviations, standard throughout the services, are often used in messages for sake of brevity. The version as sent is 62

		percent shorter than the expanded text, which reads: UNCLASSIFIED CARRIER QUALIFICATION LANDINGS COMPLETED PD ESTIMATED TIME OF ARRIVAL GUANTANAMO BAY CUBA Ø3146ØZ.
13	BT	Break.
16	K	Go ahead and transmit.

NBA gives *Leyte* a receipt for the message, and by doing so assumes responsibility for relay. NBA has no direct link with Norfolk, the destination of the message, but does have a RATT circuit to NAVCOMMSTA Washington—who, in turn, has a landline connection to Radio Norfolk. NBA accordingly adds a routing indicator to the message (for which format line 1 has been left) informing Washington to relay to Norfolk. Radio Norfolk, guard for COMAIRLANT, effects delivery to the addressee.

Dual precedence may be used in a plaindress message to more than one authority or activity, provided the message has both action and information addressees. No more than two precedence prosigns can be used in the heading of such a message. The higher precedence prosign appears first, and applies to action addressees. The lower prosign refers only to information addressees.

The following example illustrates dual precedence wherein COMNAVAIRLANT will receive the message ROUTINE and NAS Jacksonville receives it DEFERRED.

NBA DE NHRB NRZ—T—R—M—Ø11234Z—
FM NHRB—TO CABR—INFO DUNE GR6 BT

Here is an example of a fleet broadcast message from NAVCOMMSTA, Washington, D. C., originated by CNO. Note the use of conjunctive address groups and the exempted addressee prosign. CW fleet broadcast messages repeat each element of the heading.

Format line	Transmission	Explanation
2 and 3	NERK NERK NERK DE NSS NSS NSS	Any or all U. S. Navy ships from Radio Washington. (This call is sent with the first message of each hourly schedule, omitted thereafter.)
4	W NR522 W NR522–	Radio Washington serial number 522—that is, the 522d message placed on this broadcast schedule since the first of the current month.
5	P P–	PRIORITY precedence to action addressees.
5	R R–	ROUTINE precedence to information addressees.
5	11Ø847Z 11Ø847Z	DTG.
6	FM FM	Originator's prosign.
6	BOSS BOSS–	CNO.
7	TO TO	Action addressee prosign.
7	EATG EATG	All ships operating under_____.
7	CABR CABR	COMAIRLANT.
7	EATG EATG	All ships operating under_____.
7	HIME HIME–	COMBATCRULANT.
8	INFO INFO	Information addressee prosign.
8	SKAT SKAT–	NAS GTMO.
9	XMT XMT	Exempted addressee prosign, meaning that stations or addressees which follow are exempted from foregoing collective address—in this case, the action address.
9	PINS PINS	CRUDIV 10 (a CRUDIV operating under COMBATCRULANT).
9	NHCY NHCY	USS *Antietam* (CVS 36) operating under COMAIRLANT.
10	GR156 GR156	Group count.
11	BT	Break.
12	(156 encrypted groups)	Text.
13	BT	Break.
16	AR	This is the end of this transmission and no reply is expected.

Message Forms

A military message may be drawn up in any one of the following forms: plaindress, abbreviated plaindress, or codress.

Plaindress

A plaindress message is one in which the originator and addressee designations are indicated externally of the text.

Unless the call serves as the address, a plaindress message contains all the components shown in the basic message format, except that the prefix may be omitted.

A plaindress message always must include the following elements:

1. Precedence;
2. Date-time group.

The group count designation always will be included when the accounting symbol is employed.

Abbreviated Plaindress

Operational requirements for speed of handling—of contact reports, for example—may dictate the abbreviation of plaindress message headings. In such cases, any or all of the following may be omitted from the heading:

1. Precedence;
2. Date;
3. DTG;
4. Group count.

Codress

A message in codress form is an encrypted message in which the designations of the originator and addressees and additional passing instructions, if necessary, are included in the encrypted text. All components of the basic message format are employed for a codress message, except the address component of the message heading (format lines 6-9).

The message address will be included in the encrypted text in the following order: originator, action addressees, information addressees and exempted addressees. Such address designators are to be in plain language.

To maintain security, any message which refers to an external date-time group of a codress message, should be classified.

Codress provides a greater degree of security than plaindress. The basic improvement is that a potential enemy is not able to determire which are the action addressees and who is to receive the message for information. Second, any single transmission shows only who is receiving the message on that particular circuit. On the face of it, this may not appear to be a great improvement, but in analysis it is significant. For a message being sent from the Chief of Naval Operations to some ten action addressees and perhaps an additional fifteen information addressees (the greatest number of transmissions being sent over land wires and teletype trunk lines using station routing indicators and only a small number sent on relatively easily monitored radio circuits) the odds against compromise are tremendous. Even in a task force situation, where some transmissions would be by flashing light, the codress system is effective.

The codress message is prepared for transmission as follows:

1. The heading of the encrypted version received from the cryptocenter should indicate only the precedence and date-time group. Attached for use by the communication center should be a list showing the addressees or address designators of the stations to whom the message is addressed.

2. The message center will then prepare a heading for each required transmission. The heading of each transmission must contain only those call signs or address groups necessary to route the message to the crypto guard for each addressee who will be reached by the particular transmission. Encrypted call signs and address groups will be employed, if prescribed.

3. On each individual transmission the heading contains only such station or address designations as will enable the relaying or receiving stations to deal properly and expeditiously with it.

4. Only the prosign "T" may be used in the external heading. No plain language transmission instruction is authorized. The prosign "T" should be used only to instruct other communication stations who have to relay and/or decrypt it themselves.

5. If an activity has to relay the message as well as decrypt it for itself, the address

group or call sign of both the activity and the station to which it is to be relayed must be included in the external transmission instructions.

6. Shore radio stations must not be required to decrypt the text in order to effect further routing.

EXAMPLE: YUCR originates a message for transmission to BZOC, BZOE, ESCJ, QMZF, XYAQ and YJVO. Which of these commands are action addressees and which are to receive it for information will be noted in the encrypted message.

Three transmissions are necessary from YUCR as follows:

1. Transmission to BZOC:

BZOC DE YUCR-P-271Ø25Z GR58 BT
TEXT BT

2. Transmission to GZP for relay to BZOE and YJVO (GZP to relay without decrypting):

GZP DE YUCR-T-BZOE YJVO-P-271Ø25Z GR58 BT
TEXT BT

3. Transmission to MTP, ESCJ, QMZF and XYAQ (MTP who is crypto guard for QMZF is to relay and also decrypt):

MTP DE YUCR-T-ESCJ MTP XYAQ-P-271Ø25Z GR58 BT
TEXT BT

Note that MTP is included after the "T" so he will know he must decrypt.

As the result of receiving the message as shown in (3) above GZP will transmit:

BZOE YJVO DE GZP-P-271Ø25Z GR58 BT
TEXT BT

As the result of (3) above MTP will transmit as follows:

ESCJ XYAQ DE MTP-P-271Ø25Z GR58 BT
TEXT BT

OPERATING SIGNALS

Radio operators and teletypists very frequently exchange routine advice and operating information, and occasionally relay emergency communication instructions or reports to other ships and stations and to aircraft. Traffic of this nature is transmitted in condensed, standard form by the use of operating signals—3-letter groups beginning with Q or Z. These signals—of which there are several hundred—represent words, phrases, or complete sentences, and are a form of shorthand, eliminating time-consuming plain language transmissions. Q signals are employed in both military and civil communications, and are understood by ships and shore stations of any nationality. Z signals are used only in United States and allied military communications, and represent meanings not found in the Q code. Both Q and Z signals can be used together, when necessary, in military communications. Operating signals are published in ACP 131. This publication has decode sections for both Q and Z signals tabbed alphabetically, and an encode section tabbed by subject matter.

Use of Operating Signals

Operating signals are prescribed for every form of electrical telecommunication except radio-telephone. Instead, the radiotelephone operator transmits operating information in brief spoken phrases. An exception is when a message containing an operating signal is relayed by radiotelephone; in this case the operator transmits the group phonetically.

Many operating signals may be used in either of two ways—as a question or as a statement. The prosign INT before the signal places it in the form of a question. Example: USS *Enterprise* (CVAN 65) asks NAVCOMMSTA Washington (NSS):

NSS DE NIQM INT QRU meaning "Have you anything for me?"

Reply:

NIQM DE NSS QRU meaning "I have nothing for you."

When communicating with nonmilitary stations, the prosign IMI, used after the Q signal, is employed instead of INT ahead of the Q or Z signal to give an interrogatory meaning.

Some signals must be accompanied by a numeral suffix which is used to complete, amplify or vary the basic meaning. Example: A teletypewriter operator checks circuit operation with the query INT ZBK, meaning "Are you receiving my traffic clear?" The receiving station has a choice of replies: ZBK1 means "I am receiving your traffic clear," or ZBK2, "I am receiving your traffic garbled."

Many operating signals contain blank portions in their meanings which are filled in to

convey specific information. INT ZRE means "On what frequency do you hear me best?" In ACP 131 the declaratory meaning listed for ZRE is "I hear you best on____KC) (MC)." The operator fills in the necessary information:

NSS DE NIQM ZRE 8578 meaning "I hear you best on 8578 KC."

Other signals have, in their meanings, blanks enclosed in parentheses. Filling in such a blank is optional. INT ZHA means "Shall I decrease frequency very slightly (or_____ KC) to clear interference?" The operator receiving the signal INT ZHA without the frequency added knows it means "Shall I decrease frequency very slightly?"

During wartime, operating signals are often encrypted, especially those which reveal—

1. Specific frequencies.
2. Cryptographic data.
3. The organization of networks.
4. Ship movements (estimated times of arrival, departure, etc.).

Unless they are encrypted, operating signals possess no security and must be regarded as the equivalent of plain language.

CLASSES OF MESSAGES

Our subject finally turns to classes of messages, of which there are five: A, B, C, D, and E. Classes A, B, and C are Government messages, and D and E are nongovernment, or private messages. The purpose of this classification system is to aid administration and accounting.

By far the largest volume of traffic handled by the Navy is class A, consisting of official messages of the Department of Defense.

Class B includes official messages of the United States Government excluding those originated by the Department of Defense.

Class C consists of broadcast traffic in special arbitrary forms, available to ships of all nationalities. Class C messages are concerned with special services, such as hydrographic data, weather, and time.

Class D's are private messages for which the Navy collects tolls. The group includes radiograms and press messages sent by correspondents aboard ship.

Class E messages are personal messages to and from naval personnel, handled free of charge over naval circuits. Charges are collected from the sender only when a commercial communication company, such as Western Union, will handle the message over part of its route. For example, suppose your ship is in the Atlantic and has a class E message addressed to a man at a naval air station in Cuba. Your ship transmits the message to Radio Washington, which relays it via San Juan, P. R., to a station at Guantanamo Bay, Cuba, that effects delivery to the naval air station. The message never leaves Navy channels and the originator pays nothing. But if the message were addressed to Louisville, Western Union would handle it out of Washington and the ship would collect tolls from the originator for the distance between Washington and Louisville. Your ship would forward the money to DNC for payment to Western Union in accordance with instructions found in the effective edition of DNC 26.

The class E message privilege is primarily for purposes of morale. It affords naval personnel at sea a means of communication regarding urgent personal matters without incurring prohibitive expense. It is not available between points on shore within the United States. In general, the privilege is used sparingly. Subjects ordinarily acceptable for transmittal or delivery are matters of grave personal concern, such as the serious illness of a close relative; birth announcements; important nonrecurring business communications; matters of life and death; and occasional greetings on important anniversaries. Not acceptable are trivial or frivolous messages, those of unnecessary length, and ordinary congratulations.

ORIGINATOR; DRAFTER; RELEASING OFFICER

The originator of a message is the command by whose authority the message is sent. The drafter is the person who actually prepares the message for release. The releasing officer authorizes transmission of the message for and in the name of the originator. The commanding officer is usually releasing officer, but he may delegate releasing authority if he wishes.

DRAFT CAREFULLY!

It is the responsibility of all of these officers to see that outgoing messages are properly drafted. Too many messages are still being sent out that are unclear, wordy, or full of stilt. Precedence is sometimes abused and too many or too few addressees included.

CHAPTER 4

THE COMMUNICATION CENTER AFLOAT

PHYSICAL LAYOUT

The physical layout of radio central, the cryptocenter, and the radio transmitter room on a *Forrest Sherman* class destroyer is shown in figures 4-1 and 4-2. These illustrations will give you an idea of the communication capabilities of a new destroyer. In addition to these three spaces, there is an auxiliary radio room containing an LF receiver, an MF/HF receiver, a UHF receiver, an MF/HF transmitter, and a UHF transmitter.

THE MESSAGE

All communication traffic follows a similar system of checking, logging, releasing, etc. These various steps are outlined in the following paragraphs. Although each of these steps will be followed regardless of the size of ship or personnel available, you will find that on smaller ships some of the steps are performed by one person instead of the two or three which would be found on a larger vessel.

For example, on a destroyer the watch supervisor will probably double as the CWO and perform all the necessary steps in preparing a message for routing, while on a larger ship such as a cruiser each of these steps will be performed by different persons.

FILES

Communication Center File

The communication center file, formerly called the general file, is an unclassified source of reference for all messages (irrespective of means of transmission) addressed to or originated by the command. It contains the original of each plain message, and an encrypted copy of each classified message; as received or transmitted. When an encrypted copy is not available or is nonexistent (as in the case of unencrypted classified messages transmitted by registered mail or approved wire), a filler or dummy referring to the cryptocenter file is filed in place of the message. Messages are filed chronologically by date-time group.

If desired, the file may be subdivided into incoming and outgoing sections. Encrypted copies of classified messages in the communication center file will contain operator's services and communication watch officers' initials. Plain language outgoing messages will contain the above notations plus drafting and releasing officers' signatures and initials of persons to whom the messages were routed.

Cryptocenter File

The cryptocenter file contains the edited plain language version of each classified message addressed to or originated by the command, filed chronologically by DTG. Outgoing messages will show drafting and releasing officers' signatures, and initials of persons to whom the message was routed. In effect, the cryptocenter file is the classified portion of the communication center file.

The cryptocenter file may be physically subdivided to comply with stowage requirements for classified matter. In all cases, Top Secret messages are afforded separate stowage.

Radio Station File

The radio station file is a chronological record of all radio traffic handled by the

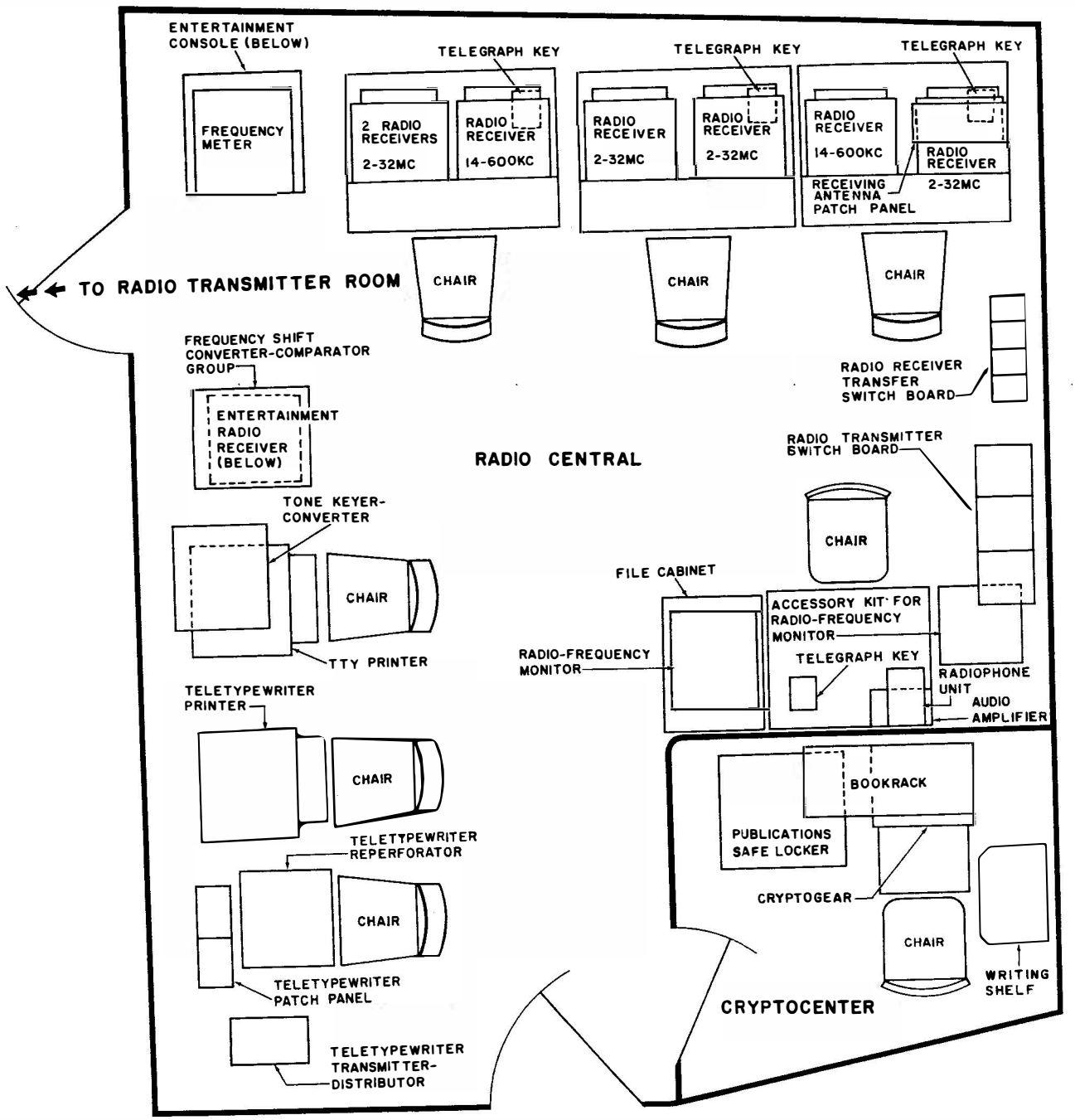


Figure 4-1.—Layout of radio central and cryptocenter.

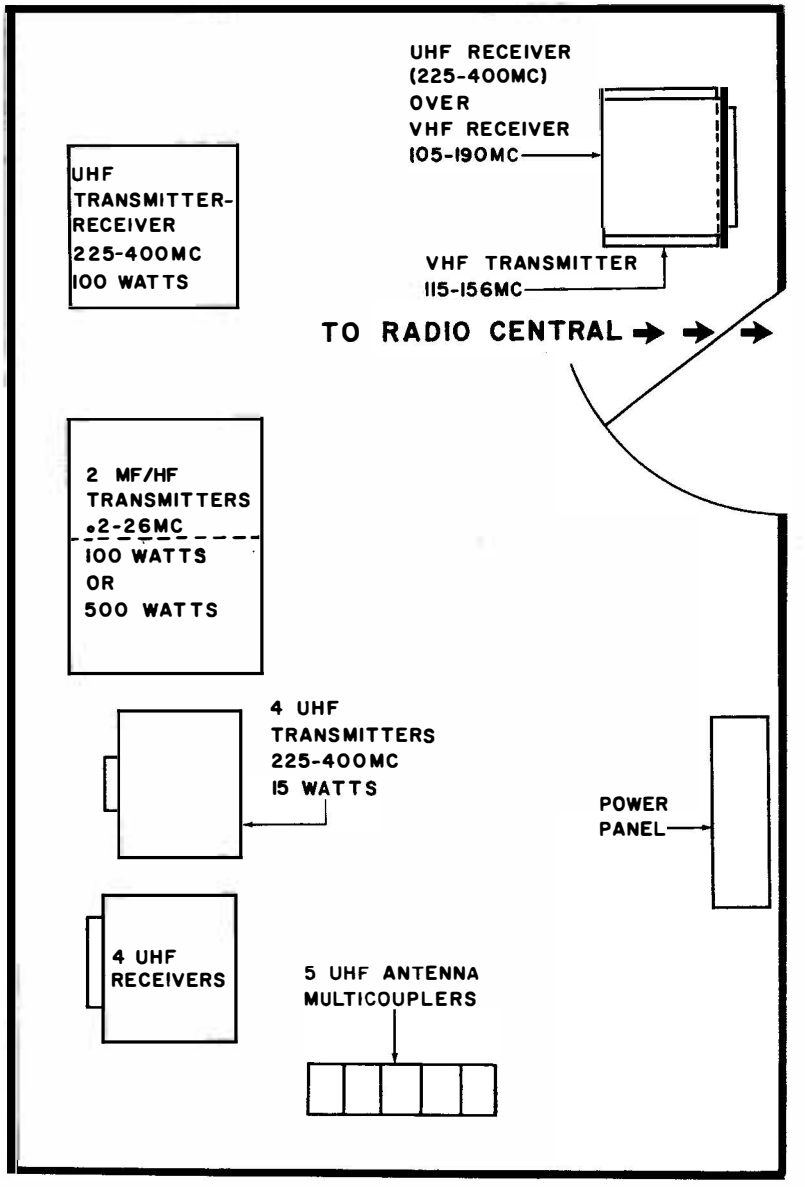


Figure 4-2.—Layout of radio transmitter room.

command. Broken into various components, it contains a copy of each message received by radio addressed to the command, and a copy of each message transmitted by radio, whether addressed to the command or not. These copies bear operators' services (TOD or TOR, initials of operator, frequency received or transmitted on, and for outgoing messages, the station to which the message was sent), and are filed by time of receipt/time of delivery or in order of visual date-time group (VDTG).

General Message File

The general message file is a source of reference for all general messages of which the command is an addressee. It is subdivided by type of general message, and each type is filed in serial order. The file is given the classification of the highest classified message contained therein. General message files

may also be divided by security classification, with appropriate cross-reference, to facilitate access and stowage.

Visual Station File

The visual station file is a chronological record of all traffic (except tactical signals transmitted via flaghoist) handled by the command by visual means. It is identical in purpose and description to the radio station file.

Log Files

Log files include the radio log file, visual station log file, and signal log file.

The radio log file is a file of logs for all radio circuits, including logs of fleet broadcasts and intercept schedules.

The visual station log file includes the visual circuit copy of each message addressed to, transmitted by, or relayed by the command.

The signal log file, as its name implies, is a file of the signal logs.

Destruction of log files is authorized after 6 months, except for logs relating to distress or disaster, which are retained 3 years. Logs of historical or continuing interest are retained indefinitely.

INCOMING MESSAGES

Unclassified Messages

An incoming plain language message is processed through the following steps.

1. The radio operator copies the message on a circuit book (or takes it off the RATT) and passes it to a "breakdown man" who translates the call signs in the heading. He, in turn, passes it to the radio supervisor.
2. The supervisor checks the entire message and sends it into the message center.
3. The CWO checks the message, logs it, and marks action and information officers. It is given to the message center Radioman, who makes a smooth copy with as many carbons as are required. These are passed back to the CWO.
4. The CWO checks the message again, and gives it to the messenger, retaining at least one copy until completion of delivery.
5. The messenger delivers the traffic to action and information officers, who receipt by initialing a copy (usually the original of the copies typed by the Radioman). The Captain, executive officer, and communication officer receive copies of all messages, and for this reason often maintain file boards on which their copies are placed.
6. After distributing all copies and obtaining initials, the messenger returns the completely initialed original to the message center. There the CWO checks it for completeness of delivery. This master copy becomes a permanent part of the message center file, and the radio circuit copy is sent back to the radio room for the radio station file.

Classified Messages

Confidential messages require security measures in handling. As few copies as possible are made, with routing strictly limited to those who need to know. Some, or all, information officers do not receive personal copies, but see and initial the original copy, which then is returned and placed in the Confidential cryptofile.

Only one copy should be made of a Secret message. Action officers, and other officers who must know, see and initial the translation copy, as for Confidential.

The procedures described above apply to messages requiring prompt but not instant delivery. For high precedence messages the CWO must use the most rapid means of delivery available—particularly to action officers. Direct delivery by approved telephone circuit, delivery of rough translations before writeup, and various other expedients may be resorted to when necessary. Routine delivery follows as soon as possible.

The CWO does not route Top Secret messages. These are processed by the Top Secret control officer, appointed by the Captain to handle all Top Secret matter aboard. He may or may not be a regular communicator.

INCOMING MESSAGE LOG

ALL TIMES GMT

DATE 13 AUG 19—
PAGE NR. 2

BROCAST NR.	CRYPTO-CENTER NR.	TIME IN	TIME OUT	FROM	ACTION	DTG	GROUPS	SYSTEM	PRECEDENCE AND FILE NR.	CWO
K102	1	0450	0506	COMDESDIV222	DESDIV 222	130401	14	154	-R- FILE 1	RTK
K139				COMSERVLANT	Weeks	130103	20		-M- TRANSFER CMC	RTK
K158				CNO	ALCOM 78	130358	19		-M- CHANGE INC 26	RTK
K173	2	0648	0709	COM 5	Weeks	130523	36	112	-R- FILE 2	RTK
K180	3	0657	0714	CTF 60	Weeks	130644	17	154	-P- FILE 2	

Figure 4-3.—Page from incoming message log.

Logging

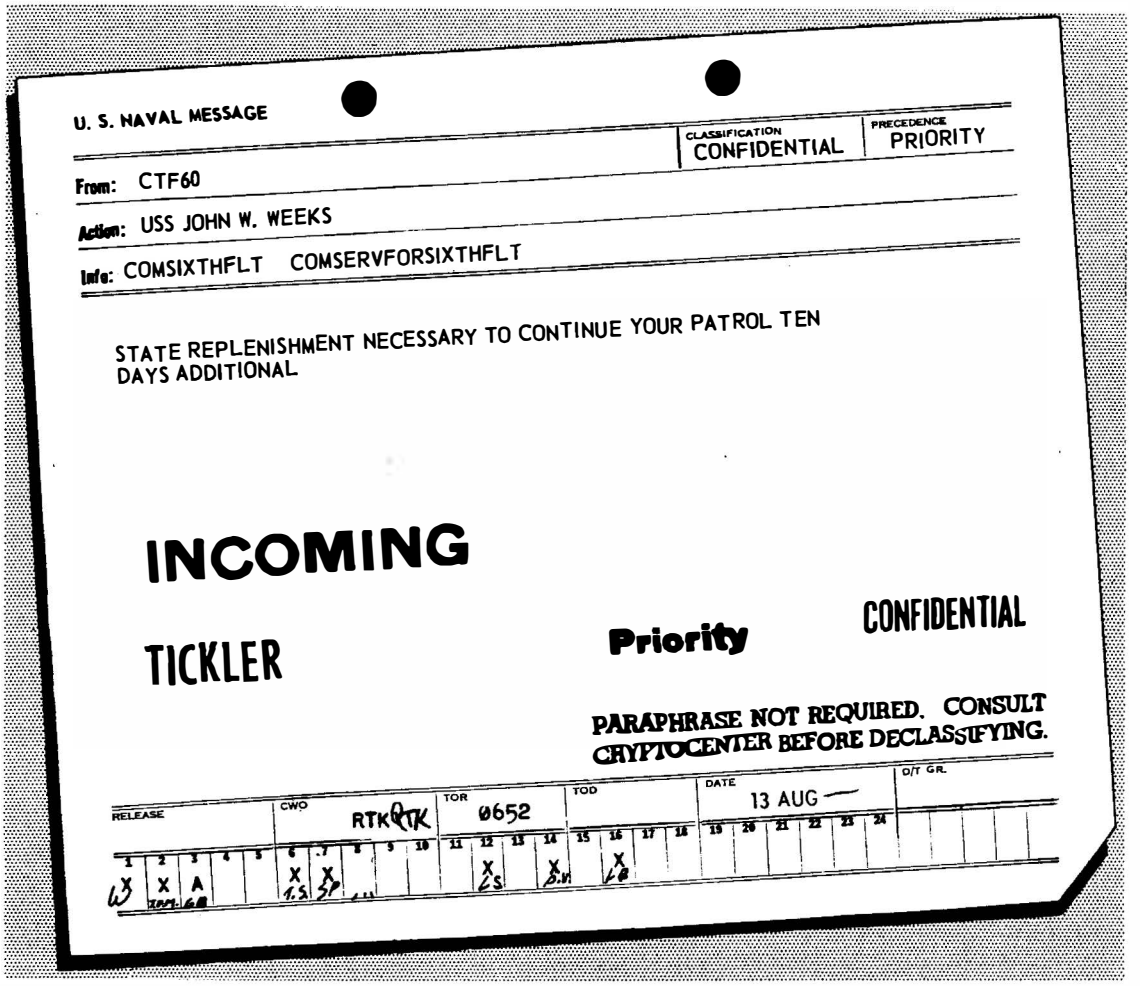
Assume that an incoming encrypted message has just been passed to the CWO by the supervisor. After checking the message, the CWO logs it as shown in figure 4-3. The first column of the log is for the broadcast number, K180. The message is classified and must be decrypted; it is, accordingly, assigned a cryptocenter number for purposes of reference and accounting. Columns 3 and 4 give the time the cryptocenter receives and returns the message. Columns 5 and 6 are for the originator and action addressees. Information addressees are omitted, except that own ship is entered if an information addressee. The DTG of the message is shown in column 7, the group count in column 8, and the cryptosystem in column 9. Column 10 is for the precedence and location of the plain version in the cryptocenter files. The last column is for the CWO's initials, but is left blank until the message has been completely routed and returned to the message center for filing.

An unclassified message would be logged as K139 and K158. The cryptographic information in columns 2, 3, 4, and 9 would be omitted and, because it could not be filed permanently in any place other than the unclassified message center file, a two- or three-word summary of its contents would be inserted instead of a notation on its location in the files.

Internal Routing

The call signs in the heading of a message give no indication of the officers aboard who are to receive the message, either for action or information. The CWO must read the text and decide who is primarily responsible and who is officially interested.

It is important that the right number of copies be made. If a message is underrouted,



U. S. NAVAL MESSAGE

CLASSIFICATION CONFIDENTIAL | PRECEDENCE PRIORITY

From: CTF60

Action: USS JOHN W. WEEKS

Info: COMSIXTHFLT COMSERVFORSIXTHFLT

STATE REPLENISHMENT NECESSARY TO CONTINUE YOUR PATROL TEN DAYS ADDITIONAL

INCOMING

TICKLER

Priority

CONFIDENTIAL

PARAPHRASE NOT REQUIRED. CONSULT CRYPTOCENTER BEFORE DECLASSIFYING.

RELEASE | CWO RTK RTK | TOR 0652 | TOD | DATE 13 AUG | O/T GR.

Figure 4-4.—CTF 60's 130644Z.

the result may be unnecessary delay. The other extreme, preparing a copy for everyone aboard who might have even a remote interest in the message, is equally bad; it would take too much time and often circulate classified information too widely.

Messages are customarily routed for action to the department head having direct cognizance over the matter, and for information to the commanding officer, executive officer, and other officers concerned.

Before a message is delivered, the CWO should go over it once more to see if he has left himself open for questions from the recipient. If there is dual precedence, is it clearly shown? Are there any references in the text? If so, are identifying excerpts shown on the face of the message?

Finally, the message is stamped, as appropriate; initialed; and, if necessary, a copy is placed in a temporary file.

An example of a message written up for internal routing may be helpful. Referring again to the incoming message log (fig. 4-3), it may be seen that the latest incoming message was broadcast NR K180, bearing DTG 130644Z. After being returned from the cryptocenter, written up by the message center Radioman, and stamped by the CWO, it appears as in figure 4-4.

OUTGOING MESSAGES

An outgoing message is processed through these steps:

1. After determing that a message is necessary, the drafter prepares it, assigning appropriate classification and precedence, and sends it to the releasing officer.

2. The releasing officer, often the commanding officer or executive officer, checks the message for content, precedence, classification, brevity, and clarity, making any changes he sees fit. If he thinks the message is unnecessary, or that it can be given a lower precedence, he returns it to the drafter. If he approves the message, or approves it with changes, he sends it to the message center.

3. As soon as the message arrives, the CWO enters it in the outgoing log.

4. If the message is classified, the CWO prepares it for encryption and logs it into the cryptocenter. After being assigned a DTG and encrypted, it is passed back to the CWO, who logs it out of the cryptocenter, drafts a heading, and sends it to the radio room. If the message is unclassified, it is necessary to add only a heading before it is sent into the radio room.

5. The originator's rough draft is given to the Radioman, who makes file and routing copies.

6. In the radio room the supervisor logs the message and gives it to an operator.

7. The operator transmits the message and the supervisor picks it up again.

8. The supervisor logs the time of delivery (TOD), and temporarily returns the message to the message center for completion of the CWO's log.

9. Copies bearing TOD are routed for information to interested officers aboard.

10. The originator's rough draft is placed in the alibi file (the communicator's "alibi," in case an originator thinks his message did not go out as he wrote it): the original encrypted copy goes to the radio supervisor for the radio station file; a filler, dummy, or copy of the encrypted version goes into the message center file; and a plain language version is entered in the proper section of the cryptofile.

For an example of the handling of an outgoing message, suppose the operations officer has originated a reply to CTF 60's 130644Z, concerning replenishment necessary to keep the ship at sea 10 additional days.

As soon as the operations officer's rough draft reaches the message center, the CWO checks it for initials of the releasing officer. He finds it approved, with a change in phraseology. He gives the message a general check, and compares it with the tickler copy to see if the outgoing conveys to CTF 60 the information requested.

The message must now be prepared for the cryptographer. Since the message is to be sent codress, the CWO prefixes the complete address to be encrypted along with the originator's text. He logs the message into the cryptocenter. It appears as in figure 4-5.

When the cryptographer has finished, the CWO logs the message out of the cryptocenter. The encrypted message comes back on gummed machine tape, pasted 10 groups to a line on a message blank. The originator's rough draft is returned with it. The CWO gives the originator's rough draft only to the Radioman, who types the file and routing copies, showing excerpts from the referenced message. The encrypted version still lacks a heading, so the CWO addresses it to NAVCOMMFAC Port Lyautey for relay by the broadcast. He then adds the group count and sends the encrypted message to the radio room supervisor.

File and routing copies are not distributed until a TOD is taken off the serviced transmission copy returned from the radio room. Internal routing is the same as for the incoming message which it answers, except that there is no action officer.

When the messenger returns from distributing routing copies, a final entry is made in the CWO's log (fig. 4-6) and copies of the message go into the proper files.

BROADCASTS

Fleet Broadcasts

Fleet broadcasts are the primary means of delivering traffic to the fleet. All ships not exempt must copy all messages transmitted on the appropriate area broadcast. They are responsible for maintaining a complete file of the serially numbered messages. The fleet broadcast is broken down into the CW, RATT, FAX, and submarine broadcast. The fleet

ORIGINATOR'S ROUGH DRAFT

From: USS JOHN W. WEEKS

Action To: CTF 6Ø

Info To: COMSIXTHFLT
COMSERVFORSIXTHFLT

Drafted by: G.L. Bowman

Released by: J. W. W.

PRECEDENCE	CLASSIFICATION
☐ Z	☐ TOP SECRET
☐ Y	☐ SECRET
☐ O	☒ CONFIDENTIAL
☒ P	☐ PLAIN
☐ R	
☐ M	

☐ BY MAIL ☐ VISUAL

FM JOHN W WEEKS TO CTF 6Ø INFO COMSIXTHFLT
COMSERVFORSIXTHFLT X

YOUR 13Ø644Z X SIXTY THOUSAND GALS NSFO X AMMO ADEQUATE X FRESH PROVISIONS DESIRED
BUT NOT NECESSARY

CONFIDENTIAL

131210Z	AUG.	19—	CONF	RTK
DTG	Month	Year	Class Ref.	CWO

Figure 4-5.—Week's 131210Z, ready for encryption.

OUTGOING MESSAGE LOG

ALL TIMES GMT

DATE 13 AUG 19——

PAGE NR. 1

CRYPTO-CENTER NR.	TIME IN	TIME OUT	FROM	ACTION	DTG.	GROUPS	SYSTEM	PRECEDENCE AND FILE NR.	CRYPT. OFFICER	CWO
1	ØØØ1	ØØ14	WEEKS	CTF 60	13ØØ1Ø	32	116	-P- FILE 1	JRH	RTK
2	Ø91Ø	Ø922	WEEKS	DES	13Ø918	15	154	-M- FILE 1	JRH	RTK
3	1254	1225	WEEKS	CTF60	131216	45	154	-P- FILE 2	JRH	RTK

Figure 4-6.—Page from outgoing message log.

submarine broadcast usually is integrated with the regular CW broadcast unless an independent fleet submarine broadcast is established in the area. This usually occurs only during wartime.

All fleet broadcasts normally are transmitted on several frequencies (listed in JANAP 195) to allow a choice for best reception, considering the time of day or night and the atmospheric conditions.

JANAP 195 gives the operating schedule for each type of fleet broadcast. For example, the fleet broadcast (CW) commences every hour on the hour, unless otherwise indicated, and normally does not exceed 50 minutes in duration, except the general message schedule which may be extended to 1 hour and 50 minutes. Submarine schedules, when included as a submarine component of the fleet broadcast, are normally transmitted every odd hour.

General Broadcasts

General broadcasts include scheduled transmissions of the following material:

1. Messages to U. S. Navy controlled merchant ships (MERCAST);
2. Hydrographic information;
3. Weather;
4. Time signals;
5. Press.

The general broadcast, like the fleet broadcast, has CW, RATT, and FAX components. Operating schedules for each of these can be found in JANAP 195, as can the various operating frequencies.

Areas

Broadcast areas are delineated in JANAP 195. The areas for the fleet broadcasts and general broadcasts are the same. Figure 18-3 shows how the surface of the globe is divided into broadcast areas and the broadcast station for each area.

SHIP-SHORE COMMUNICATIONS

Ship-shore radio circuits are the primary means for delivery of traffic from ships and commands at sea to shore radio stations.

Types of Circuits

Ship-shore radio circuits fall within three general categories: primary, secondary, and special circuits.

Watch requirements are set up only as necessary for each ship. There may be times, however, when the secondary ship-shore circuit is used as a harbor net, in which case a watch must be maintained.

Primary Ship-Shore Radio Circuits

Primary ship-shore radio circuits have been provided for long-distance communications. Prior to transmitting, ships should determine the best frequency to be used. This can be done by referring to the propagation tables in DNC 14 or by listening to the HF fleet or general broadcast from the shore radio station which you desire to contact. The closest ship-shore frequency to the fleet or general broadcast frequency should then be tried.

Shore stations will generally guard radioteletypewriter and radiofacsimile ship-shore circuits only on a request basis. Ships desiring to transmit on these circuits should send a procedure message to the shore radio station concerned, using the appropriate radiotelegraph primary ship-shore circuit.

Secondary Ship-Shore Radio Circuits

The secondary circuits have been established for use in lieu of the primary ship-shore circuits when the ship is within reliable range. Medium frequencies are normally utilized for these circuits. Secondary ship-shore radio circuits may also serve as warning nets by ships in or near established harbors. When in harbors, all ships except those attached to naval district or sea frontier forces and guarding district or sea frontier frequencies will guard the frequency employed as harbor common, or make guardship arrangements.

Special Ship-Shore Radio Circuits

Special circuits may be established by CNO, based on recommendations of fleet or force commanders, with a view to providing adequate ship-shore radio circuits to fulfill the missions of forces under their commands. In certain circumstances, ships may be authorized to use point-to-point circuits to pass traffic to shore stations which normally do not guard a ship-shore radio circuit.

COASTAL HARBOR AND HIGH SEAS RADIOTELEPHONE SERVICES

During peacetime, fleet commanders and district commandants may authorize naval vessels to use commercial radiotelephone services. Such services provide two-way telephone conversations through commerical land radiotelephone stations between naval vessels and any telephone on land. Naval vessels using this service are limited to calls originating on the ship. Incoming calls to the ship cannot be accepted.

The Chief of Naval Personnel has concurred in the desirability of this service as a contribution to the morale of personnel afloat.

The Coastal Harbor Service is provided to meet the needs of ships operating within a few hundred miles of the shore. Coastal Harbor Radiotelephone stations provide radio communications over relatively short distances and have been established at the following locations: Astoria-Portland, Boston, Charleston, Galveston, Jacksonville, Miami, New Orleans, New York, Norfolk, San Diego, San Francisco-Eureka, San Pedro, Seattle, Tampa, Wilmington and Oahu. Station call signs and operating frequencies are listed in DNC 26.

High Seas Radiotelephone Service stations are located at Oakland, Calif., New York, and Miami, and provide longer range radiotelephone service. Ordinarily radiotelephone service through High Seas Radiotelephone stations should be used only by ships operating beyond the normal range of the Coastal Harbor stations.

To initiate service, a form letter is submitted to the telephone company representative nearest the home port of the ship. A list of telephone company representatives and addresses may be found in DNC 26. The company sets up an account in the ship's name and

thereafter will accept calls through any of its stations. Any changes in the home port assignment of the ship will necessitate sending a new letter request to the telephone company representative nearest the new home port.

The communication officer is responsible for the shipboard arrangements for use of the telephone service. Included in his responsibilities are the preparation of the form letter to initiate service; provision of locally prepared forms to be filled out by users of the service; selection and adjustment of the shipboard transmitter and receiver; collection of charges and transfer of money to the disbursing officer; verification of telephone company bills prior to payment by the disbursing officer; and maintenance of technical liaison with the telephone company.

The charge for service depends upon the location of the ship as well as the land telephone. Calls may be either station-to-station or person-to-person, the charge being the same in either case. For Coastal Harbor Service the coastal waters are divided into rate areas which are defined by latitude and longitude and are illustrated in DNC 26. The initial rate is for 3 minutes or less, with overtime charges based on one-third of the initial rate for each minute of overtime. All charges are subject to 10 percent Federal excise tax. Collect calls are permitted and, if accepted by the person or station called, no charge is collected from the user on the ship.

For High Seas Radiotelephone Service the United States is divided into three land rate areas by groups of states and the oceans are divided into three ocean rate areas defined by latitude and longitude. A chart in DNC 26 shows the land and ocean rate areas.

Practically all standard Navy transmitters and receivers designed for voice amplitude modulation emission and reception are suitable for this service. The transmitter must be on the exact frequency specified; otherwise the carrier will not actuate the calling device at the telephone company marine operator's desk, and the call will be unanswered. It is best to tune the transmitter before coming into range to prevent the calling device from being actuated unintentionally.

The best microphone to use is the push-to-talk (release-to-listen) type. Remember that most users will know nothing about radio equipment, and the microphone should be demonstrated to the user before he goes on the air. Ship and shore station transmit on different frequencies, but when the microphone switch is pressed, receiver blockage may nevertheless occur if the transmitting and receiving antennas are close together.

To place a call, the user fills out a form (provided by the communication officer), giving his name, serial or file number, rank or rate, city, telephone number and individual to be called, whether the call is collect, and the time the call is to be made. (The commanding officer will normally designate the hours during which service will be available.) Charges are entered and the communication officer signs. The caller keeps one copy for a receipt.

Assuming that preliminary arrangements have been made and the equipments are properly tuned, the shipboard operator listens to make certain the circuit is not in use. Then if the circuit is clear, he calls the marine operator by voice:

NORFOLK MARINE OPERATOR—THIS IS USS FREMONT

When the operator responds, he is given the name of the ship, the coastal rate area in which the ship is located, the city and telephone number desired, and, if the call is person-to-person, the name of the individual called. He is then requested to quote the rates for the call.

THIS IS USS FREMONT—RATE AREA 2B—CALLING WASHINGTON DC—LUDLOW 4-5400—PERSON TO PERSON—MR LAURENCE DORSEY—QUOTE TIME AND CHARGES

When the marine operator has made the telephone connections, the circuit is ready for the caller. Best results are obtained by speaking plainly and naturally. Instruct the caller not to speak until the other person finishes. When the conversation is over, the shipboard operator notifies the marine operator:

THIS IS USS FREMONT—CALL COMPLETED

The marine operator then quotes the time and charges. The Coastal Harbor and High Seas Radiotelephone channels are actually like party lines and are shared by a large number of ships. Courtesy and discretion are necessary if everyone is to share the service equally. Observe these rules:

1. Avoid chains of calls. Space them out so other ships can use the circuit without too much delay.
2. Keep conversations brief.
3. Plan calls for slack hours. The hours between 1900 and 0700 local harbor time are least busy.
4. Be discreet in conversation. Anyone with a short-wave set can monitor half the transmissions.

CHAPTER 5

BASIC RADIO THEORY

ELECTROMAGNETIC RADIATION

A radio-frequency current flowing in a wire of finite length produces electromagnetic fields that may be disengaged from the wire and set free in space. There they will travel continuously. If another wire of finite length is placed in the path of the electromagnetic field, electrons within the wire will be set in motion. Further, the characteristics of the electron motion with respect to frequency, degree, and direction will be similar to those of the original field. If intelligence in some form is being carried by the electromagnetic field, it will be reproduced in similar form in the second wire. The whole function of radio communication is to deliver intelligence. It can be seen from the foregoing that the initial wire is a transmitting antenna and the second wire a receiving antenna. Any efficient transmitting antenna makes an efficient receiving antenna.

General Nature and Properties

Radio waves, as do other forms of electromagnetic radiation, travel at approximately 300,000,000 meters or 186,000 miles per second in free space. They can be reflected, refracted, and diffracted. The speed with which electromagnetic waves travel is influenced considerably by the medium through which they move. Dielectrics, that is, nonconductors, affect the speed of electromagnetic waves in varying degrees depending on their characteristics.

A good conductor of electricity, such as metal, inhibits penetration by electromagnetic waves because the lines of force are practically short-circuited. This can be seen from the reduction in volume of an automobile radio as one drives under a bridge. Such waves, on the other hand, readily pass through a dielectric.

An electromagnetic wave is made up of moving fields of electric and magnetic lines of force which are at right angles to each other and both of which are mutually perpendicular to the direction of travel. This is illustrated in figure 5-1.

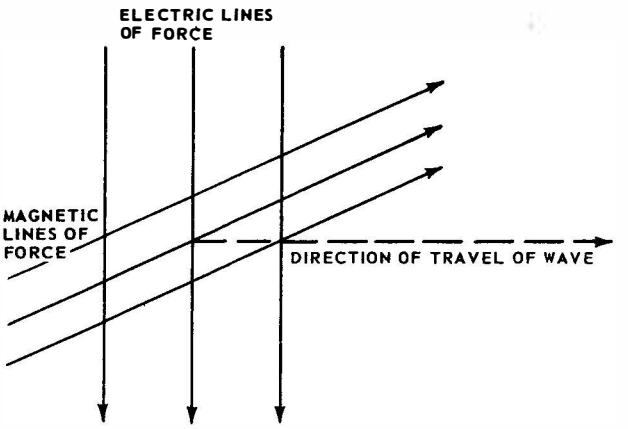


Figure 5-1.—Fields in an electromagnetic wave.

Frequency and Wavelength

Radio waves traveling through space are the result of changing electric currents in an antenna. This book does not cover the electrical theory of antenna systems. For our purpose, one should remember that changing electric currents in a wire (antenna) cause changing fields about the wire.

For a radio receiver to obtain useful intelligence, it must be tuned to the same frequency as the transmitter. By frequency is meant the total number of complete cycles the electromagnetic wave goes through in a unit of time. The accepted standard of measurement is cycles per second. Referring to figure 5-2, let us consider the characteristics of a single cycle of a typical radio wave. It is sinusoidal in shape and is induced by a varying current in

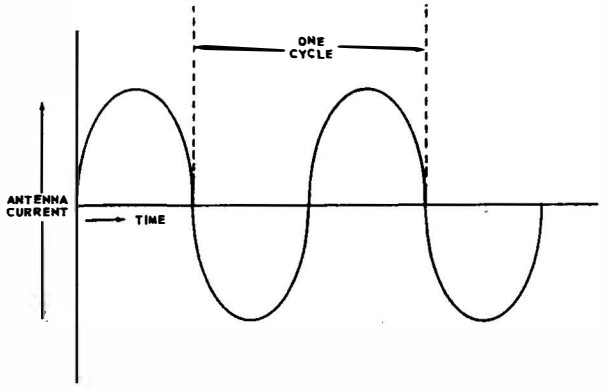


Figure 5-2.—Cycle characteristics of radio wave.

the transmitter antenna. The antenna is stationary, so one should try to visualize the movement of electrical current in it. Starting from zero, we see the current increase in one direction, reverse itself, increase in the other direction, and again reverse itself. The antenna radiates as long as this process repeats.

We have already noted that radio waves travel at a constant velocity. This points up an important relationship regarding velocity, frequency, and wavelength:

$$\frac{\text{Velocity in meters per second (300,000,000)}}{\text{Frequency (in cycles per second)}} = \text{Wavelength (in meters)}$$

Wavelength is the distance the electromagnetic wave travels in free space during one cycle. For example: to find the wavelength of a radio wave with a frequency of 100,000 cycles per second:

$$\frac{300,000,000}{100,000} = 3000 \text{ meters.}$$

In other words, the leading edge of a 100,000-cycle per second wave is 3000 meters from the antenna when the second cycle is just starting.

Frequency Spectrum

Frequencies within the range of 15 to 15,000 cycles per second are called audiofrequencies because vibrations of air particles at any of those frequencies can be heard by the human ear. Above 15,000 cycles per second are the radio frequencies. Two units are used in speaking of frequencies: kilocycle for 1000 cycles, and megacycle for 1,000,000 cycles. These are abbreviated KC and MC, respectively. The following table illustrates the general frequency bands used in communication.

Designation of radio waves according to frequency	Authorized abbreviation	Frequency
Very low	VLF	Below 30 KC
Low	LF	30 to 300 KC
Medium	MF	300 to 3000 KC
High	HF	3 MC to 30 MC
Very high	VHF	30 MC to 300 MC
Ultra high	UHF	300 MC to 3000 MC
Super high	SHF	3000 MC to 30,000 MC
Extremely high	EHF	30,000 MC to 300,000 MC

WAVE FORMATION

When a radio wave leaves a vertical antenna, a part of the wave moves outward in contact with the ground to form the ground wave, and the rest of the wave moves upward and outward to form the sky wave. (See fig. 5-3.)

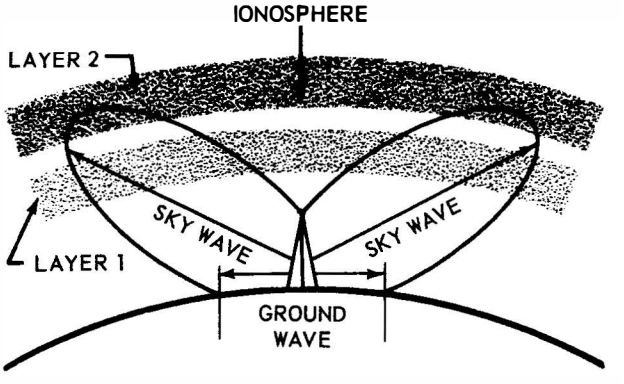


Figure 5-3.—Formation of the ground wave and sky wave.

The ground and sky portions of the radio wave are responsible for two different methods of carrying messages from transmitters to receivers.

The ground wave normally is used for relatively short-range communications. However, ground waves are sometimes utilized for long-range communication on VLF or LF using very high power. Daytime reception from most nearby commercial stations is carried by the ground wave.

The sky wave is used for long-range, high-frequency daylight communication. At night, the sky wave provides a means for long-range contacts at somewhat lower frequencies.

The Ground Wave

The ground wave is made up of two parts, a surface wave and a space wave. The surface wave travels along the ground while the space wave follows two paths, one through the air from transmitter to receiver, the other a reflected path from the ground into the air. Since the space wave follows two paths of different lengths, the two components may arrive in or out of phase. As the distance from the transmitter changes, the two components may add or cancel.

As it passes over the ground, the surface wave induces a voltage in the earth, setting up eddy currents. The energy to create these currents is taken away from the surface wave, which is weakened as it moves away from the antenna. Increasing the frequency results in a rapidly increasing rate of attenuation. Because of this increased attenuation with increased frequency, surface-wave communication is generally limited to the lower frequencies. The surface-wave component is not confined to the earth's surface, but extends to considerable heights, diminishing in field strength with increased height.

Shore establishments are able to furnish long-range surface-wave communication by using frequencies between 18 and 300 KC with extremely high power.

Since the electrical properties of the earth over which the surface wave travels are relatively constant, the signal strength from a given station at a given point is nearly constant. This holds true in practically all localities, except those that have distinct rainy and dry seasons. In those regions, the difference in the amount of moisture will cause the soil's conductivity to change.

The best type of surface for surface-wave transmission is sea water. Next in order of desirability are large bodies of fresh water, wet soil, flat loamy soil, dry rocky terrain, desert, and jungle. Because of the superiority of surface-wave conductivity by salt water, high-power, low-frequency transmitters are located as close to the edge of the ocean as practicable.

Not all ground-wave communication employs the lower part of the frequency spectrum. VHF-UHF communications, for example, use so-called line-of-sight transmission. At these frequencies the direct wave component of the ground wave is increasingly important. It should be noted that whereas the range of the ground wave at low frequencies can be effectively increased only by increasing radiation power, the range of frequencies of 30 MC or higher can be increased effectively by increasing antenna height as well as by increasing radiation power.

The Sky Wave

The behavior of the sky wave is quite different from that of the ground wave. Some of the energy radiated is refracted by an ionized layer of atmosphere, called the IONOSPHERE, and is bounced or bent back toward the earth. If a receiver is located in the area where the returning wave strikes, it is possible to detect the signals clearly even though the receiver is located several hundred miles beyond the range of the ground wave.

The ionosphere is located in the rarefied atmosphere, approximately 40 to 350 miles above the earth. It differs from the other atmosphere in that it contains a much higher number of positive and negative ions. In the atoms of many substances, such as gases, one or more of the outer electrons, which revolve around the nucleus of the atom somewhat as the planets revolve around the sun, are detached from the atom, thus leaving the atom as a whole with a net positive charge. In this case the atom is said to be IONIZED. The negative ions (electrons) are produced by ultraviolet and particle radiations from the sun. The rotation of the earth on its axis, the annual course of the earth around the sun, and the development of sun spots all affect the number of ions present in the ionosphere, and these in turn affect the quality and distance of radio transmission.

The ionosphere is constantly changing. Some of the ions are recombining to form neutral atoms, while other atoms are being split to form ions. The rate of formation and recombination of ions depends upon the amount of air present and the strength of the sun's radiations.

At altitudes above 350 miles the particles of air are too sparse to permit large-scale ion formation. At altitudes less than 40 miles,

too few ions exist to affect materially sky-wave communication.

LAYERS OF THE IONOSPHERE

Different densities of ionization at different heights make the ionosphere appear to have layers. Actually there is thought to be no sharp dividing line between layers, but for the purpose of discussion a sharp demarcation is indicated.

The ionized atmosphere at an altitude of between 40 and 50 miles is designated the D-layer. Its ionization is low and has little effect on the propagation of radio waves except for the absorption of energy from the radio waves as they pass through it. The D-layer is present only during the day. This greatly reduces the field intensities of transmissions that must pass through daylight zones.

The band of atmosphere at altitudes between 50 and 90 miles contains the E-layer. It is a well-defined band with greatest density at an altitude of 70 miles. This layer is strongest during daylight hours, and is also present though much weaker at night. The maximum density of the regular E-layer appears at about noon, local time.

The ionization of the E-layer at the middle of the day is sometimes sufficiently intense to refract frequencies up to 20 MC back to earth. This is of great importance to daylight transmissions for distances up to 1500 miles.

The F-layer extends approximately from the 90-mile level to the upper limits of the ionosphere. At night, only one F-layer is present; but during the day, especially when the sun is high, this layer often separates into two parts, F_1 and F_2, as illustrated in figure 5-4. The F_2-layer is the most highly ionized of all the layers, and is the most useful for long-range communication. The degree of ionization of this layer exhibits an appreciable day-to-day variation in comparison with that of the other layers. The intensity of the ionization reaches a maximum in the afternoon and gradually decreases throughout the night. The rise of ion density is very rapid in the morning, and the low recombination rate permits the high ion density to persist. Shortly after sunset the F_1- and F_2-layers recombine into a single F-layer.

In addition to the layers of ionized atmosphere that appear regularly, erratic patches occur at E-layer heights and are referred to as SPORADIC-E ionizations. These patches often are present in sufficient number and intensity to enable good VHF radio transmission over distances where it is not normally possible.

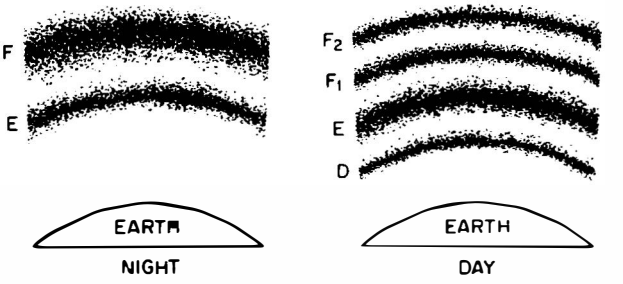


Figure 5-4.—E-layer and F-layer of the ionosphere.

Sometimes sporadic ionizations appear in considerable strength at varying altitudes and actually prove harmful to radio transmissions.

Effect of Ionosphere on the Sky Wave

The ionosphere acts as a conductor, absorbs energy from the wave, and (as illustrated in fig. 5-5) refracts the sky wave back to earth.

The ability of the ionosphere to return a radio wave to earth depends upon the angle at which the sky wave strikes the ionosphere, the frequency of the transmission, and upon the ion density. Figure 5-5 shows a radio wave refracted to earth by the ionosphere. A receiver located at either of the two points labeled B can receive transmissions from point A.

In figure 5-6 the sky wave is assumed to be composed of three rays. The angle at which ray 1 strikes the ionosphere is too nearly vertical for the ray to be returned to earth. The ray is bent out of line, but it passes through the ionosphere and is lost.

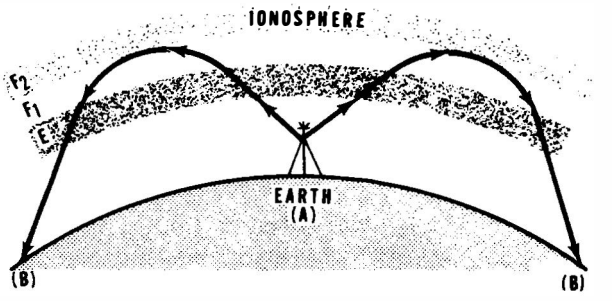


Figure 5-5.—Refraction of the sky wave by the ionosphere.

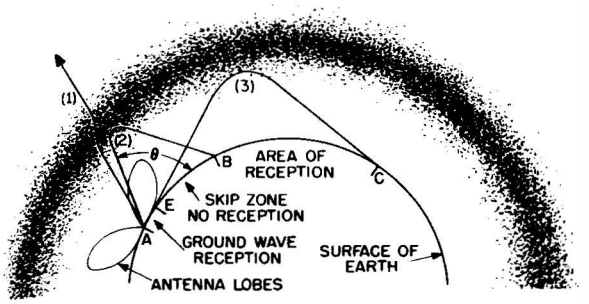


Figure 5-6.—Effect of angle of departure on area of reception.

The angle made by ray 2 is called the critical angle for that frequency. Any ray that leaves the antenna at an angle greater than the critical angle will penetrate the ionosphere.

Ray 3 strikes the ionosphere at the smallest angle that will be refracted and still return to earth. Any smaller angle will be refracted toward earth, but will miss it completely.

As the frequency decreases, the critical angle increases. Low-frequency fields can be projected straight upward and will be returned to earth. The highest frequency that can be sent directly upward and still be returned to the earth is called the critical frequency. At sufficiently high frequencies, the wave will not be returned to the earth, regardless of the angle at which the ray strikes the ionosphere.

The critical frequency is not constant, but varies from one locality to another, with the time of day, the season of the year, and according to the sunspot cycle. This variation in the critical frequency is one reason why the communicator uses issued predictions—frequency tables or nomograms—to determine the maximum usable frequency (MUF) for a particular hour of the day.

Nomograms and frequency tables are prepared from data obtained experimentally from stations located all over the world, and are supplied to communication officers in long-range predictions that remove much of the guesswork from radio communication.

Refer again to figure 5-6. The area between points B and C will receive the transmission via the refracted sky wave. The area between points A and E will receive signals by ground wave. All receivers located in the skip zone between points E and B will receive no transmissions from point A, since neither the sky wave nor the ground wave reaches this area.

Effect of Daylight on Wave Propagation

The increased ionization during the day is responsible for important changes in sky-wave transmission. It causes the sky wave to be returned to the earth nearer to the point of transmission, and the extra ionization increases the absorption of energy from the wave. A frequent question in sky-wave propagation is whether the ionosphere will "support" (refract) a radio wave of a particular frequency, and whether the received signal will be strong enough at the receiver to be heard above the noise level present at the receiver. The answer to this question can be given only after a consideration of the many factors involved—what particular path the radio wave will take in traveling from the transmitter to the receiver; whether the frequency of the radio wave lies between the values determined by the MUF and the lowest usable high frequency (LUHF) for the particular signal path; and the field strength that may be expected of the signal upon its arrival at the receiver. The presence of the F_1 and E-layers with the F_2-layer makes possible long-range, high-frequency communication, provided all factors taken into consideration are favorable.

Absorption usually reduces the effective daylight communication range of low-frequency and medium-frequency transmitters to surface-wave ranges.

The high ionization of the F_2-layer during the day, enabling refraction of high frequencies which are not greatly absorbed, has an important effect on transmissions of the HF band. Figure 5-7 shows how the F_2-layer completes the refraction and returns the transmissions of these frequencies to earth, making possible long-range, high-frequency communication during daylight hours.

The waves are partially bent while passing through the E-layer and F_1-layer, but are not returned to earth until the F_2-layer completes the refraction. VHF waves usually pass through the ionosphere.

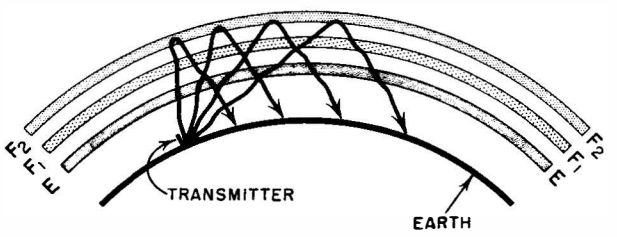


Figure 5-7.—Effect of the F_2-layer on transmission of high-frequency signals.

Multiple Refraction

Frequently the refracted wave returns to the earth with enough energy to be reflected back to the ionosphere, and then refracted to earth a second time.

In figure 5-8, the ray strikes the earth at point A with sufficient force to be reflected back to the ionosphere and then refracted to earth a second time. Frequently a sky wave has sufficient energy to be refracted and reflected several times, thus greatly increasing the range of transmission. Because of this so-called multiple-hop transmission, transoceanic and around-the-world communication is possible with moderate power.

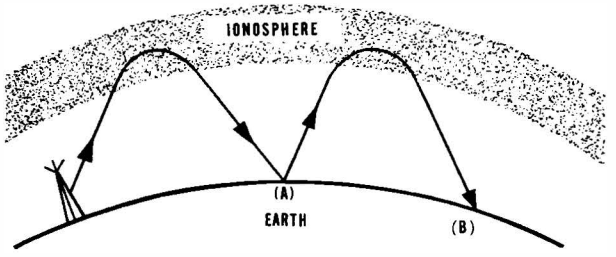


Figure 5-8.—Multiple refraction and reflection of a sky wave.

FADING

Fading is a term used to denote variations in signal strength at the receiver. There are several causes; some are easily understood, others are more complicated.

One cause is probably the direct result of interference between single-hop and double-hop transmissions. If the two waves arrive in phase, the signal strength will be increased, but if the phases are opposed, they will cancel each other and weaken the signal. This is called INTERFERENCE FADING.

Interference fading is also severe in regions where the ground wave and sky wave are in contact with each other. This is especially true if the two are approximately of equal strength. Fluctuations of the sky wave with a steady ground wave can cause worse fading than the sky-wave transmission alone.

The variations in absorption and the path of the wave in the ionosphere are responsible for ABSORPTION FADING. Occasionally, sudden ionospheric disturbances will cause complete absorption of all sky-wave radiations.

Receivers located near the outer edge of the skip zone are subjected to SKIP FADING as the sky wave alternately strikes and skips over the area. This type of fading is sometimes so complete that the signal strength falls to near zero level.

Additional variation in the field intensity affecting the receiving antenna occurs as a result of changes in the state of polarization of the downcoming wave relative to the orientation of the antenna. This variation is called POLARIZATION FADING. The result is random and constantly changing values of the amplitude and orientation of the electric field with respect to the receiving antenna. The state of polarization of sky waves varies more rapidly the higher the frequency, which accounts in part for the rapid fading of the higher frequencies.

Frequency Blackouts

Frequency blackouts are closely related to some types of fading. In reality, a blackout is a complete fade, blotting out the entire transmission.

Changing conditions in the ionosphere shortly before sunrise and after sunset may cause blackouts at certain frequencies. The higher frequencies pass through the ionosphere, while the lower ones are absorbed by it.

Ionospheric storms—turbulent conditions in the ionosphere—often cause erratic communications. Some frequencies will be blacked out,

while others may be reinforced. Such a storm may occur in a few minutes, or may take hours to develop. It may last several days.

When frequency blackouts occur, radio operators must be alert to prevent complete loss of contact with other ships or stations. In severe storms, critical frequencies are much lower and absorption in the lower layers of the ionosphere is much higher.

VHF AND UHF COMMUNICATION

In recent years there has been a trend toward use of frequencies above 30 MC for short-range, ship-to-ship, and ship-to-plane communication. Early concepts suggested that these transmissions traveled in straight lines. This naturally led to the assumption that transmission range was limited to the distance to the horizon, as determined by the height of transmitter and receiver antennas.

Extensive use and additional research show the earlier line-of-sight theory to be in error at times. Radio waves in the VHF and UHF bands may be refracted, and so detected hundreds of miles beyond the horizon. This is a point the communicator must bear in mind when his ship is in waters where radio security is essential.

Since VHF and UHF waves tend to follow approximately straight lines, mountains or large hills in the transmission path will cast a radio shadow. A receiver located in shadow will receive a weakened signal, and in some cases no signal at all.

Ducts

The abnormal ranges of VHF and UHF are caused by abnormal atmospheric conditions within a few miles of the earth. Normally the warmest air is near the surface of the water. The air gradually becomes cooler with increasing altitude. However, unnatural situations often develop where warm bands of air are above the cooler layers. This unusual situation is called a temperature inversion.

Whenever temperature inversions are present, the amount of refraction—called index of refraction—is different for the air trapped within the inversion than for the air outside the inversion. The differences in the index of refraction form channels or ducts that will pipe the signals many miles beyond the assumed normal range.

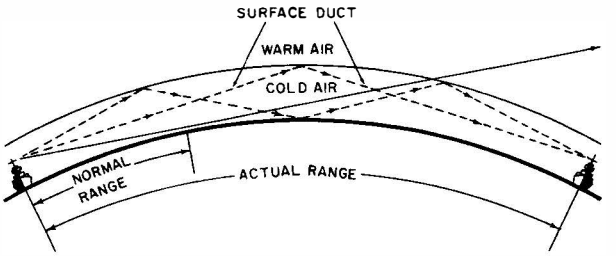


Figure 5-9.—Duct effect.

At times these ducts will be in contact with the water and may extend a few hundred feet into the air. At other times the duct will start at an elevation of about 500 to 1000 feet, and extend an additional 500 to 1000 feet in the air.

If an antenna extends into the duct or if the wave enters a duct after leaving an antenna, the transmission may be conducted for a long distance to another ship whose antenna extends into the duct. This is illustrated in figure 5-9.

When Ducts Are Formed

The communicator must be able to recognize weather conditions that lead to duct formations. Since complete aerological information is not always available, he must rely on simple, visible evidence and his own common sense.

The following rules have exceptions, but a duct can be expected to form when—

1. A wind is blowing from land.
2. There is a stratum of quiet air.
3. There are clear skies, little wind, and high barometric conditions.
4. A cool breeze is blowing over warm ocean, especially in the tropic areas and in the tradewind belt.
5. Smoke, haze, or dust fails to rise, but spreads out horizontally.
6. The receiver is fading rapidly.
7. The moisture content of the air at the bridge is considerably less than at the surface of the sea.
8. The temperature at the bridge is 1° or 2° F higher than at the surface of the water.

GENERAL USE OF FREQUENCIES

Each frequency band has its own special uses. The uses depend upon the nature of the waves—surface, sky, or space—and the effect that the sun, earth, ionosphere, and atmosphere have upon them.

It is almost impossible to lay down fixed rules for the choice of a frequency for a particular purpose. Some general statements can be made, however, concerning the best frequency band for a particular purpose. Most rules for the use of frequencies deal with variations that are beyond human control. This is especially true of medium- and high-frequency transmissions using the sky wave.

One way of being reasonably certain a long-range communication gets through is to use a combination of high power and low frequency. This combination is used by the Navy's large shore stations to keep in touch with the fleet around the world. Since this requires an antenna array too large for shipboard, the shipboard communicator gets his message to a distant point by sending it to the nearest large shore station for relay to its destination.

All sky-wave transmissions—and that means almost all from 1600 to 30,000 KC—are associated with skip distance, which is that distance between the transmitter and receiver at which the ion density of the layers of the ionosphere will just support reflection. The skip zone, on the other hand, depends on the extent of the ground-wave range, and disappears entirely if the ground-wave range equals or exceeds the skip distance. Sky-wave transmissions thus give long ranges, but in the process many stations in the skip zone may fail to receive the transmission—possibly the one for whom the message is intended.

Navy Frequency Band

To the Navy communicator a very important part of the frequency spectrum lies in the medium-and high-frequency bands (2000 to 18,-100 KC). These bands are used for long-distance naval communications from ship-to-ship and ship-to-shore. Standard transmitters, such as the TBK, TBL, TBM, and TCK (found on almost any ship) operate within this range of frequencies. The use of such transmitters tends to eliminate completely the skip zone. These transmitters are being replaced in the fleet by the AN/SRT 14, 15, and 16 series.

DNC 14 Series

To assist the communicator, the Navy publishes the DNC 14 series, entitled *Recommended Frequency Bands* and *Frequency Guide.*

DNC 14 is published quarterly, 3 months in advance. The publication contains tables showing frequency bands recommended for use under normal conditions for communication to and from certain bases. It also publishes nomograms intended as rough guides to suitable frequencies for radio communication up to 2200 nautical miles.

Frequency Tables

Frequency tables allow for the hour of day (GMT), distance of transmission, and direction of the base from the ship. For all bases, the distances are 250 to 2500 nautical miles—north, east, south, and west from the ship to the base. In addition, Pearl Harbor, San Francisco, Guam, and Manila are carried with transmission distances up to 5000 nautical miles and with bearings of these bases from a ship at intervals of 30°.

The frequency bands listed in DNC 14 and the approximate frequencies they cover are shown in the table below. When any frequency band shown in the table is not available, preference should be given the next lower of the available bands.

Designated band	Frequencies in megacycles
2	2.0 to 2.9
3	3.0 to 3.9
4	4.0 to 4.9
5	5.0 to 5.9
6	6.0 to 7.9
8	8.0 to 9.9
10	10.0 to 11.9
12	12.0 to 13.9
14	14.0 to 15.9
16	16.0 to 17.9
18	18.0 to 19.9
20	20.0 to 21.9
22	22.0 to 23.9
24	24.0 to 25.9
26	26.0 to 27.9

A sample frequency table is shown in figure 5-10. This was used for communication with Port Lyautey during June 1960. Using the sample, assume a ship is heading for Norfolk, Va., and is about 750 miles west of Port Lyautey. The time is 1100 GMT, and the message is destined for NHY, Port Lyautey. Locate the time of transmission in the extreme left column, and move right to the second column, which is headed 500-1000 miles. Port Lyautey is east of the ship, so read from the column headed by the letter E. The recommended frequency for transmission of the message is 16 MC.

The frequency listed for a given hour, GMT, is usable within one-half hour of the given time. In the example above, 16 MC is usable from 1030 GMT to 1130 GMT. Before 1030, the 1000 value should be used; after 1130, the 1200 value should be used.

The directions in the column heading (N, E, S, and W) are in every case the bearings of the base from the ship, not the ship from the base. For directions of transmission in the quadrants between any two of the cardinal points, the frequency used should be the lower of the two.

PORT LYAUTEY, MOROCCO
JUNE 1960

GMT	Distance in Nautical Miles and Direction of Base from Ship																GMT
	250 - 500				500 - 1,000				1,000 - 1,500				1,500 - 2,000				2,000 - 2,500				
	N	E	S	W	N	E	S	W	N	E	S	W	N	E	S	W	N	E	S	W	
00	5	3	3	3	10	5	4	4	18	8	8	6	12	8	10	8	14	10	12	10	00
01	3	3	3	3	12	4	4	4	20	6	6	6	12	8	8	8	14	8	10	8	01
02	3	3	3	3	4	4	4	4	16	6	6	6	10	6	8	8	12	8	8	8	02
03	3	3	3	3	4	4	4	4	6	6	5	5	10	6	6	6	12	6	8	8	03
04	3	3	3	3	4	4	3	3	6	5	5	5	8	5	6	6	10	6	8	8	04
05	3	2	2	3	3	3	3	4	5	5	5	6	8	5	8	8	10	5	8	10	05
06	3	3	3	3	4	4	5	5	6	6	6	6	8	5	8	10	10	6	10	12	06
07	6	6	6	6	14	5	10	12	14	6	16	20	10	8	10	10	14	8	10	14	07
08	8	6	6	8	18	12	10	14	18	20	16	22	12	8	12	12	16	10	12	14	08
09	10	8	8	8	20	14	10	14	22	22	16	22	12	10	12	12	16	10	12	14	09
10	10	8	8	8	20	16	12	16	24	22	16	22	12	12	12	14	16	12	12	14	10
11	12	8	8	8	22	16	12	16	24	24	16	22	14	12	12	14	18	12	12	14	11
12	10	8	8	8	20	16	12	14	24	22	16	22	16	14	14	14	20	12	12	14	12
13	10	8	6	8	20	14	10	14	24	22	16	20	18	14	14	14	22	14	12	14	13
14	10	8	6	6	20	14	8	10	22	20	12	12	20	14	12	14	24	14	12	14	14
15	8	6	6	6	18	10	8	8	22	12	12	12	22	14	12	14	24	14	12	14	15
16	8	6	6	6	16	8	3	6	22	12	14	12	24	12	12	16	26	12	12	16	16
17	8	6	6	6	14	6	6	6	22	12	14	12	24	12	12	16	26	12	12	16	17
18	6	6	6	6	8	6	8	6	22	12	14	12	24	12	14	16	26	12	14	18	18
19	6	6	5	6	8	6	10	12	14	12	14	18	22	12	14	16	26	12	14	18	19
20	5	5	5	5	14	12	10	10	12	18	14	16	18	12	14	14	22	14	16	14	20
21	5	5	5	5	14	10	8	5	12	18	10	8	16	14	14	12	20	14	16	14	21
22	5	5	4	4	12	5	8	5	10	10	10	8	14	12	14	10	18	14	14	12	22
23	6	4	4	4	10	5	5	5	8	8	8	8	12	10	12	8	14	12	12	10	23

Figure 5-10.—Frequency table for Port Lyautey, June 1960.

For example: A ship is 1700 nautical miles southwest of Port Lyautey, at 1600 GMT, June 1960. Transmission is to the northeast. From the table, the frequency for transmission to the east is 12 MC and to the north, 24 MC. The best frequency is in the 12-MC band.

Nomograms

By proper use of nomograms it is possible to determine approximately the best frequency for any given communication, and also the approximate upper and lower limits of the band of frequencies on which communication is possible.

Figure 5-11 is an illustration of a nomogram. To find the recommended frequency for a particular transmission, the communicator first locates the approximate midpoint of the transmission path on the map printed on the last page of each published nomogram series. He determines the latitude, local time, and zone at this midpoint. (The zones are labeled E, W, and I on the map, indicating east, west, and intermediate.) Selecting a nomogram for the current month and correct latitude (see fig. 5-11), he lines up a straight edge through the distance of transmission (right-hand column) and the local time at the midpoint of transmission (left-hand column). The straight edge intersects the frequency scale in the middle of the nomogram, indicating the recommended frequency.

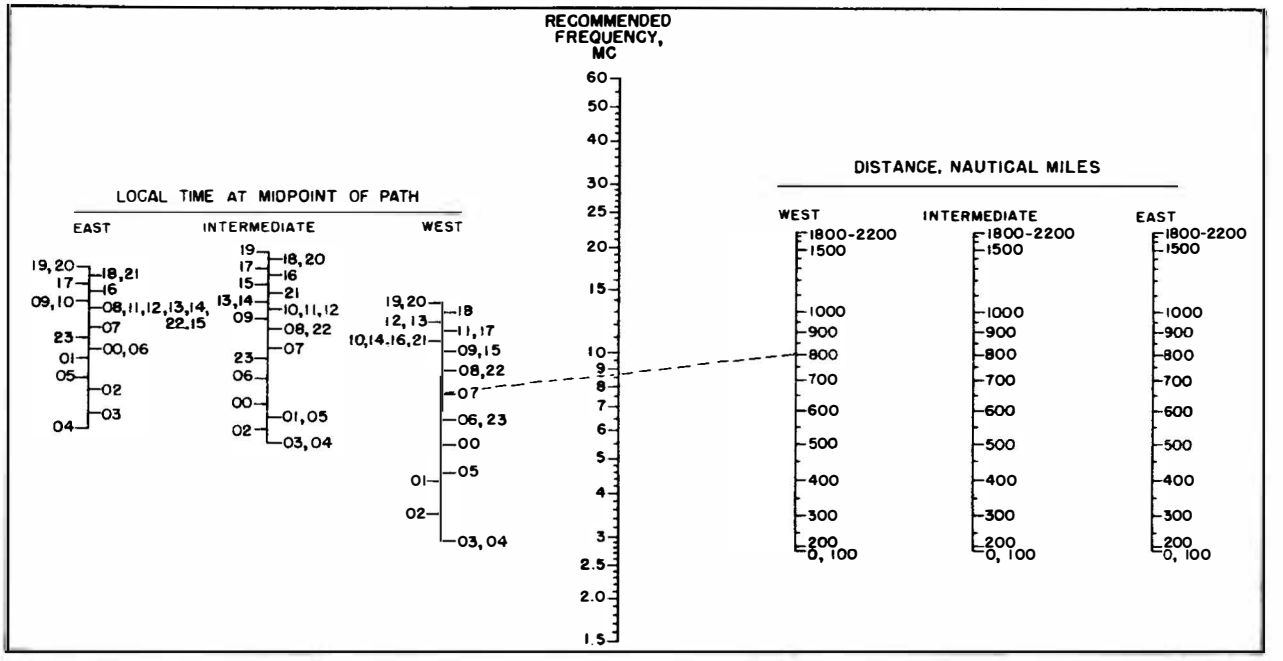


Figure 5-11.—Nomogram for latitude 40° N, predicted for June 1960.

Figure 5-11 predicted the frequency for the following example:

Month—June 1960

Latitude of midpoint of transmission path	40° N.
Longitude of midpoint of transmission	60° W.
Local time at midpoint of transmission path	0700.
Transmission distance	800 nautical miles.

The map indicates the midpoint of transmission lies in the W zone. The recommended frequency, as shown, is 8.7 MC.

Usually the exact recommended frequency, determined by nomogram, is not available. In this case, the next lower frequency available should be used. The closer the operating frequency is to the recommended frequency, the better the communication. If the operating frequency is above the recommended frequency, there is danger the waves won't be reflected to the receiving station; if the operating frequency is much below the recommended frequency, the signals will be too weak.

One nomogram in DNC 14 serves as a guide to the band of useful frequencies corresponding to a given recommended frequency. It gives the approximate range of frequencies within which the most satisfactory transmission may be expected for a radiated power of 0.5 kilowatt, which is the average power of a shipboard radiotelegraph transmitter.

FREQUENCIES FOR THE NAVY

Although technical advances are constantly rendering greater portions of the spectrum usable, the ever-increasing demand for space in the spectrum makes careful allocation of frequencies necessary.

The Chief of Naval Operations controls and allocates frequencies for use by the naval service. Frequencies for naval communications are procured initially by CNO and then allocated or assigned for use by fleet or area commanders. These officers are authorized to assign frequencies for use in their area as the military situation warrants.

Communication planning for a full-scale operation requires the allocation of minute portions of the radio spectrum to supply the complex networks that link air, surface, and subsurface units of the Navy with those of our merchant fleet and joint and allied forces. Because of the heavy demand, common use of a frequency is practiced where possible. The assignment of frequencies for exclusive use by a particular force—for instance, the amphibious force—is rarely possible.

Communication plans specify the frequencies to be used by all commands in an operation, from task fleets down to the smallest unit. A frequency plan for a typical carrier task force of six task groups would require, conservatively, 75 frequencies, guarded as directed. This plan assigns (1) the task force commander's circuit; (2) primary tactical maneuvering warning net; (3) ship-to-shore circuits; (4) primary CIC nets; and (5) lifeguard air-sea rescue emergency circuit.

Some idea of the number and complexity of circuits the Navy uses can be gained from the following list:

Shore fire control;
Amphib air support;
Fighter air defense;
Ships in company;
Distress, air-search rescue;
Harbor control;
Primary tactical.

Each of the above circuits is normally paralleled by a secondary circuit, and also may be assigned an alternate frequency. When all goes well—no equipment failures, no interference—a shore fire control party alone requires three or four frequencies to accomplish its mission.

An important part of every communicator's job is to see that the Navy gets the most out of its portion of the radio spectrum. This requires efficient use of equipment, strict circuit discipline, and adherence to established communication procedures. More than that, it requires maximum use of all methods of communication. The experienced communication officer knows that much of his information can go by mail, and he has learned that visual methods have a permanent place in Navy short-range communications.

WAVE GENERATION AND TRANSMISSION

Much has been written on radio transmitters and receivers. The more technical knowledge an officer has of his equipment the better prepared he is to solve his operational problems. Obviously one cannot delineate the degree of knowledge of the theory of operation of radio equipment which is sufficient to assure excellent performance as a communication officer. Some technical knowledge is necessary. This text will cover only the most limited scope. You, as communication officer, will have to study the technical phases of your job. You can be sure that you will never know enough; your job will never be finished.

Vacuum Tubes

The vacuum tube has been described in many ways. One of the most convenient is to think of it as a valve. A knowledge of vacuum tubes is basic to understanding radio transmitters and receivers. The following are important theories to remember:

1. Electricity is the flow of free electrons through a conductor. In various ways this flow of electricity can be controlled. Electrons, which are negatively charged particles, always flow toward any area which is positively charged. Here, as in all of nature, the maxim that opposites attract is true.

2. Certain metals, when heated, have a tendency to give off free electrons. All substances do this to a degree, some more than others. In most cases the electrons fall back into the metal. However, if we change the conditions somewhat, we can cause the electrons to leave permanently.

For example, in figure 5-12 the cathode is made of a material which tends to give off electrons when heated. In the illustration it is heated by battery "A." If the cathode is encased in a container with another piece of metal and most of the air is removed, proper conditions have been produced to cause the electrons to flow. First, the cathode is heated. Then, by some exterior means ("B" battery), the cathode is caused to be negatively charged with respect to the other piece of metal called the plate. Electrons will flow across the open space from the cathode to the plate. The electron tube here described is the simple diode which has many applications aboard ship.

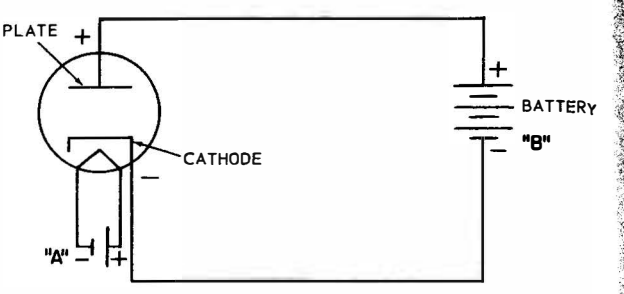


Figure 5-12.—The diode.

Triode

The triode is made by slightly modifying a diode. Suppose we place a small screen, similar to the familiar window screen, in the space between the cathode and the plate of the diode. This screen is called the grid. If the same conditions exist for our new tube as originally existed for the diode, and the voltage on the grid equals that on the cathode, the tube will again conduct electricity. However, if we change the voltage on the grid just a little, the flow of electricity from the cathode to the plate will vary considerably. Actually, almost all of the electrons pass between the wires of the screen and reach the positively charged plate. (See fig. 5-13.)

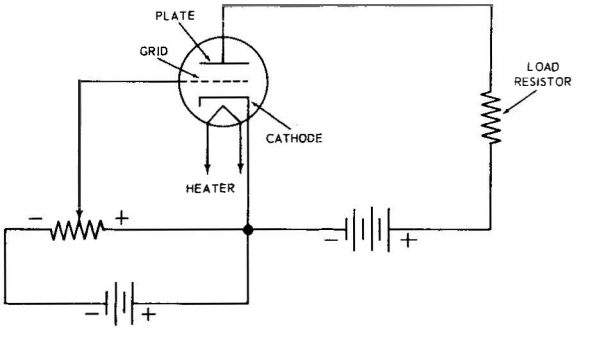


Figure 5-13.—The triode.

When the negative voltage on the cathode and the positive voltage on the plate are held constant, we vary the voltage on the grid. If the grid charge is zero, some current will flow. The zero means the voltage on the grid is the same as that on the cathode. Now, let us make the voltage on the grid more negative than the cathode. We find that less current flows to the plate than before. If we continue to make the grid more negative with respect to the cathode, eventually we can cause the current to stop. The voltage between the grid and cathode has a much greater effect on current flow through the tube than does that between the plate and cathode. This is because the grid is much closer to the cathode than is the plate. Now, if the process is reversed and we increase the voltage on the grid in a positive direction, the electrons will again flow. The amount of current will increase as the grid voltage increases right past the zero mark, and on to the area where the grid is positive with respect to the cathode. Figure 5-14 shows this graphically. Although this graph looks complicated, it is really quite simple and is basic to everything in radio. The horizontal scale is grid voltage (eg), or the charge on the grid, and is positive to the right and negative to the left. The vertical straight line is plate current increasing from zero (no current flow) up the line to a considerable flow of electrons. Hold the plate voltage constant at about 100 volts. With the grid charge zero (same as cathode) the current flow to the plate is shown at point A in figure 5-14. As the grid charge is made negative (left on the bottom scale), the plate current lessens until finally there is no plate current, as at point B. Reversing, the plate current begins to flow until, again at zero, the plate current reaches A; then, as the grid becomes positive, the plate current advances further, as at C.

The whole basis of using a tube as an amplifier is described above. By selecting a properly designed tube, a change of a few volts, plus or minus, in grid voltage can result in a large change of current flow to the plate. In this way a small variation in grid voltage can be multiplied 10, 15, or even more times in the plate current. Three tubes in a row, each amplifying 10 times, can result in 3 volts' variation on the grid of the first tube causing 1000 times greater variation in the output of the third tube. When one considers that the strength of a signal picked up by the antenna of a radio receiver is in the area of millionths of a volt (microvolts), it is easy to see why such amplification is necessary to drive a radio speaker so the human ear can hear the transmitted intelligence.

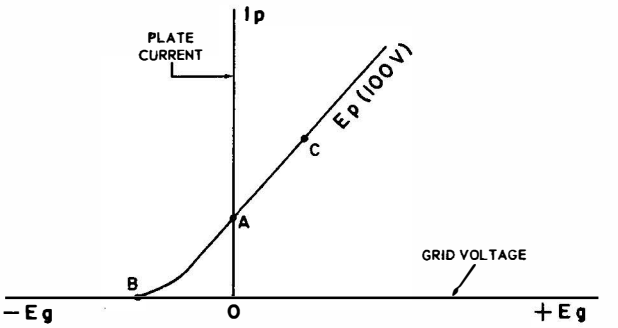


Figure 5-14.—Typical triode operating characteristics.

There are many variations of the electron tube, some having more than one grid, some including two diodes or triodes within the same tube. Their study must be left to a more advanced work than this. We will confine ourselves to developing an elementary transmitter and receiver based on the foregoing simple information.

Oscillators

In our discussion of frequencies, it was pointed out that a transmitter sends out intelligence on a specific frequency and that a radio receiver, if it is to capture that intelligence, must be tuned to the same frequency. In the transmitter the basic frequency is generated by some form of oscillator.

Many variations of oscillator circuits have been designed. The general concept of a crystal-controlled oscillator will be discussed here to give some understanding of how the carrier frequency which is transmitted is generated.

Some crystalline substances such as Rochelle salt, quartz, and tourmaline have the property of changing their shape if an electromotive force is applied to them. The shape of the cut and the temperature of the crystal affect the frequency considerably. If the crystal is made to vibrate mechanically, it will, in turn, generate an electromotive force.

Generally, the crystal, cut to very close tolerances, is placed between two metal plates and a spring device employed to exert mechanical pressure. The crystal unit is inserted in a temperature controlled oven to ensure uniform heating. The crystal may be installed between the grid and the cathode of a triode tube and, by feeding back a small amount of the energy from the tube plate, the circuit will continue to oscillate at the crystal frequency. As described earlier, this frequency can then be amplified through a series of electron tubes until sufficient power has been generated to cause the antenna to radiate into space. Of course the type of oscillator varies, depending on many considerations. Most are tunable to any frequency between maximum and minimum limits for which the circuit is designed.

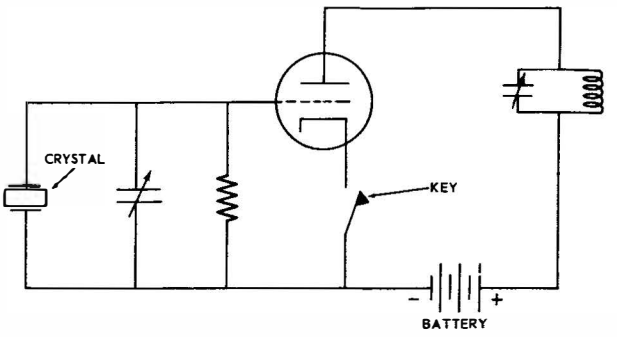


Figure 5-15.—Typical crystal oscillator with keying circuit.

Keying

Many eleborate circuits have been designed to facilitate keying—that is, turning the transmitter on and off so that intelligence is radiated from the antenna in usable form. One of the simplest would be to insert a key, similar to the telegrapher's hand key, in the cathode of the triode circuit already described. When the key is closed, current could flow through the tube; when it is open, the current would stop. This is illustrated in figure 5-15. Do not be concerned with the various other symbols in the illustration. The important thing is to note the crystal between the grid and cathode of the tube, which causes the desired oscillation, and the key in the cathode with which the current flow through the tube is started and stopped.

Voice Modulation

So far we have dealt with the transmission of a single frequency carrier wave which has been cut on and off at varying intervals in accordance with the intelligence to be sent. Now, let us consider the problem of sending voice signals so that one may speak directly into a microphone at the transmitting station and be heard and understood at the receiving station.

We have stated that a radio frequency is above 15 kilocycles and an audiofrequency is below that frequency. Actually, voice frequencies run considerably below that figure. Against a similar time scale we can illustrate the comparative sizes of radio frequency waves and audiofrequency waves as in figure 5-16. It can be seen that many cycles of radio frequency waves are completed within 1 cycle of audiofrequency. For instance, 1000 cycles per second is audible, and within the time of 1 cycle (1/1000 second), a 50-KC radio frequency would complete 50 cycles. In the amplitude modulation (AM) radio which is the common commercial type, the system used is to modify the envelope of the radio frequency in accordance with the audio signal.

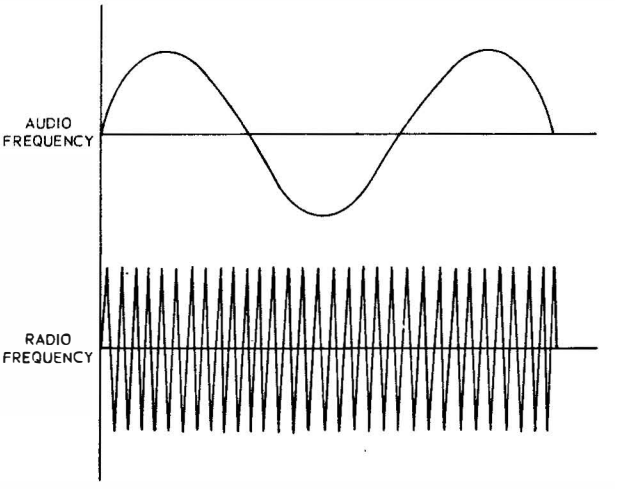


Figure 5-16.—Audiofrequency and radio frequency waves.

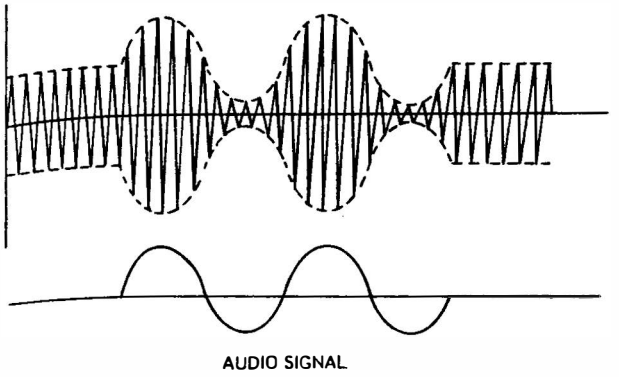


Figure 5-17.—Amplitude modulated radio frequency.

Figure 5-17 illustrates an amplitude modulated radio frequency. Notice how the top envelope of the radio frequency conforms to the shape of the audio signal below it. The bottom part of the AM signal is just the opposite of the top part. This is accomplished in a transmitter by means of a modulator circuit. The modulator circuit mixes the radio frequency and audiofrequency, and the modulated radio frequency is then sent to the antenna, which radiates the electromagnetic wave into space.

Figure 5-18 is a considerably simplified drawing of a modulator of the grid-bias type. The theory of the modulator is to vary the grid voltage of the triode in accordance with the audiofrequency. The current passing through the tube increases as the audio wave becomes more positive and decreases as it becomes more negative. At the same time, the radio frequency is being coupled to the grid by the capacitor shown to the left of the grid in the drawing. Instead of the RF signal being amplified without change, as we saw earlier in this chapter, the varying of the grid charge by the audio signal varies the current passage, and the output signal on the plate is the modulated RF signal shown in figure 5-18. The audio signal is coupled to the grid by a small transformer, and the output signal is coupled to the antenna in the same way. Notice that the two batteries maintain the charge on the grid slightly less than on the cathode, and the cathode charge is much less than that on the plate.

In practice, the batteries are replaced by electronic power supplies, and many additional components are needed to control the circuit. The point is for you to understand the idea of the circuit.

ANTENNAS

Radio energy generated by the transmitter is radiated by the antenna.

Any wire carrying alternating current will radiate some energy. Perhaps the reader has noticed the interference in an automobile radio when near powerlines. A powerline is, of course, a poor antenna because it was designed to carry rather than to radiate energy.

One basic antenna is the dipole (sometimes called a Hertz, or half-wave antenna), a wire with a length equal to one-half a wavelength. It must be remembered that a transmitter is merely a high voltage generator of alternating current. If a feeder line from a transmitter is connected to the center of a dipole, the antenna will act as though an AC generator were set between two quarter-wave antennas, as in view A of figure 5-19. During one-half of the generator's alternation, electrons in the antenna will flow from right to left (fig. 5-19, B). On the next half alternation, electrons flow in the opposite direction (fig. 5-19, C).

The voltage in the transmitting antenna establishes an electric field in the space about the wire, and the current establishes a magnetic field. One cannot exist without the other. The two together make up an electromagnetic wave. If the feeder line to the antenna were severed, stopping the flow of energy to the antenna, the electromagnetic field would collapse back to the parent wire.

An alternating current is flowing into the wire, and, as it changes direction, there is an infinitely small interval when no current flows. The field at once begins to collapse; but, even though the energy is moving at the speed of light, the outermost part of the field cannot return to the wire before the next one-half alternation has thrown up a new field of opposite polarity. Thus, the returning field is pushed away from the antenna and becomes a free wave of electromagnetic energy radiating through space.

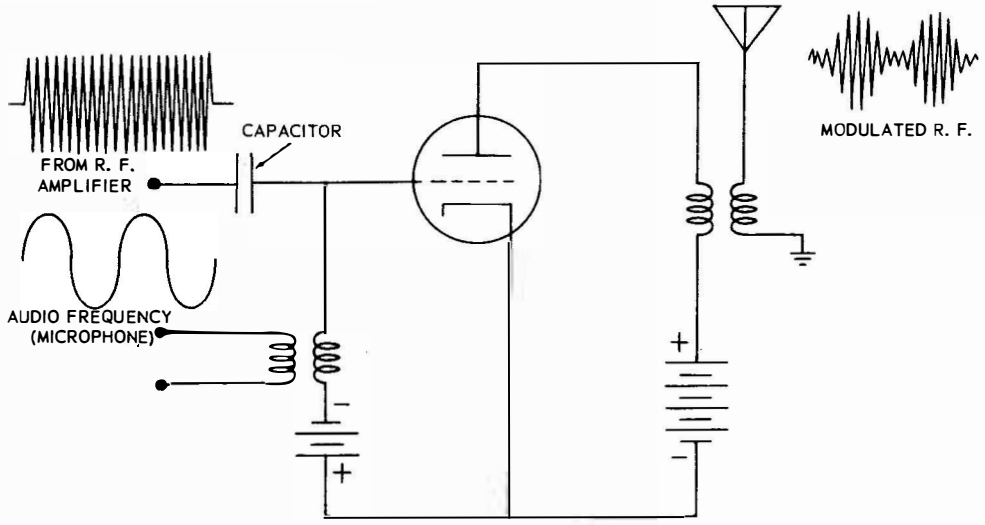


Figure 5-18.—Grid bias modulator.

A vertical dipole, suspended in space away from the influence of the earth, is surrounded by a magnetic field the shape of a doughnut, as in part A and part B of figure 5-20. No radiation takes place at the ends of the dipole (line OA). Radiation progressively increases through lines OB and OC, until the maximum is radiated on a plane parallel to the surface of the earth.

The field radiated by a horizontal dipole is in the shape of a doughnut standing on edge (fig. 5-20, view C). The greatest field strength is now in a vertical plane, but still at right angles to the dipole.

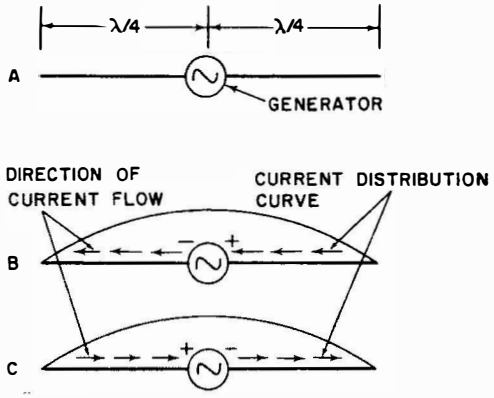


Figure 5-19.—Instantaneous direction and distribution of current in an antenna.

Standing Waves

If an antenna is energized by an alternating current of a frequency equal to the antenna's resonant frequency, the current and voltage values will vary along the length of the wire, and will always be 90° out of phase. In a dipole, current will be at minimum in the center and at maximum at the ends. "The points where voltage or current are maximum are called voltage or current loops. The points of minimum voltage or current are known as voltage or current nodes. Figure 5-21 shows the location of loop and node points along a full-wave antenna." Current and voltage nodes appear every one-half wavelength, but are separated by one-quarter wavelength.

The wave of energy sent out by the transmitter travels to the ends of the antenna, from

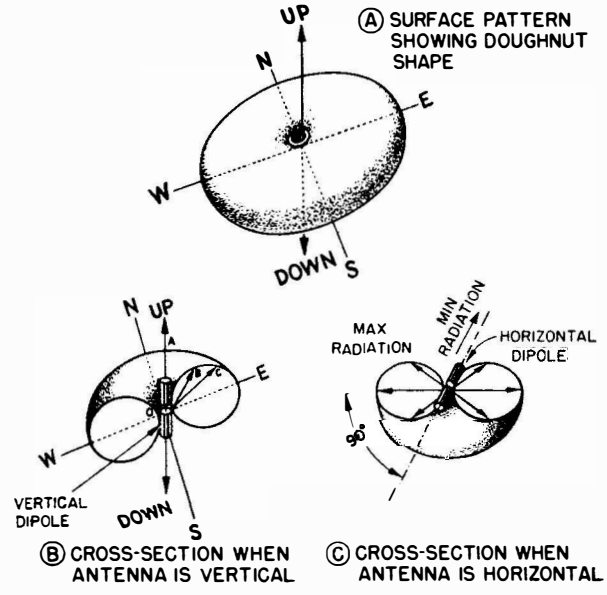


Figure 5-20.—Electromagnetic field surrounding a dipole.

where it is reflected back along the length of the wire. The time required for this process depends upon the length of the antenna, and hence upon the frequency.

If the dipole is resonant to the frequency generated by the transmitter, the returning wave strikes the fresh oncoming wave and the current and voltage in the two waves reinforce each other.

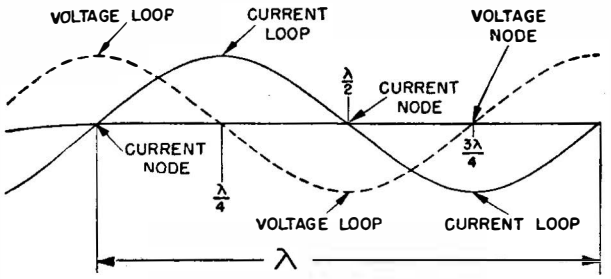


Figure 5-21.—Standing waves along full wave antenna.

This condition is constant as long as the antenna is energized, and the effect is the same as though there were standing waves along the length of the wire instead of two sets of moving waves, as is really the case. Only in the presence of standing waves is an antenna radiating at maximum.

Actual and Electrical Antenna Length

The dipole has been defined as an antenna with a length equal to one-half a wavelength. Assume that a station wishes to transmit on a frequency of 3 MC. Substituting in the formula given earlier in this chapter, we find the wavelength for that frequency is—

$$\frac{300 \times 10^6 \text{ (velocity in meters per second)}}{3 \times 10^6 \text{ (frequency in cycles per second)}} = 100 \text{ meters}$$

The dipole to be used for that frequency will be—

$$\frac{100}{2} = 50 \text{ meters, or about 164 feet.}$$

The foregoing pertains to an ideal antenna, completely free from the influence of the earth. Since no antenna really is free from the earth's influence, the physical length of an antenna should be about 5 percent shorter than the electrical length given by the formula. A half-wave antenna for a 100-meter station will be 50 meters minus 5 percent, or 47.5 meters long.

The physical length of a half-wave antenna for frequencies above 30 MC can be calculated from the frequency by the following equation:

$$\text{Length (feet)} = \frac{492 \times 0.95}{\text{frequency in megacycles}}$$

The number 492 is a constant. The correction factor 0.95 is 100 percent minus the 5 percent loss due to the effect of the earth.

It is, of course, impractical physically to lengthen or to shorten an antenna every time the transmitter is tuned to a new frequency. The length may, however, be changed electrically, a process known as TUNING THE ANTENNA.

Because of cost and construction difficulties, half-wave antennas are seldom used for transmitters operating at frequencies below 1000 KC. A dipole for 550 KC, for example, would have to be about 851 feet long. At the lower frequencies the Marconi antenna, another basic type, affords a solution to the problem of undue length.

Marconi Antenna

The principle of the Marconi antenna (also known as the quarter-wave or grounded antenna) is illustrated in figure 5-22. The transmitter is connected between the bottom of the antenna and the earth. Although the antenna is only a quarter-wavelength, the earth itself acts as another quarter-wave antenna. By the aid of this image wave in the earth, half-wave operation is obtained from an antenna half the size of a dipole.

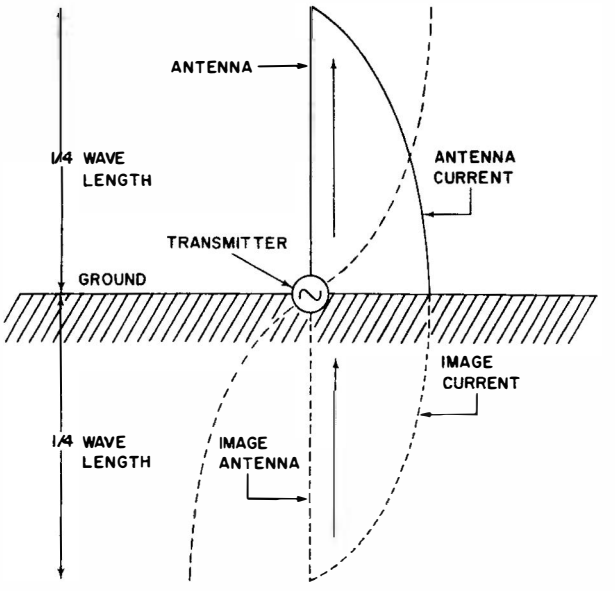


Figure 5-22.—Quarter-wave Marconi antenna, showing image current.

The relationship of current and voltage in a quarter-wave antenna is similar to that in a dipole. Voltage is maximum at the top of the antenna and minimum at the bottom. Current is greatest at the bottom and least at the top.

The Marconi antenna is used extensively with portable transmitters. On an airplane, a quarter-wave mast or a trailing wire is the antenna, and the fuselage produces the image. Similar installations are made on ships. A quarter-wave mast or horizontal wire is the antenna, and the superstructure and hull provide the image.

RECEIVERS

We mentioned earlier that the signal which is picked up by a receiving antenna is in the range of a few millionths of a volt. Obviously this signal must be considerably amplified if it is to be of any use. Then the audiofrequency, if voice is being received, must be removed from the RF signal. Let us examine how this is done. Bear in mind once again that the circuits described here are considerably simplified.

The antenna is usually coupled to an electron tube amplifier similar to those discussed previously. Attached to the grid is a tunable tank circuit. (See fig. 5-23.) The tank consists of a capacitor and a coil forming a small loop. In figure 5-23 notice that the capacitor symbol has an arrow through it. This means it is capable of being varied. It permits tuning the receiver to different frequencies. Based upon the values or sizes of the capacitor and coil forming the loop, all such circuits have a frequency at which they resonate. Essentially, this means that the resonant frequency alternates easily while all other frequencies are damped considerably. Remember that by changing the value of the capacitor in our circuit by rotating the tuning dial, the resonant frequency is changed. Thus, if we want to tune in at 500 KC on a receiver, we change the tuning dial until the values of the capacitor and coil are such that their resonant frequency is 500 KC. All signals of 500 KC which then strike the antenna will be amplified by the receiver while all other frequencies will be rejected.

The RF signal is still so small that several more stages of amplification are necessary. Most modern receivers are of the so-called superheterodyne type. This type of receiver takes advantage of a basic principle of frequency mixing to allow superior amplification in the set.

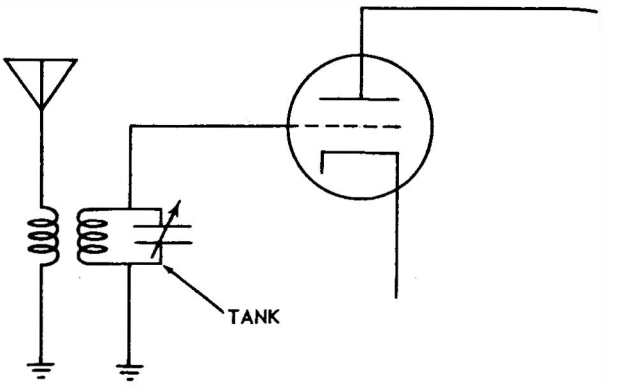


Figure 5-23.—Tunable tank circuit.

The principle is as follows: If two frequencies are mixed, four frequencies result. The original two frequencies still remain and, in addition, the sum and difference frequencies also are produced. In other words, if a signal of 50 KC and a signal of 20 KC are mixed, the result would be four frequencies—50 KC, 20 KC, 70 KC, and 30 KC. Of the last two, 70 KC results from adding 50 KC and 20 KC, and 30 KC results from subtracting 20 KC from 50 KC.

In building an amplifier, the design problems are considerably simplified if the frequency is constant. The superheterodyne receiver uses this principle to simplify design. Immediately after the first RF amplifier stage, an oscillator is installed which is connected mechanically to the variable capacitor shown in figure 5-23. When the receiver tuning dial is turned to change the frequency being accepted from the antenna, the oscillator is also varied so that a new frequency is being mixed with it, and the next two or three stages accept and amplify only one of the four frequencies thus formed.

The principle of the superheterodyne receiver can be seen in figure 5-24. Assume a signal of 100 KC is to be received. When the tuning dial is turned to 100 KC the variable capacitor in both the RF amplifier stage and the oscillator stage are changed together by mechanical linkage so that the oscillator produces a frequency 10 KC more than the RF. Both of these are mixed and the four resulting frequencies (100 KC, 110 KC, 210 KC, and 10 KC) are fed to a mixer. Here the three extraneous frequencies are damped and the 10 KC is passed on to the next stage,

called the Intermediate Frequency amplifier (IF stage). Any suitable frequency may be used for the IF. The IF amplifier usually consists of several stages, each with a high amplification rate. Thus the efficiency can be greatly increased, and the set can be produced more economically. The oscillator is of a variable type but essentially does the same job as the crystal type shown in figure 5-15.

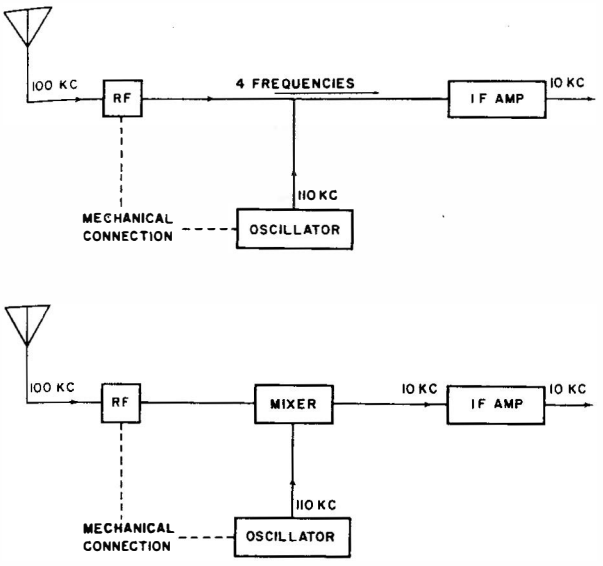


Figure 5-24.—Principle of superheterodyne receiver.

Detectors

Now let's try to get some sound out of the signal we have carried through the receiver. This is done with a circuit called a detector. A new concept is involved which we shall explain first.

Figure 5-25 shows a resistor and capacitor in parallel, which is called an R-C circuit. A resistor is a device which offers resistance to the flow of an electric current through it. This flow of electricity results in a change in the charge between the two ends of the resistor. That is, as the electrons flow through the resistor (shown in fig. 5-26), the charge on the exit end becomes positive with respect to the entrance end.

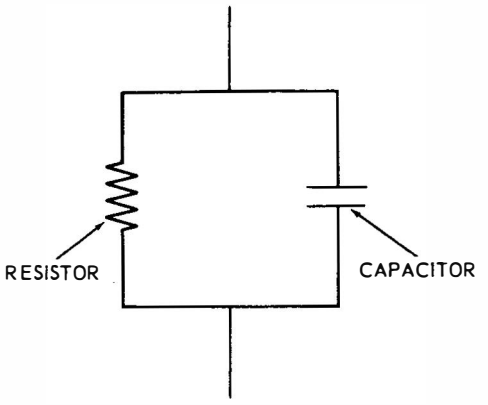


Figure 5-25.—R-C circuit.

The capacitor, on the other hand, will not conduct direct-current electricity. However, if the charge on one plate is different from that on the other, it will try to equalize itself by sending the excess electrons on the negative plate to the positive plate through any outside connecting wires that are available. With this in mind, examine the R-C circuit again. In figure 5-27, if we let a direct current flow through the circuit from negative to positive so that the charge on the positive side is 5 volts while that on the negative side is zero, what happens when the current is turned off? You will find that the excess of electrons on the negative side of the capacitor will leak around through the resistor until both plates of the capacitor have the same number of electrons. Because of the resistance put up by the resistor, this will not happen instantaneously. The voltage readings taken at point A in figure 5-27 might show results like the graph in figure 5-28. The speed with which the voltage returns to zero will depend on the values of the resistor and capacitor.

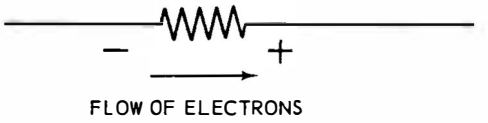


Figure 5-26.—Current flow through a resistor.

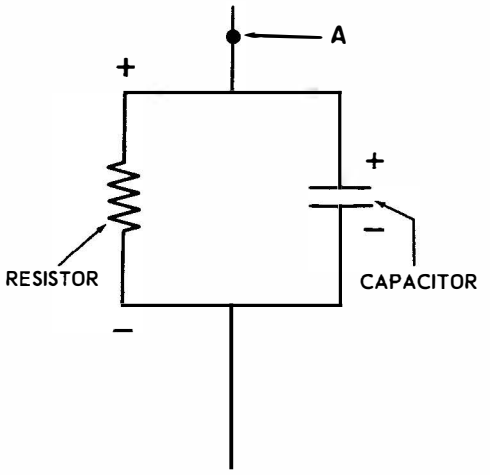


Figure 5-27.—Charged R-C circuit.

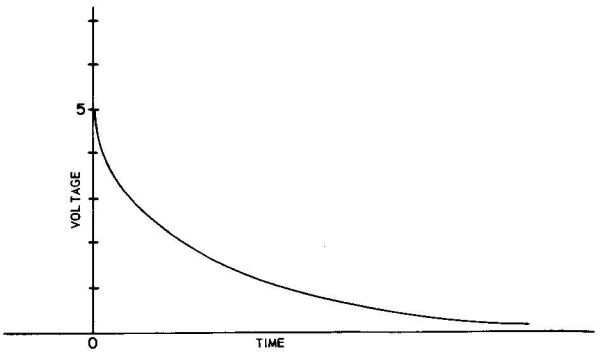


Figure 5-28.—Discharge of R-C circuit.

Suppose we put this idea to use in a detector by putting an R-C net in the cathode of a diode tube. On the plate of the tube in part A of figure 5-29 we will put in the modulated intermediate frequency coming through the receiver. (Many of the necessary refinement components have been left out of the drawing.) The input looks like that in view B of figure 5-29. It is the complete IF frequency whose envelope has been modulated by the audiofrequency. If the capacitor were not in parallel with the resistor in the cathode, the output would appear as in view C of the illustration. This is because the tube can only conduct when the plate is positive so that all the negative swings are cut off. Now, suppose we put the capacitor back in the circuit. The tube will conduct on all the positive swings of the IF. Each time it does, the capacitor will become charged to the same degree as the resistor. While the tube is shut off, the excess electrons on the negative side of the capacitor will leak through the resistor to the positive side so the output voltage will never be allowed to return to zero. As a result, the output signal will look like view D of figure 5-29, which is a close approximation of the original audio that went into the transmitter. This output can then be coupled directly to a speaker, or, as would most likely be the case, it could be amplified by an audio amplifier stage before driving the speaker.

Beat Frequency Oscillator

In those cases where CW is to be received and Morse code signals are read directly by the Radioman, a special oscillator is installed which will produce a frequency differing from the IF frequency by approximately 1000 cycles per second. The difference frequency is then amplified and, since it is within the audible range, fed directly to the speaker. Such an oscillator is called a beat frequency oscillator.

FACSIMILE

Facsimile is a method for transmitting pictorial and graphic information by wire or radio and reproducing it in original form at the receiving station. The most useful application of facsimile by the Navy has been the transmitting of fully plotted weather charts.

The use of facsimile for distribution of weather charts has eliminated the need for skilled weather analysts and duplicate plotting aboard each ship and station where weather information is required. Significant economies, as well as a more uniform, accurate, and rapid weather service have been effected.

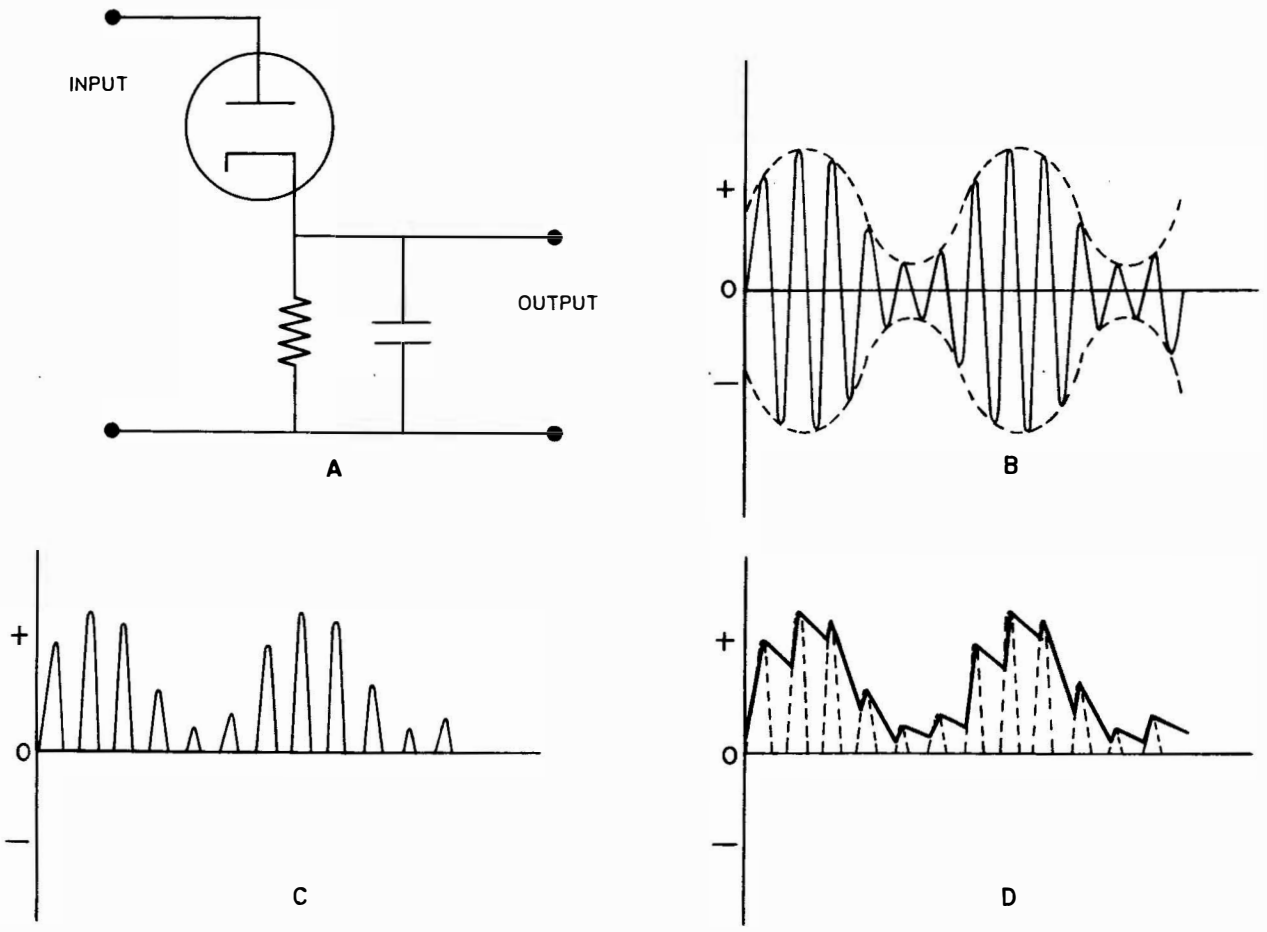


Figure 5-29.—Diode detector and wave forms.

Principles of Facsimile

The Navy has a number of facsimile equipments in use. All operate in much the same way. The picture to be sent is wrapped around a cylinder on the transmitting machine. It is necessary that the picture lie perfectly flat, for variations in the surface plane cause faulty transmission of the intelligence. The cylinder rotates at a constant speed and at the same time moves longitudinally along a shaft. The picture is illuminated by a beam of light focused through a condensing lens. As the beam passes over each portion of the picture, it is reflected into a photoelectric tube, and the variation in intensity of reflected light due to the character of the picture creates voltage variations in the tube output circuit. These voltage variations constitute the picture signal and may be sent directly over a landline or used to modulate the radio frequency carrier of a transmitter.

The photoelectric tube has been called the electric eye, but it does not have the capacity of the eye or camera lens to view many images simultaneously. It can only measure the light value of any single area toward which it is directed. It is not possible with present equipment to show the picture to the tube for an

instant and expect it to analyze the intelligence for transmission. It is, rather, necessary to divide the picture into small areas containing monotone values of detail, which the photoelectric tube is capable of analyzing correctly. Thus, facsimile uses a scanning principle, and allows the photoelectric tube to view a spiraling area one one-hundredths inch wide. As the drum rotates and moves longitudinally, consecutive areas are viewed by the tube until the entire picture has been analyzed for transmission.

At the receiver the signal is demodulated and the voltage variations are used to operate a recorder in synchronization with the transmitter. If the transmission is to be recorded on photographic film or paper, the signal reaching the receiver is amplified until it is strong enough to operate a neon recorder lamp. The lamp scans sensitized paper or film on the drum, reception taking place in a darkroom. The paper or film is exposed in varying degrees corresponding to the image viewed by the photoelectric tube in the transmitter. In the case of film, photographic development yields a negative which may be used for making prints.

Where it is desirable to operate without a darkroom or chemicals, the nonphotographic process is preferable. One type of FAX receiver employs a device called a bar, hammer, or helix, which produces a picture by pressing down on carbon paper with pressures varying according to the transmitted picture. A second and more common type records on a specially prepared paper by what is literally a burning process. A stylus is connected to the output of the recorder amplifier in such a way that a high voltage is developed at the stylus point as signals are received. The electrified stylus burns a white surface coating on the paper which has a conductive black undercoating. One type of this paper may be used for making copies by the gelatin-ink transfer (hectograph) process.

One of the greatest problems in the development of facsimile, and still a difficulty of operation and maintenance, is synchronizing the transmitting and receiving drums. As the scanning begins, both drums must be revolving at exactly the same speed. This is accomplished by a sealed, temperature-compensated, tuned fork which vibrates at 1800 cycles per second. A frequency variation of as little as one-tenth cycle will, in 20 minutes, cause an inch of skew in the received copy.

A difficulty encountered in any transmission circuit, especially over long distances, is interference. In CW, voice, or RATT, bursts of noise obliterate a portion of the signal and repeats may be required. In facsimile, bursts of interference cause a one one-hundredth inch line through a portion of the picture, but leave it readable. A number of systems for minimizing fading and interference are in use. At present the Navy is concentrating on frequency-shift keying for facsimile transmissions.

ELECTRONIC EQUIPMENT NOMENCLATURE SYSTEMS

You will find the older system of designating electronic equipment by a group of letters and numbers still being used. Such equipment designations as TBL-5, TCK, and RED are still common aboard ship. More and more, however, the older equipments are being replaced with others carrying the new identification symbols.

The identification system is set forth in detail in Department of Defense publication MIL-STD-196, *Military Standard, Joint Electronics Type Designation System.* You will be a better communicator for the half-hour or so which you devote to its study.

In brief, each electronic equipment is designated by the letters AN followed by a slant mark (/), three letters, and a number, in that order. There may be additional suffix letters and numbers, but all equipments will have at least this minimum. Meanings are as follows:

AN/	A major equipment.
First letter	Designed installation classes—airborne, surface craft, submarine, etc.
Second letter	Type of equipment—radar, sonar, radiac, radio, etc.
Third letter	Purpose—bombing, communications (receiving and transmitting), navigational aids, receiving, detecting, transmitting, etc.
Number	Model number.
Letter	Modification letter.

For an example, consider the equipment designation AN/SPS-6C.

AN/ marks it as a major equipment.

The first letter, S, means it is for surface craft.

The letter P identifies the type of equipment as radar.

The third letter (S) denotes that the purpose of the equipment is detecting.

The number 6 is the model number.

The letter C following the model number means this is the third modification of the equipment.

ADVANCEMENTS IN NAVAL COMMUNICATION EQUIPMENT

Many improvements have been made through the years in communication equipment. Evaluation reports of fleet exercises emphasize the need for more reliable and rapid communications between fleet units. Research continues in this field, often with highly promising results.

Single Sideband

A mode of radio emission that is increasing in importance to the Navy is known as single sideband (SSB). Single sideband is not a new term in the history of communications. It has been used extensively by the shore communication system for many years. However, the congestion in the medium- and high-frequency bands and recent developments which have reduced the physical sizes of equipments have given a new impetus to the advantages of using SSB in fleet communications.

Because of the wide interest now developing in SSB, conventional amplitude modulation is sometimes referred to as double sideband (DSB) to distinguish it from single sideband.

Following is a brief introduction to the technique of SSB.

In amplitude modulation, the modulation of the carrier produces a complex signal consisting of three individual waves: the original carrier, plus two identical sidebands, each carrying the same intelligence. Naturally, this appears to be an uneconomical means of transmission. By eliminating the carrier and one of the sidebands, the same intelligence can be transmitted at a saving in power and frequency bandwidth.

Suppressed Carrier

In SSB, the carrier itself is eliminated at the transmitter, so that sideband frequencies are produced but the carrier is reduced to a minimum. This is usually the most difficult or troublesome aspect in understanding SSB suppressed carrier. In single sideband suppressed carrier, there is no carrier present under modulation conditions. That is, when speech is fed into the SSB transmitter, the carrier itself does not appear. All the radio-frequency energy appearing at the transmitter output is concentrated in the sideband energy or "talk power."

Now, we have eliminated the carrier, but we still have both the upper and lower sidebands. If, however, one of the two sidebands is filtered out before it reaches the power amplifier stage of the transmitter, the same intelligence can be transmitted on the remaining single sideband. All the power is then transmitted in one sideband, rather than being divided between the carrier and both sidebands as in DSB. This amounts to an increase in power for the wanted single sideband. Equally important, the bandwidth required for SSB voice circuits is approximately half that needed for DSB.

SSB Advantages

It has been pointed out that in DSB there are two sidebands which are heterodyned (mixed) with the transmitted carrier. If these sidebands are not received in phase (usually because of multipath skywave propagation conditions), the signal heard is fuzzy, distorted, and possibly quite loud. One sideband may experience a slight phase shift due to the multipath transmission, thereby nearly canceling the other sideband. This produces distortion and loss of intelligibility. Fading or slight phase shift of the carrier can produce similar results. However, with the suppressed-carrier type of SSB, these problems are minimized. Other advantages of suppressed-carrier SSB follow.

INCREASE IN EFFECTIVE POWER.—In a conventional DSB system, approximately one-half of the transmitter's power goes into the

carrier, assuming 100 percent modulation, and the remaining one-half is divided equally between the two sidebands. However, with the suppressed-carrier SSB system, virtually all of this power goes into the single sideband which carries the useful voice intelligence.

PROVISION FOR DOUBLE THE NUMBER OF CHANNELS.—In the system of SSB suppressed carrier, the number of voice channels utilizing the same frequency in the radio spectrum is doubled. These two channels are referred to as the upper and lower sidebands. With the scarcity of frequencies available for new assignments in the spectrum, particularly in the 2 to 30 MC range, this is an important advantage in fleet communications.

REDUCTION OF INTERFERENCE.—In normal voice DSB communications systems, the carrier of the transmitting station remains on the air until the transmitter is turned off. If an additional station transmits while the carrier of the other station is on, squeals and howls result. These are caused by the heterodyning of two or more signals transmitting at the same time. In SSB, as soon as the individual stops speaking into the microphone, talk power in the remaining (or single) sideband, leaves the air. Even though two stations may transmit at the same time, it may be possible for a receiving station to read through the interfering station the same way we are able to listen to more than one conversation at the same time around the mess table.

In the past, the distance range of shipboard voice circuits has always been relatively limited because the transmitters do not have the power for voice modulation that they have for CW telegraphy. SSB offers the best method of increasing the range of reliable voice communications.

The SSB principle of radio transmission and reception will also be used in the new High Capacity Communication System (HICAPCOM) now being developed. HICAPCOM will utilize ground wave transmission in the MF/HF bands to reach beyond the line-of-sight and avoid skip zones. It will provide reliable communications for a task force dispersed over distances up to 300 miles. Each radio frequency used may have from one to four voice-width channels, and each voice-width channel may be subdivided into 40 subchannels for RATT transmissions. Additionally, equipment similar to that used for HICAPCOM will provide the communication link for the Navy Tactical Data System (NTDS).

Satellite Communications

In the study of communication theory we have seen that one of the paramount problems faced by the communicator is choosing the frequency on which to operate. We have further discussed the growing need for more frequencies in the already crowded frequency spectrum. It was shown that for long-range communications the usable frequency spectrum was from about 2 MC to 28 MC. There are times when frequency blackouts occur and there may be no usable frequency available for long-range communications.

One solution to this problem is to utilize communications via satellite relay. It was seen that UHF is a line-of-sight system since it normally will pass through the ionosphere and we will not obtain that valuable "skip" necessary for long-range communications. Now, if we can substitute a satellite for the ionosphere to either reflect signals directly back to earth or amplify and retransmit these signals, we will be able to use UHF or SHF and obtain very long ranges, depending on the height of the satellite. Thus we no longer would be dependent on the ionosphere for communications and could also use frequencies that are not in the crowded area of the spectrum, thereby greatly increasing the amount of information that might be passed.

Several types of satellite relay are under study and evaluation by the Navy. The first is the passive satellite. This consists of any body placed in orbit that may be capable of reflecting the transmitted signal back to earth. It may consist of many satellites in low orbits for medium range or few satellites in high orbits for long range. The Navy has developed the Communications Moon Relay (CMR) system using the reflection method for reliable communications between Washington, D.C. and Pearl Harbor, Hawaii. One disadvantage of the passive type of satellite is that it takes rather large, sophisticated, high-gain antennas and fairly high-powered transmitters to utilize this method.

A second type of satellite under study is the active satellite. This type of satellite will receive a signal from earth, and amplify and retransmit it back to earth. The ground stations

can utilize fairly low-power transmitters and smaller antennas as compared to passive satellites. The main disadvantage of the active satellite is the complexity of the satellite itself. It must be made reliable enough to be economically and operationally feasible.

One of the most interesting methods of communications via active satellite is being experimented with in project ADVENT. This system calls for several satellites equally spaced around the world in 24-hour equatorial orbits. If the satellite is in an equatorial orbit and at sufficient altitude (19,300 miles from the earth's surface), its orbit will match the rotation of the earth and appear as a stationary satellite permanently fixed over a predetermined longitude. Ships and stations located anywhere on the earth from 70° N to 70° S would be able to view one of these satellites and could conceivably transmit at any time of the day to any place on the globe, within the above latitude limits. Any number of methods of transmission will be available to this system, including digital data, SSB, and possibly even reconnaissance television. Since the frequency will be above 2000 MC, the capacity of the system will be very high. Terminals for the eventual communication system described here will include fixed and mobile ground stations, aircraft, ships, and submarines.

Although this system may not be operational for some time, its potential as a worldwide communication system is tremendous. It is the responsibility of every communicator to keep current on the progress of satellite communications.

CHAPTER 6

RADIOTELEPHONE

INTRODUCTION

Radiotelephone (sometimes called voice radio) is one of the most useful military communication methods.

Because of its directness, convenience, and ease of operation, radiotelephone is used by ships and aircraft for short-range tactical communication. Its direct transmission of voice makes it possible for a conning officer to have in his hands a means of personal communication with the OTC and with other ships. There is little delay while a message is prepared for transmission, and acknowledgments can be returned instantly. Radiotelephone equipment is usually operated on frequencies that are high enough to have line-of-sight characteristics—that is, the waves will not follow the curvature of the earth. Because of the employment of high frequencies, the range of radiotelephone communications is normally limited to 20 to 25 miles. Since radiotelephone procedure can be learned easily and is frequently operated by other than trained operators, all personnel must be cautioned that transmissions by radiotelephone are subject to enemy interception and therefore have no security.

With these advantages of radiotelephone go some disadvantages. Transmissions may be unreadable because of static, enemy interference, and a high local noise level caused by shouts, gunfire, and bomb or shell bursts. Wave propagation characteristics of radiotelephone frequencies are sometimes freakish, and transmissions may be heard from great distances. Inasmuch as most radiotelephone messages are in plain language, in the interest of security all transmissions must be kept as short and concise as possible consistent with clearness, while adhering to the prescribed procedure.

NETS

A net is an organization of two or more stations capable of direct communications on a common channel. One station in the net—the NET CONTROL STATION—is in charge. The station serving the senior commander is usually designated as net control, although it may be another station if another station is in better position to control the net. The duties of the net control station are to maintain circuit discipline and speed the flow of traffic on the net.

Directed and Free Nets

Large nets and nets handling many messages usually operate as directed nets, which means that no station may transmit a message without calling and obtaining permission from net control. Nets which do not require strict control may operate as free nets; in this case the controlling station authorizes member stations to send their messages without obtaining prior permission.

Command, Common, and Functional Nets

Nets are classified into three types according to mission or purpose: (1) command, (2) common, and (3) functional.

A command net links a commander with his immediate subordinates in the chain of command, and with any other units that may be designated. For example, a task force command net is activated by the task force commander and guarded by the task group commanders.

A common net links all ships (and in amphibious operations, troop units) of the same task organization. For example, a task group common net is activated by the task group commander and is guarded by all ships and troop units in the task group.

A functional net is for direct communication between personnel in charge of the specific task for which the net is provided.

DO'S AND DON'TS OF MICROPHONE TECHNIQUE

DO—

1. DO listen before transmitting. Unauthorized break-in is lubberly and causes confusion. Often neither transmission gets through.

2. DO speak clearly and distinctly. Slurred syllables and clipped speech are both hard to understand. A widespread error among untrained operators is failure to emphasize vowels sufficiently.

3. DO speak slowly. Unless the action officer is listening he will have to rely on the copy being typed or written at the other end. Give the recorder a chance to get it all the first time. You will save time and repetitions that way.

4. DO avoid extremes of pitch. A high voice cuts best through interference, but is shrill and unpleasant if too high. A lower pitch is easier on the ear, but is hard to understand through background noises if too low.

5. DO be natural. Maintain a normal speaking rhythm. Group words in a natural manner. Send your message phrase by phrase rather than word by word.

6. DO use standard pronunciation. Speech with sectional peculiarities is difficult for persons from other parts of the country. Talkers using the almost standard pronunciation of a broadcast network announcer are easiest to understand.

7. DO speak in a moderately strong voice. This will override unavoidable background noises and prevent dropouts.

8. DO keep correct distance between lips and microphone. If the distance is too great, speech is inaudible and background noises creep in; if too small, blaring and blasting result. If a handset is held naturally the distance will be approximately correct.

9. DO shield your microphrone. Turn your head away from noise-generating sources while transmitting.

10. DO keep the volume of a handset earphone low.

11. DO keep speaker volumes to a moderate level.

12. DO give an accurate evaluation in response to a request for a radio check. A transmission with feedback and/or a high level of background noise is not loud and clear even though the message can be understood.

13. DO pause momentarily, when possible, and interrupt your carrier. This allows any other station with higher precedence traffic to break in.

14. DO adhere strictly to prescribed procedures. Up-to-date radiotelephone procedure is found in the effective edition of ACP 125.

15. DO transact your business and get off the air. Preliminary calls only waste time when communication is good and the message short. It is not necessary to blow into a microphone to test it, nor to repeat portions of messages when no repetition has been requested.

DON'T

1. DON'T transmit while surrounded by other persons loudly discussing the next maneuver or event. It confuses receiving stations, and a serious security violation can result.

2. DON'T hold the microphone button in the push-to-talk position until absolutely ready to transmit. Your carrier will block communications on the net.

3. DON'T hold a handset in such a position while speaking that there is a possibility of having feedback from the earphone added to other extraneous noises.

4. DON'T hold a handset loosely. A firm pressure on the microphone button prevents unintentional release and consequent signal dropout.

5. DON'T send test signals for longer than 10 seconds.

PRONOUNCING NUMERALS

Care must be taken to distinguish numerals from similarly pronounced words. Pronounce numerals as follows:

Numeral	Spoken as	Numeral	Spoken as
0	Zero	5	Fi-yiv
1	Wun	6	Six
2	Too	7	Seven
3	Thuh-ree	8	Ate
4	Fo-wer	9	Niner

Numerals are transmitted digit by digit except that exact multiples of hundreds and thousands may be spoken as such. Examples:

Number	Spoken as
44	Fo-wer fo-wer
90	Niner zero
136	Wun thuh-ree six
500	Fi-yiv hun-dred
1478	Wun fo-wer seven ate
7000	Seven thow-zand
16000	Wun six thow-zand
16400	Wun six fo-wer hun-dred
812681	Ate wun two six ate wun

PHONETIC ALPHABET

Any letter of the alphabet that occurs in radiotelephone is identified by using the standard phonetic alphabet equivalent.

Alphabet letter	Phonetic equivalent	Pronounced as
A	ALFA	AL fah
B	BRAVO	BRAH VOH
C	CHARLIE	CHAR LEE
D	DELTA	DELL tah
E	ECHO	ECK oh
F	FOXTROT	FOKS trot
G	GOLF	GOLF
H	HOTEL	hoh TELL
I	INDIA	IN dee ah
J	JULIETT	JEW lee ett
K	KILO	KEY loh
L	LIMA	LEE mah
M	MIKE	MIKE
N	NOVEMBER	no VEM ber
O	OSCAR	OSS cah
P	PAPA	pah PAH
Q	QUEBEC	keh BECK
R	ROMEO	ROW me oh
S	SIERRA	see AIRrah
T	TANGO	TANG go
U	UNIFORM	YOU nee form
V	VICTOR	VIK tah
W	WHISKEY	WISS key
X	XRAY	ECKS ray
Y	YANKEE	YANG KEY
Z	ZULU	ZOO loo

PROWORDS

Prowords are words and phrases used to speed the handling of radiotelephone messages. They perform the same functions and are used in the same manner as prosigns are used in the other procedures. Many prosigns and prowords are exactly equivalent in meaning.

Pages 77 and 78 show a complete list of prowords (except for precedence prowords) together with an explanation of each and the corresponding prosign, if one exists.

RADIOTELEPHONE MESSAGE

Radiotelephone uses a 16-line message format that is closely comparable to the formats used in radiotelegraph and in teletypewriter communications. It also uses the same three military message forms: plaindress, abbreviated plaindress, and codress. By far the most common message form in radiotelephone traffic is the abbreviated. In fact, it is sometimes so abbreviated that its resemblance to the basic message format is barely detectable. But the three major message parts are still there: heading, text, and ending. Each of these, as in teletypewriter, can be reduced to parts, components, elements, and contents.

Proword	Explanation	Equivalent to
ALL AFTER	The portion of the message to which I have reference is all that which follows ___ .	AA
ALL BEFORE	The portion of the message to which I have reference is all that which precedes ___ .	AB
BREAK	I hereby indicate the separation of the text from other portions of the message.	$\overline{BT}$
CORRECTION	An error has been made in this transmission. Transmission will continue with the last word correctly transmitted.	EEEEEEEE
	An error has been made in this transmission (or message indicated). The correct version is ___ .	C
	That which follows is a corrected version in answer to your request for verification.	C
DEFERRED	Precedence DEFERRED.	M
DISREGARD THIS TRANSMISSION.	This transmission is in error; disregard it. (This proword shall not be used to cancel any message that has been completely transmitted and for which receipt or acknowledgment has been received.)	EEEEEEEE $\overline{AR}$
DO NOT ANSWER	Stations called are not to answer this call, receipt for this message, or otherwise to transmit in connection with this transmission. (When this proword is employed the transmission shall be ended with the proword "OUT.")	F
EMERGENCY	Precedence EMERGENCY.	Y
EXECUTE	Carry out the purport of the message or signal to which this applies. (To be used only with the executive method.)	$\overline{IX}$ (5-sec. dash)
EXECUTE TO FOLLOW.	Action on the message or signal which follows is to be carried out upon receipt of the proword "EXECUTE." (To be used only with the executive method.)	$\overline{IX}$
EXEMPT	The addressee designations immediately following are exempted from the collective call.	XMT
FIGURES	Numerals or numbers follow.	___
FLASH	Precedence FLASH.	Z
FROM	The originator of this message is indicated by the address designation immediately following.	FM
GROUPS	This message contains the number of groups indicated by the numeral following.	GR
GROUPS NO COUNT	The groups in this message have not been counted.	GRNC
INFO	The addressee designations immediately following are addressed for information.	INFO
I READ BACK	The following is my response to your instructions to read back.	___
I SAY AGAIN	I am repeating transmission or portion indicated.	$\overline{IMI}$
I SPELL	I shall spell the next word phonetically	___
I VERIFY	That which follows has been verified at your request and is repeated. (To be used only as a reply to VERIFY.)	___
MESSAGE FOLLOWS	A message which requires recording is about to follow. (Transmitted immediately after the call.)	___
NUMBER	Station serial number.	NR

Proword	Explanation	Equivalent to
OPERATIONAL IMMEDIATE.	Precedence OPERATIONAL IMMEDIATE.	O
OUT	This is the end of my transmission to you and no answer is required or expected.	$\overline{AR}$
OVER	This is the end of my transmission to you and a response is necessary. Go ahead; transmit.	K
PRIORITY	Precedence PRIORITY.	P
READ BACK	Repeat this entire transmission back to me exactly as received.	G
RELAY (TO)	Transmit this message to all addressees or to the address designations immediately following.	T
ROGER	I have received your last transmission satisfactorily.	R
ROUTINE	Precedence ROUTINE.	R
SAY AGAIN	Repeat all of your last transmission. (Followed by identification data means "Repeat ___(portion indicated).")	$\overline{IMI}$
SERVICE	The message that follows is a SERVICE message.	SVC
SIGNALS FOLLOW	The groups which follow are taken from a signal book. (This proword need not be used on nets primarily employed for conveying signals. It is intended for use when tactical signals are passed on nontactical nets.)	—
SILENCE	Cease transmissions immediately. Silence will be maintained until instructed to resume. (When an authentication system is in force, transmissions imposing silence are to be authenticated.)	$\overline{HM}$ $\overline{HM}$ $\overline{HM}$
SILENCE LIFTED	Resume normal transmissions. (Silence can be lifted only be the station imposing it or by higher authority. When an authentication system is in force, transmissions lifting silence are to be authenticated.)	—
SPEAK SLOWER	Your transmission is at too fast a speed. Reduce speed of transmission.	—
THAT IS CORRECT	You are correct, or what you have transmitted is correct.	C
THIS IS	This transmission is from the station whose designation immediately follows.	DE
TIME	That which immediately follows is the time or date-time group of the message.	—
TO	The addressees whose designations immediately follow are to take action on this message.	TO
UNKNOWN STATION	The identity of the station with whom I am attempting to establish communication is unknown.	$\overline{AA}$
VERIFY	Verify entire message (or portion indicated) with the originator and send correct version. (To be used only at the descretion of or by the addressee to which the questioned message was directed.)	J
WAIT	I must pause for a few seconds.	$\overline{AS}$
WAIT OUT	I must pause longer than a few seconds.	$\overline{AS}$ $\overline{AR}$
WILCO	I have received your message, understand it, and will comply. (To be used only by the addressee. Since the meaning of ROGER is included in that of WILCO, the two prowords are never used together.)	—
WORD AFTER	The word of the message to which I have reference is that which follows ___ .	WA
WORD BEFORE	The word of the message to which I have reference is that which precedes ___ .	WB
WORDS TWICE	Communication is difficult. Transmit (or transmitting) each phrase (or each code group) twice. (This proword may be used as an order, request, or as information.)	—
WRONG	Your last transmission was incorrect. The correct version is ___ .	—

RADIOTELEPHONE MESSAGE FORMAT

Parts	Components	Elements	Format line	Contents
H	Procedure . . .	a. Call	1	Not used.
			2 and 3	Station(s) called (proword EXEMPT, exempted calls). Proword THIS IS and station calling.
		b. Message follows		Proword MESSAGE FOLLOWS.
		c. Transmission identification.		Proword NUMBER and station serial number.
E		d. Transmission instructions.	4	Prowords RELAY TO; READ BACK; DO NOT ANSWER. Operating signals; call signs; address groups; address indicating groups; plain language.
A	Preamble . . .	a. Precedence; date-time group; message instructions.	5	Precedence designation. Proword TIME; date and time expressed in digits and zone suffix; operating signals.
D	Address	a. Originator's sign; originator.	6	Proword FROM. Originator's designation as address group(s), call sign(s), or plain language.
		b. Action addressee sign; action addressee(s).	7	Proword TO. Action addressee designation as address group(s), call sign(s), or plain language.
I		c. Information addressee sign; information addressee(s).	8	Proword INFO. Information addressee designation(s) as address group(s), call sign(s), or plain language.
		d. Exempted addressee sign; exempted addressee(s).	9	Proword EXEMPT. Exempted addressee designation(s) as address group(s), call sign(s), or plain language.
N				
G	Prefix	a. Accounting information; group count; service information.	10	Accounting symbol; group count; proword SERVICE.
SEPARATION			11	Proword BREAK.
TEXT	Text	a. Subject matter	12	Internal instructions; thought or idea as expressed by the originator.
SEPARATION			13	Proword BREAK.
ENDING	Procedure . . .	a. Time group	14	Proword TIME. Hours and minutes expressed in digits and zone suffix, when appropriate.
		b. Final instructions	15	Prowords WAIT; CORRECTION. Station designation.
		c. Ending sign	16	Prowords OVER; OUT.

Figure 6-1.—Parts, components, elements, and contents of a radiotelephone message.

Figure 6-1 is a table showing the correct arrangement of a radiotelephone message. Not all parts, components, elements, or contents are necessarily included in any one message, but when one of them is used it must be placed in the message in the order shown in the table.

Heading

The heading of a radiotelephone message may include any or all of the first ten procedural lines shown in figure 6-1. More often than not it will include only the call, preceding the text. One explanation for such general use of the abbreviated form is that radiotelephone communication is nearly always conducted with station originating and station addressed in direct communication.

Text

The text of the message is the basic thought or idea the originator wishes to communicate. It may be in the form of plain language, code words, cipher groups, or numerals.

Difficult words or groups within the text of a plain language message are spelled out in the phonetic alphabet. Groups or words to be spelled are preceded by the proword I SPELL. If the operator can pronounce the word, he should do so before and after spelling.

Ending

Every radiotelephone message ends with one of the prowords, OVER or OUT. With the use of OVER, the sender tells the receiver to go ahead and transmit; or, "This is the end of my transmission to you and a response is necessary." With the use of OUT, the sender tells the receiver, "This is the end of my transmission to you and no response is required." There is never a need for using OVER and OUT together.

CODE AND CIPHER MESSAGES

Code words (such as LIBRA in the text EXECUTE PLAN LIBRA) are sent as plain language words. Encrypted groups such as BAXTO are spelled phonetically: BRAVO ALFA XRAY TANGO OSCAR.

The phonetic alphabet is applied not only to letters of the alphabet; they are also the names of the signal flags. Flag A is ALFA, B is BRAVO, and so on. Signal flags are combined into code groups which have meetings of their own: ECHO KILO TWO, for example, means "anchor is dragging." The meaning of such code groups may be found in appropriate signal publications.

It may sound strange to you that flag signals are sent by radiotelephone, but it is done, and done often. You must be able to recognize whether you are hearing a flag signal or a word or group spelled phonetically. Here is how you will know: If the phonetic alphabet is used, the word I SPELL precedes it, and each phonetic letter is to be recorded as a letter. If you hear I SPELL followed by DELTA OSCAR, you would write it as DO. Without that proword, you can assume the alphabet flags are intended, and record the transmission as DELTA OSCAR.

RADIOTELEPHONE PROCEDURE

Before you continue your study of radiotelephone, you should be warned that there is no "final" word on any communication procedure. This chapter will help you, but you can keep up with changes only by continued study of current communication instructions.

Radiotelephone transmissions used for illustrative purposes are assumed to pass over the net shown in figure 6-2. Prowords are placed in italics to help you recognize them and see how they are used. Dashes indicate natural pauses.

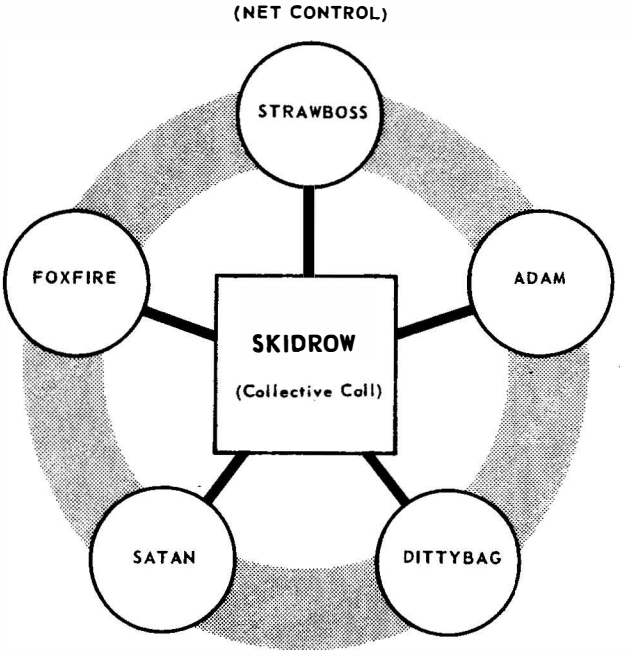


Figure 6-2.—Radiotelephone net.

Calling and Answering

Radiotelephone communication is established by a preliminary call, which will always take one of the following forms.

Full Call

FOXFIRE—. . . . . Call sign of receiving station.
THIS IS . . . . . From.
STRAWBOSS—. . . . Call sign of station calling.
OVER . . . . . Go ahead; transmit.

The reply is in the same form: STRAWBOSS—*THIS IS* FOXFIRE—*OVER*. In this case a single station has been called; if two or more were called they would reply in alphabetical order of call signs.

Collective Call

When stations on the net are assigned a collective call, the collective call is used if all stations are addressed. When necessary, the collective call contains the proword EXEMPT, followed by the call sign of station(s) exempted from the collective call.

SKIDROW—. . . . . Net call.
EXEMPT—. . . . . Exempt.
DITTYBAG—. . . . . Call sign of exempted station.
THIS IS . . . . . From.
STRAWBOSS—. . . . Call sign of station calling.
OVER . . . . . Go ahead; transmit.

ADAM, FOXFIRE, and SATAN now answer up in alphabetical order of call signs.

Abbreviated Call

The call sign of the called station may be omitted when the call is part of an exchange of transmissions between stations and when no confusion will result.

THIS IS ADAM—OVER

Clearing Traffic

With communication established, stations commence clearing traffic, as follows:

	Transmission	Meaning
H	FOXFIRE—. . . . . } SATAN—. . . . . }	Call signs of receiving stations.
	THIS IS	From.
	STRAWBOSS—	Call sign of sending station.
e	*MESSAGE FOLLOWS*—.	A message that requires recording is about to follow.
a	*ROUTINE*—.	Precedence.
	TIME	Time of origin is ___.
d	ONE TWO ONE SIX FIVE NINE ZULU—	DTG.
	FROM—	Originator of this message is ___.
i	STRAWBOSS—	Call sign of originator.
	TO—.	Action addressee is ___.
n	SATAN—.	Call sign of action addressee.
	INFO—	Information addressee is ___.
	FOXFIRE—.	Call sign of information addressee.
g	*GROUPS* SEVEN. . .	Group count.
Separation	*BREAK*—.	Long break.
Text	GO ALONGSIDE FOXFIRE AND EFFECT PERSONNEL TRANSFER—.	Thought or idea conveyed by message.
Separation	*BREAK*—.	Long break.
Ending	*OVER*—.	Go ahead; transmit.

On hearing the proword OVER, receiving stations check the message to see that it has been received fully and correctly. If so, they receipt by use of the proword ROGER, which means "I have received your last transmission satisfactorily."

THIS IS FOXFIRE—*ROGER*—OUT
THIS IS SATAN—*ROGER*—OUT

Repetitions

When words are missing or are doubtful, repetition is requested by the receiving station. The proword SAY AGAIN (alone or with ALL BEFORE, ALL AFTER, WORD BEFORE, WORD AFTER) is used for this purpose. In complying

with such requests, the transmitting station identifies that portion to be repeated.

EXAMPLES

DITTYBAG has sent a message to SATAN. SATAN has missed the word following "ship." SATAN transmits:

DITTYBAG—*THIS IS* SATAN—*SAY AGAIN—WORD AFTER* SHIP—*OVER*

DITTYBAG transmits:

SATAN—*THIS IS* DITTYBAG—*I SAY AGAIN—WORD AFTER* SHIP—SIGHTED—*OVER*

Having received the doubtful portion, DITTYBAG receipts for the entire message with ROGER.

You may give repetitions in plain language messages by natural phrases or by individual words. In encoded or encripted messages, make them by individual characters.

Correcting an Error

When an error is made by a transmitting operator, the proword CORRECTION is sent. The operator then repeats the last word, group, proword, or phrase correctly sent, corrects the error, and proceeds with the message.

EXAMPLE 1:

ADAM—*THIS IS* STRAWBOSS—*TIME* ONE ZERO ONE TWO ZULU—*BREAK*—CONVOY ROMEO THREE—*CORRECTION*—CONVOY SIERRA ROMEO THREE—SHOULD ARRIVE—ONE SIX THREE ZERO LIMA—*OVER*

If the error is not discovered until the operator is some distance beyond it, he may make the correction at the end of the message. He must be careful to identify the exact position he is correcting.

EXAMPLE 2:

ADAM—*THIS IS* STRAWBOSS—*TIME* ZERO SIX THREE ZERO ZULU—*BREAK*—ARE YOU RIGGED FOR HEAVY WEATHER—*CORRECTION—TIME* ZERO SIX FOUR ZERO ZULU—*OVER*

Canceling a Message During Transmission

During the transmission of a message and prior to the transmission of the ending proword OVER or OUT, the message may be canceled by use of the proword DISREGARD THIS TRANSMISSION. (A message which has been completely transmitted can be canceled only by another message.)

EXAMPLE:

During the transmission of a message STRAWBOSS discovers he is giving it to the wrong station:

FOXFIRE—*THIS IS* STRAWBOSS—*ROUTINE—TIME* ZERO SIX ZERO TWO ZULU—COMMENCE UNLOADING AT DAWN SIXTEENTH—PROCEED—*DISREGARD THIS TRANSMISSION—OUT*

Do Not Answer

When it is imperative that called stations do not answer a transmission, the proword DO NOT ANSWER is transmitted immediately following the call. The complete transmission is sent twice.

EXAMPLE:

SKIDROW—*THIS IS* STRAWBOSS—*DO NOT ANSWER—OPERATIONAL IMMEDIATE—TIME* ONE SIX THREE ZERO ZULU—*BREAK*—NOVEMBER YANKEE DELTA PAPA—*I SAY AGAIN—SKIDROW—THIS IS* STRAWBOSS—*DO NOT ANSWER—OPERATIONAL IMMEDIATE—TIME* ONE SIX THREE ZERO ZULU—*BREAK*—NOVEMBER YANKEE DELTA PAPA—*OUT*

Verifications

When verification has been requested on a message, the originating station will verify with the originating person, check the cryptography (if the message is encrypted), and send the correct version.

EXAMPLE 1:

STRAWBOSS—*THIS IS* ADAM—*VERIFY* MESSAGE—*TIME* ONE ZERO ZERO EIGHT ZERO ONE ZULU—*ALL BEFORE* BREAK—*OVER*

STRAWBOSS transmits:

THIS IS STRAWBOSS—*ROGER—OUT*

STRAWBOSS, after checking with the originating officer, finds the heading correct as previously transmitted.

STRAWBOSS sends:

ADAM—*THIS IS* STRAWBOSS—*I VERIFY*—MESSAGE—*TIME* ONE ZERO ZERO EIGHT ZERO ONE ZULU—*ALL BEFORE* TEXT—ADAM *THIS IS* STRAWBOSS—*PRIORITY*—*TIME* ONE ZERO ZERO EIGHT ZERO ONE ZULU—*FROM*—STRAWBOSS—*TO*—ADAM—*INFO*—DITTYBAG—*GROUPS* ONE SEVEN—*BREAK*—*OVER*

ADAM transmits:

THIS IS ADAM—*ROGER*—*OUT*

EXAMPLE 2:

STRAWBOSS—*THIS IS* SATAN—*VERIFY* MESSAGE—*TIME* ZERO EIGHT FOUR FIVE ZULU—*WORD AFTER* PROCEED—*OVER*

STRAWBOSS transmits:

THIS IS STRAWBOSS—*ROGER*—*OUT*

STRAWBOSS, after checking with the originating officer, finds that he means HONG KONG instead of SHANGHAI as word after PROCEED.

STRAWBOSS transmits:

SATAN—*THIS IS* STRAWBOSS—*CORRECTION*—MESSAGE—*TIME* ZERO EIGHT FOUR FIVE ZULU—*WORD AFTER* PROCEED—HONG KONG—*OVER*

SATAN transmits:

THIS IS SATAN—*ROGER*—*OUT*

Prowords Read Back and Words Twice

Further checks on transmission accuracy can be had by using the prowords READ BACK and WORDS TWICE. You use READ BACK when you want your own message (or a portion of it) repeated back to you as received. Remember to identify the message or portion you want read back. Transmit the READ BACK proword immediately after the call.

EXAMPLE:

ADAM—*THIS IS* STRAWBOSS—*READ BACK* TEXT—*TIME* ONE SIX THREE ZERO ZULU—*BREAK*—CONVOY DELAYED ONE TWO HOURS—*OVER*

ADAM replies:

THIS IS ADAM—*I READ BACK* TEXT—CONVOY DELAYED ONE TWO HOURS—*OVER*

STRAWBOSS then sends:

THIS IS STRAWBOSS—*THAT IS CORRECT*—*OUT*

If a message is repeated back incorrectly, it may be corrected by use of the proword WRONG, followed by the corrected version. In the example above, let us assume that ADAM made a mistake when he read the message back:

THIS IS ADAM—*I READ BACK* TEXT—CONVOY DELAY TWO ONE HOURS—*OVER*

STRAWBOSS corrects ADAM:

THIS IS STRAWBOSS—*WRONG*—CONVOY DELAYED ONE TWO HOURS—*OVER*

ADAM reads back again:

THIS IS ADAM—CONVOY DELAYED ONE TWO HOURS—*OVER*

STRAWBOSS ends the exchange with:

THIS IS STRAWBOSS—*THAT IS CORRECT*—*OUT*

WORDS TWICE is the proword used when communication is difficult. First, the call signs are transmitted twice. Then phrases, words, or groups are spoken twice. Indicate your intention by transmitting WORDS TWICE after the call. Do not repeat the proword THIS IS.

EXAMPLE:

FOXFIRE—FOXFIRE—*THIS IS* STRAWBOSS—STRAWBOSS—*OVER*—*OVER*

FOXFIRE replies:

STRAWBOSS—STRAWBOSS—*THIS IS* FOXFIRE—FOXFIRE—*OVER*—*OVER*

STRAWBOSS sends his message:

FOXFIRE—FOXFIRE—*THIS IS* STRAWBOSS—STRAWBOSS—*WORDS TWICE*—*WORDS TWICE*—*ROUTINE*—*ROUTINE*—*TIME* ONE SIX THREE ZERO ZULU—*TIME* ONE SIX THREE ZERO ZULU—*BREAK*—*BREAK*—MAIL FOR YOU—MAIL FOR YOU—RECEIVE AT FIRST LIGHT—RECEIVE AT FIRST LIGHT—*OVER*—*OVER*

FOXFIRE receipts:

STRAWBOSS—STRAWBOSS—*THIS IS* FOXFIRE—FOXFIRE—*ROGER*—*ROGER*—*OUT*—*OUT*

Executive Method

The executive method is used to execute tactical signals so that two or more units can take action at the same time. The abbreviated form is generally used for such messages. Executive messages contain the proword EXECUTE TO FOLLOW or IMMEDIATE EXECUTE, as the case may be, immediately following the

call. The signal to carry out the purpot of the message is the proword EXECUTE. It may be sent shortly after transmission of the message (normal executive method) later (delayed executive method), or in case of urgency, as a part of the final instructions of the message itself (immediate executive method). In any case a warning STANDBY precedes the proword EXECUTE. In our first example the OTC sends a message to the task group by the normal executive method.

SKIDROW—*THIS IS* STRAWBOSS—*EXECUTE TO FOLLOW—BREAK*—COR-PEN THREE FIVE SEVEN—*OVER*

All ships reply in alphabetical order:

THIS IS ADAM—*ROGER—OUT*
THIS IS DITTYBAG—*ROGER—OUT*
THIS IS FOXFIRE—*ROGER—OUT*
THIS IS SATAN—*ROGER—OUT*

When STRAWBOSS is ready to execute, he sends the executive signal. To save time, only one station (ADAM) is to receipt.

SKIDROW—*THIS IS* STRAWBOSS—STAND-BY—*EXECUTE—BREAK*—ADAM—*OVER*

ADAM replies:

THIS IS ADAM—*ROGER—OUT*

A delayed executive method message is handled in exactly the same way as a normal executive method message except that, as a memory refresher, the text of the message is repeated just before STANDBY—EXECUTE is given. Assume that the foregoing message is sent by the delayed executive method. The message is transmitted and all stations receipt for it as before. But this time STRAWBOSS is not ready to execute until several minutes have elapsed. When ready he sends:

SKIDROW—*THIS IS* STRAWBOSS—COR-PEN THREE FIVE SEVEN—STAND-BY—*EXECUTE—BREAK*—ADAM—*OVER*

ADAM replies:

THIS IS ADAM—*ROGER—OUT*

In the immediate executive method the text of the message is transmitted twice, the two texts separated by I SAY AGAIN. The warning proword IMMEDIATE EXECUTE is used in the message instructions instead of EXECUTE TO FOLLOW. The executive signal itself follows in the final instructions of the message. Notice that because only one transmission is made, the immediate executive method message does not allow stations to obtain verifications, repetitions, acknowledgments, and cancellations before the message is executed.

EXAMPLE:

SKIDROW—*THIS IS* STRAWBOSS—*IMMEDIATE EXECUTE—BREAK*—TURN NINE—*I SAY AGAIN*—TURN NINE—STANDBY—*EXECUTE—BREAK*—SATAN—*OVER*

SATAN receipts:

THIS IS SATAN—*ROGER—OUT*

Acknowledgment

An acknowledgment is a reply from an addressee indicating that he has received a certain message, understands it, and can comply with it. Only the commanding officer, or his authorized representative, can authorize an acknowledgment.

The request for an acknowledgment is the word ACKNOWLEDGE (which is not a proword) as the final word of the text. The reply is the proword WILCO. If the commanding officer can acknowledge at once, the operator may receipt for the message with WILCO, since the meaning of ROGER is contained in WILCO. If the acknowledgment cannot be returned at the moment, the operator receipts for the message with ROGER, and WILCO is sent later. The return transmission to a request for an acknowledgment is either ROGER or WILCO; never use these prowords together.

In the following example the OTC sends a tactical signal. He desires acknowledgment from two ships.

SKIDROW—*THIS IS* STRAWBOSS—*EXECUTE TO FOLLOW—BREAK*—TANGO BRAVO—TACK—ONE FIVE—TACK—ZERO ZERO ZERO—TACK—ONE TWO—FOXFIRE—DITTYBAG—ACKNOWLEDGE—*OVER*

The commanding officer of FOXFIRE wishes to consider the message before acknowledging. His operator transmits:

THIS IS FOXFIRE—*ROGER—OUT*

The commanding officer of DITTYBAG heard the message, understood it, and can comply. He directs his operator to acknowledge:

THIS IS DITTYBAG—*WILCO—OUT*

When the commanding officer of FOXFIRE is ready to acknowledge, he has two choices of reply:

STRAWBOSS—*THIS IS* FOXFIRE—*WILCO* —YOUR LAST TRANSMISSION—*OUT*

or,

STRAWBOSS—*THIS IS* FOXFIRE—*WILCO* —YOUR *EXECUTE TO FOLLOW*— *BREAK*—TANGO BRAVO—TACK— ONE FIVE—TACK—ZERO ZERO ZERO—TACK—ONE TWO—*OUT*

When ready to execute, the OTC transmits:

SKIDROW— *THIS IS* STRAWBOSS— STANDBY—*EXECUTE*—ADAM—*OVER*

ADAM receipts as directed:

THIS IS ADAM—*ROGER*—*OUT*

Signal Strength and Readability

A station is understood to have good readability unless otherwise notified. Strength of signals and readability are not exchanged unless there is good reason for it.

The response to the question "How do you hear me?" is a short, concise report of actual reception, such as "Weak, but readable," "Strong, but distorted," "Loud and clear," and so on. Reports such as "Five by five," "Four by four," etc., must never be used to indicate quality and strength of reception.

EXAMPLES:

Ship (FOXFIRE) and plane (CATFISH ONE) establish communication:

FOXFIRE—*THIS IS* CATFISH ONE—HOW DO YOU HEAR ME—*OVER*

THIS IS FOXFIRE—LOUD AND CLEAR—*OVER*

Had FOXFIRE not received CATFISH ONE strongly, the following transmission might be sent:

THIS IS FOXFIRE—YOU ARE WEAK AND BARELY READABLE—*OVER*

THIS IS CATFISH ONE—*ROGER*—*OUT*

Later, further communication is desired. Conditions are good, so no exchange of strength and readability is needed.

FOXFIRE—*THIS IS* CATFISH ONE—*OVER*

THIS IS FOXFIRE—*OVER*

THIS IS CATFISH ONE—SECOND LEG COMPLETED—*OVER*

THIS IS FOXFIRE—ROGER—OUT

Relay

The proword RELAY used alone indicates that the station called is to relay the message to all addressees.

EXAMPLE:

FOXFIRE—*THIS IS* STRAWBOSS—*RELAY*

PRIORITY—*TIME* ZERO NINE ONE ZERO ZULU—*FROM*—STRAWBOSS—*TO*—ADAM—*BREAK*—REPORT NUMBER ROUNDS EXPENDED LAST RUN—*OVER*

After FOXFIRE receipts for the message, he relays it to the action addressee:

ADAM—*THIS IS* FOXFIRE—*PRIORITY*—*TIME*—ZERO NINE ONE ZERO ZULU —*FROM*—STRAWBOSS—TO—ADAM—*BREAK*—REPORT NUMBER ROUNDS EXPENDED LAST RUN—*OVER*

The proword RELAY TO, followed by an addressee, means that the station called is to relay the message to the station indicated. When more than one station is called, the call sign of the station to relay precedes the proword RELAY TO.

EXAMPLE:

DITTYBAG—SATAN—*THIS IS* STRAWBOSS—

SATAN—*RELAY TO* FOXFIRE—*MESSAGE FOLLOWS*—*ROUTINE*—*TIME* ZERO ONE TWO TWO ZULU—*FROM* —STRAWBOSS—*TO*—FOXFIRE—*INFO* —DITTYBAG-SATAN-*BREAK*-PROCEED ON MISSION ASSIGNED—*OVER*

SATAN receipts and relays as instructed:

FOXFIRE—*THIS IS* SATAN—*MESSAGE FOLLOWS*—*ROUTINE*—*TIME* ZERO ONE TWO TWO ZULU—*FROM*— STRAWBOSS—*TO*—FOXFIRE—*INFO*— DITTYBAG—SATAN—*BREAK*—PROCEED ON MISSION ASSIGNED—*OVER*

Occasionally it is necessary to relay by radiotelephone a message which is received by some other means of communication. In our final example NOLT (FOXFIRE) has received a radiotelegraph message from NAAT (STRAWBOSS) for relay to NRTK (DITTYBAG):

NOLT DE NAAT-T-P-241632Z-FM NAAT-TO NRTK GR3 $\overline{BT}$ RETURN TO BASE $\overline{BT}$ K

FOXFIRE places the message in radiotelephone form and relays:

DITTYBAG—*THIS IS* FOXFIRE—*MESSAGE FOLLOWS*—*PRIORITY*—*TIME* TWO FOUR ONE SIX THREE TWO ZULU—*FROM*—STRAWBOSS—*TO*—DITTYBAG—*GROUPS* THREE—*BREAK*—RETURN TO BASE—*OVER*

Setting Up a Net

The procedures described here are for use either when opening a net for the first time or when reopening a net that has been temporarily secured. In the next example STRAWBOSS opens a free net.

SKIDROW—*THIS IS* STRAWBOSS—*OVER*

SKIDROW answers in alphabetical order of stations:

STRAWBOSS—*THIS IS* ADAM—*OVER*
STRAWBOSS—*THIS IS* DITTYBAG—*OVER*
STRAWBOSS—*THIS IS* FOXFIRE—*OVER*
STRAWBOSS—*THIS IS* SATAN—*OVER*

STRAWBOSS then calls the net and informs all stations that their transmissions have been heard:

SKIDROW—*THIS IS* STRAWBOSS—*OUT*
(or proceeds with message)

If some station does not reply to a collective call within 5 seconds, the next station goes ahead and answers. The delinquent station then answers last, if able to do so. If the station is having some difficulty that makes it impossible to answer the call at all, the operator reports in to the net when he can. In the example above, assume FOXFIRE had equipment failure and could not answer. SATAN waits 5 seconds and answers as usual. When FOXFIRE is able to transmit, he calls STRAWBOSS:

STRAWBOSS—*THIS IS* FOXFIRE—REPORTING IN TO NET—*OVER*

STRAWBOSS (having no traffic for FOXFIRE) replies:

THIS IS STRAWBOSS—*ROGER*—*OUT*

In the next example, STRAWBOSS calls member stations and announces that the net is directed. He requests the precedence and addressees of traffic to be transmitted.

SKIDROW—*THIS IS* STRAWBOSS—*THIS IS* A DIRECTED NET—OF WHAT PRECEDENCE—AND FOR WHOM—ARE YOUR MESSAGES—*OVER*

SKIDROW answers up, each station indicating the traffic on hand:

STRAWBOSS—*THIS IS* ADAM—I HAVE ONE *OPERATIONAL IMMEDIATE* AND ONE *ROUTINE* FOR YOU—*OVER*
STRAWBOSS—*THIS IS* DITTYBAG—NO TRAFFIC—*OVER*
STRAWBOSS—*THIS IS* FOXFIRE—I HAVE ONE *PRIORITY* FOR DITTYBAG—*OVER*
STRAWBOSS—*THIS IS* SATAN—NO TRAFFIC—*OVER*

STRAWBOSS informs all stations that their transmissions have been heard, and commences to clear traffic in order of precedence:

SKIDROW—*THIS IS* STRAWBOSS—*ROGER*—ADAM—SEND YOUR *OPERATIONAL IMMEDIATE*—*OVER*

When ADAM has sent and obtained a receipt for his message, net control gives the station with next highest precedence message permission to transmit.

FOXFIRE—*THIS IS* STRAWBOSS—SEND YOUR *PRIORITY*—*OUT*

DITTYBAG, hearing the authorization, tells FOXFIRE to go ahead. This saves FOXFIRE the trouble of making a preliminary call.

THIS IS DITTYBAG—*OVER*

FOXFIRE goes ahead with his message at once:

DITTYBAG—*THIS IS* FOXFIRE—*MESSAGE FOLLOWS*—(etc.)

When STRAWBOSS hears the proword OUT that ends the exchange between DITTYBAG and FOXFIRE, he directs ADAM to send the ROUTINE that is still outstanding.

As operators are handed messages to be send out, they call net control and request permission to transmit. SATAN, for example, has a DEFERRED for ADAM:

STRAWBOSS—*THIS IS* SATAN—I HAVE ONE *DEFERRED* FOR ADAM—*OVER*

STRAWBOSS replies (assuming no other station wishes to send a message of higher precedence):

THIS IS STRAWBOSS—SEND YOUR MESSAGE—*OUT*

Whereupon SATAN sends his message. If, however, higher precedence traffic awaited transmission, STRAWBOSS would send:

THIS IS STRAWBOSS—*WAIT*—*OUT*

When traffic conditions permit, STRAWBOSS would call SATAN and give him permission to transmit:

SATAN—*THIS IS* STRAWBOSS—SEND YOUR *DEFERRED*—*OUT*

ADAM answers up to save a preliminary call, and SATAN clears his message.

AUTHENTICATION

Authentication is a security measure designed to protect a communication system against fraudulant transmission.

A radiotelephone message must be authenticated if there is any chance it might be of enemy origin. Be alert and be quick to be suspicious. You can sometimes (but not always) spot an enemy deceptive message by the operator's mistakes in procedure or in English grammer or pronunciation. One of the best informal authenticators is to be able to recognize the other operator's voice.

Whenever an authentication system is promulgated, accompanying instructions shall specify the method of use and transmission procedure for use. Procedures will vary slightly with the form of authentication and the means of communication employed.

CHAPTER 7

VISUAL SIGNALING

FACILITIES ABOARD SHIP

Signal Bridge

Relationship to Communication Center

Visual communications constitute an integral part of the over-all communication effort of the ship. As such, the signal bridge plays an important part in the effectiveness of communications as a function of command. A considerable portion of the administrative and operational communication traffic may be transmitted via visual means to provide more equitable distribution of the workload within the ship. The basic communication doctrine set forth in NWP 16 includes a statement to the effect that visual signaling is to be used for communications in preference to radio whenever practicable. This doctrinal concept is attributable to the facts that: (1) radio communication facilities are over-worked both in peace and war, and (2) radio transmissions are susceptible to enemy interception and direction finder search.

The communication center of a DD is known as main radio, radio I, or radio central. The signal bridge serves as an adjunct to the main communication station aboard ship, and copies of all messages received or sent by visual means are incorporated in the files of this station. A file of each incoming and outgoing visual message is also maintained by the signal bridge.

PHYSICAL LAYOUT

The signal bridge of all ships is located high in the ship to facilitate communication by the various visual means available. In our example, the DD 931 class destroyer, the signal bridge is physically located on the 02 level, on the after end of the bridge. (fig. 7-1).

Flag bags are installed on either side of the after end of the bridge, with halyards running to the yardarm. In this vicinity are appropriate means of communication with other stations within the ship, such as radio central, pilothouse, bridge, and CIC. Two 12-inch signal searchlights are mounted on either side of the signal bridge, and two additional 12-inch lights on the 03 level above the pilothouse. Normally, one will also find a signal shelter with some sort of desk facility for writing up visual messages, plus stowage for the various publications required. This shelter is usually covered so as to afford a measure of protection from weather. Message-passing tube facilities are provided between the signal bridge and radio central. A signal system is used at both ends to notify personnel that a message is being passed.

Pilothouse

The infrared (AN/SAT-2) transmitter control is located on the after bulkhead of the pilothouse. It is capable of energizing either of the two light communicating systems (infrared or blinker), but the two are interlocked so that, although they employ a common keying system, only one can operate at a time. This device prevents the possibility of simultaneous keying of both infrared and yardarm blinkers under blackout conditions.

The anchor and signal lights supply and control panel, also on the after bulkhead, has an ON or OFF control for power to the blinker lights. Inasmuch as this circuit is used for communications, however, the infrared transmitter control and the associated telegraph key circuit provide final control.

Anti-Air Warfare Station

The AAW station is located on the 03 level directly above the pilothouse. Two 12-inch signal searchlights are located on this level, one each on the port and starboard bulwarks. Operating controls for these devices are on the searchlights, themselves, but the ON-OFF power

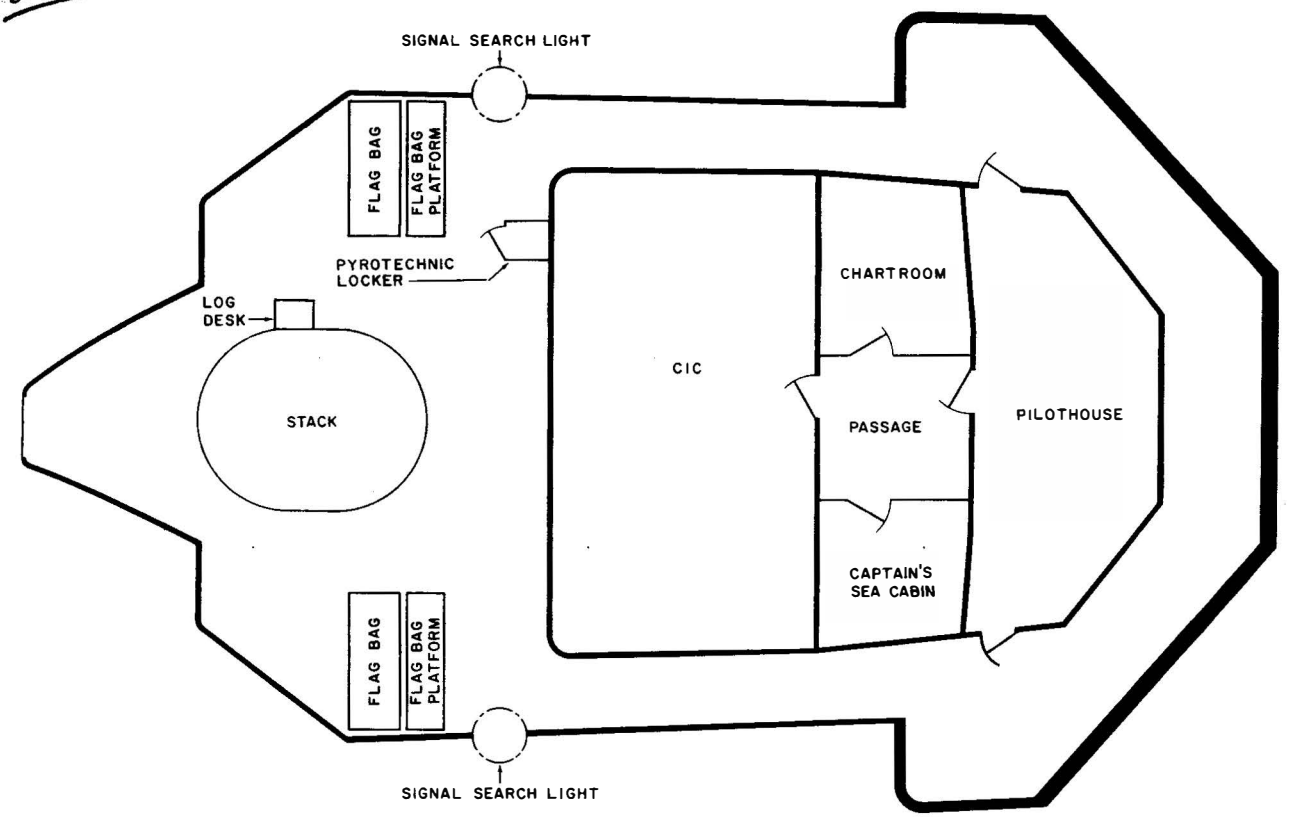


Figure 7-1.–Bridge area on DD 931 class destroyer.

switch is located on the bulkhead under the searchlight mounting bracket. Filters for the two searchlights normally are stowed in cabinets, one on each bulwark abaft the light.

Receptacles for the power supply to an infrared receiver are located one each on the port and starboard bulwarks, under the searchlight mounting brackets. Each receptacle is wired independently of the adjacent switch; the latter is for searchlight control only.

Each of the four 12-inch searchlights has a type H hood for infrared conversion stowed close by. Application of this hood provides a directed source of infrared radiation for possible limited use in station keeping and directional code or recognition communication.

Infrared Transmitters

Two T-438/SAT-2 infrared beacon transmitters, each beacon covering 180°, are mounted over the surface search radar antenna platform on the foremast, one on the port side and one on the starboard, for full 360° coverage. The two operating keys are installed on the 02 level, one each port and starboard, permanently mounted to the rail at each location.

Infrared Receivers

Six type AN/SAR-4 receivers, which require a cord connection with ship's power and four completely portable type C3 receivers are furnished for infrared reception. The former are electronic in design, whereas the latter operate on the principle of phosphor conversion of infrared rays to visible wavelengths and can be used when maximum range is not required.

THE SIGNAL FORCE

Every Man a Lookout

Every man standing watch on the bridge is required to be a lookout, as well as perform his other duties. This is particularly true of

the Signalmen on watch. They must be constantly vigilant and alert to note any ship or aircraft, objects in the water, and so forth, in addition to visual signals. As a matter of pride and smartness, it should be the objective of the signal bridge watch to be the first to see and report everything. It goes without saying that this must be true of any visual signal. Never let the situation develop where the officer of the deck has to call the signal gang on watch to attention.

Recognition

Recognition of ships and planes, both U.S. and foreign, is an important part of lookout duties. Every Signalman should also know merchant ship stack markings, flags of private steamship lines, and foreign ensigns—all this, in addition to ready recognition of combatant ships and aircraft.

Spotters

A good spotter on the signal bridge is invaluable for spotting flaghoist signals on the ship of the OTC. He may use the long glass, or he may use the "big eyes," which are oversize binoculars mounted on a swivel stand. When operating in company and performing tactical maneuvers by flaghoist, a spotter may be needed continuously, especially if the flagship of the OTC is some distance away.

Recorders

For each visual message received, a recorder is required to write it down as it is read by the man on the light. It is customary for Signalman strikers to perform the duties of the recorder. Figure 7-2 is a typical example of a rough filled-in message blank.

VISUAL MESSAGE

(NAAT DE H3)

HEADING -R- Ø82Ø3ØZ - FM H3 - TO NAAT GR1Ø BT

TUGS	AND	YARD	PILOT	WILL	(5)
MEET	YOU	Ø816ØØR	HOSPITAL	POINT	(10)
					(15)
					(20)
					(25)
					(30)
					(35)
					(40)
					(45)
					(50)

ORIGINATOR: PORT DIRECTOR, PORTSMOUTH VA. | DATE: 8 MAY 19

ACTION: USS SHILOH | SYSTEM: FL

TOR: 2Ø41Z | TOD:

INFORMATION: | OPER: KR | SUPR: WPW

XMT: | DTG Ø82Ø3ØZ

Figure 7-2.—Rough copy of visual message.

Procedure on Receipt of Tactical Signal

The normal procedure for carrying out tactical signals transmitted by flaghoist is as follows: The signal is called out by the spotter and the signal is repeated flag for flag at the dip, and recorded in the signal log. The signal officer or Signalman in charge refers to the signal book for the meaning. The signal bridge then reports to the OOD "Signal in the air, sir" followed by the signal and its meaning; this same information is also passed to CIC where the signal is again decoded. The CIC officer informs the OOD of the signal, meaning, and action required. This procedure serves as a doublecheck on the bridge as well as the signal bridge. The reply "Understood" from the OOD to the signal bridge serves as receipt to the signal bridge and as authority to acknowledge for the signal as understood at the appropriate time.

TYPES OF VISUAL COMMUNICATIONS

Flaghoist Signaling

General Terms

In flaghoist signaling, it is important that the signal officer understands general terms associated with hoisting signals. Some of these terms are:

HOIST: A hoist consists of the flags and pennants flown on a special halyard. On a destroyer type, for example, the basic requirements include ability to fly a 5-flag hoist on a single halyard.

DISPLAY: A complete signal, with two or more adjacent hoists flying at the same time.

CLOSE UP: A hoist is termed close up when the first flag in the hoist is flush against the block on the yardarm.

AT THE DIP: A hoist is at the dip (or dipped) when it is hoisted and stopped about two-thirds the way up to the yardarm.

HAULED DOWN: A hoist is said to be hauled down when it has been cleared from sight on the halyard.

Figure 7-3 illustrates two of the above definitions.

The parts of a signal flag are shown in figure 7-4.

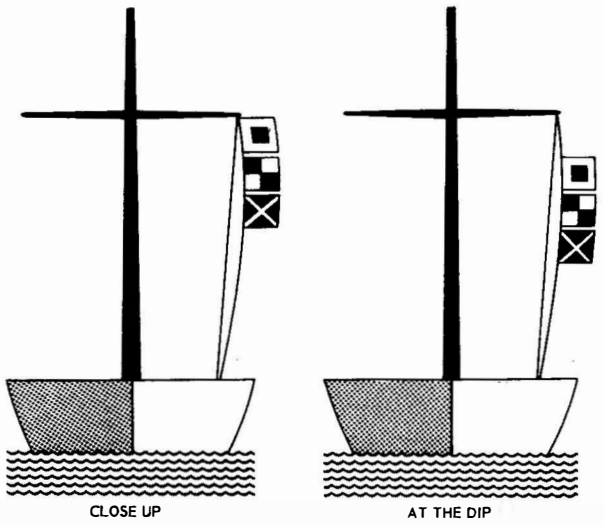


Figure 7-3.—Flaghoist close up and at the dip.

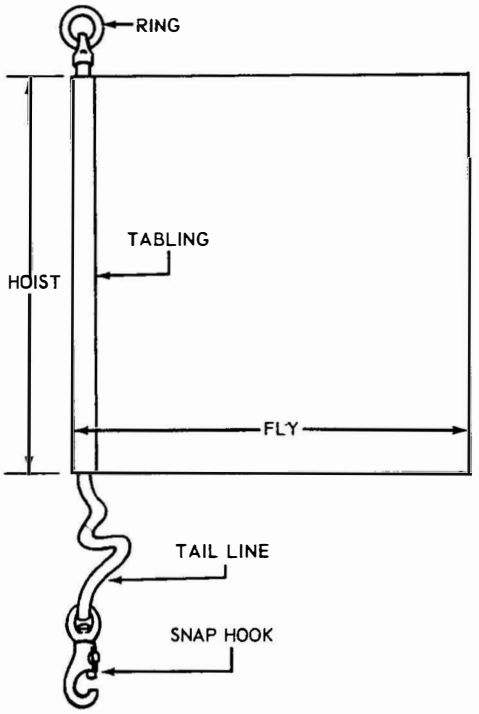


Figure 7-4.—Parts of a signal flag.

Tackline and Signal Flag

The TACKLINE (fig. 7-5), a 6-foot section of halyard with a snap hook on one end and a ring on the other.

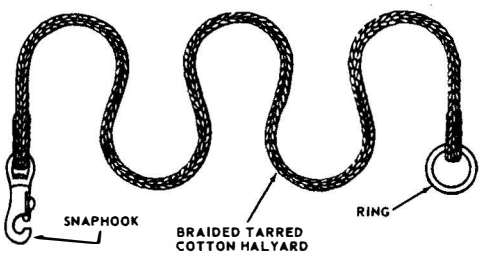


Figure 7-5.—Tackline.

The tackline, transmitted and spoken TACK, is used:

1. To avoid ambiguity. It separates signals or groups of numerals which, if not separated, could convey a different meaning from that intended.

2. When, for the needs of a particular signal, the instructions order that a tackline be used.

When there are more flags in a signal than can be made in a single hoist the signal should be broken into two or more hoists, the breaks being made where TACK would normally be inserted to avoid ambiguity.

Reading Flaghoists

The flags of a single hoist are read from top town. When a signal is too long to fit on the halyard—when, in other words, it requires more flags than can be made into a single hoist—the signal is continued on another halyard. In this event the hoists are read from top down and from outboard in, as shown in figure 7-6.

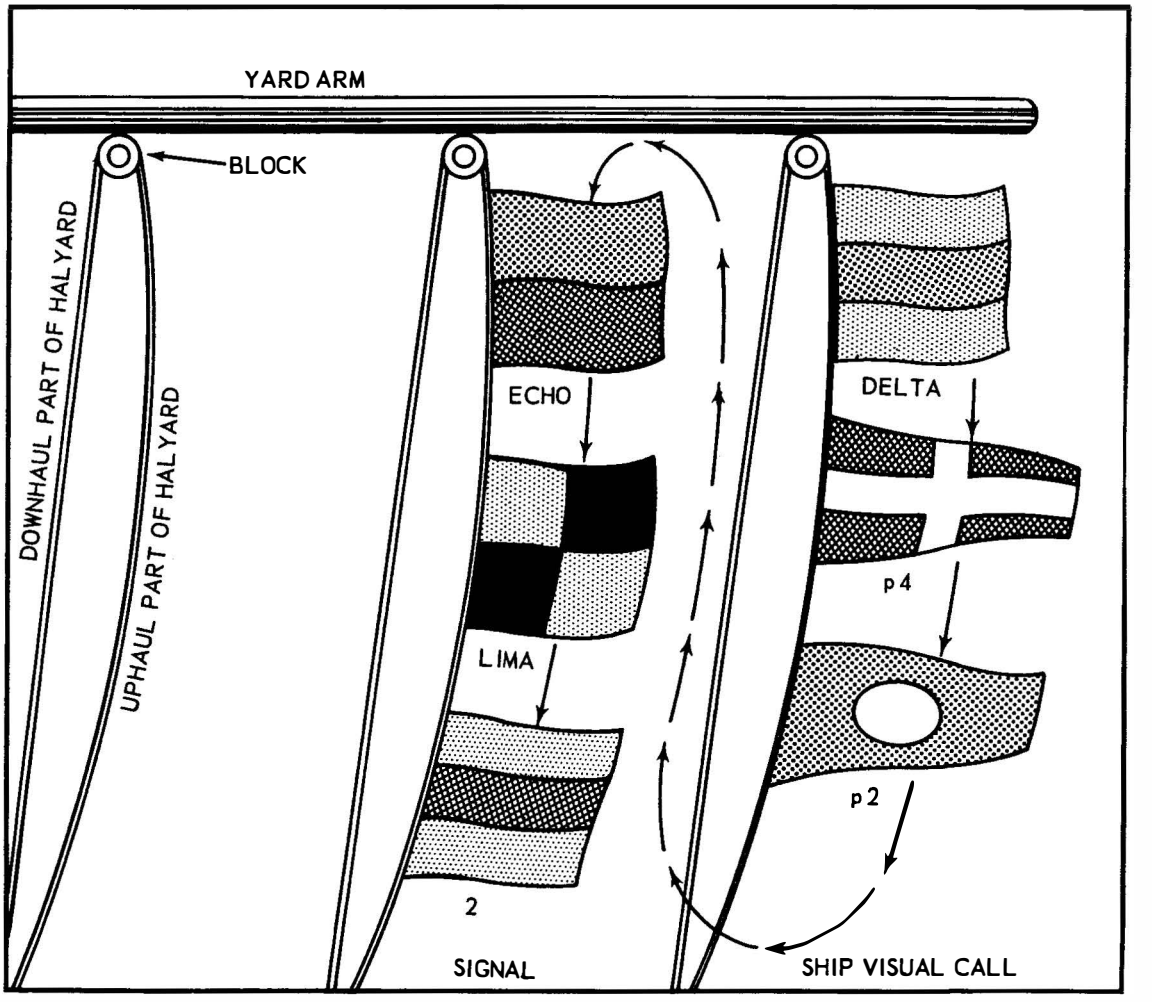


Figure 7-6.—How to read flaghoist. (Read down – outboard hoist first.)

A complete signal, whether on one hoist or on two or more adjacent hoists flying at the same time, is called a display. When displays of more han one hoist are raised, the separate hoists are run up one by one in the correct order. As a general rule, if a signal is too long to be shown completely on three halyards, two or more displays are made of the signal. The heading is kept flying on a separate halyard until the last hoist of the text is hauled down.

Flags may also be hoisted at the triatic stay, a line extending from the foremast aft to a stack or to another mast (fig. 7-7). Such signals are read from forward aft.

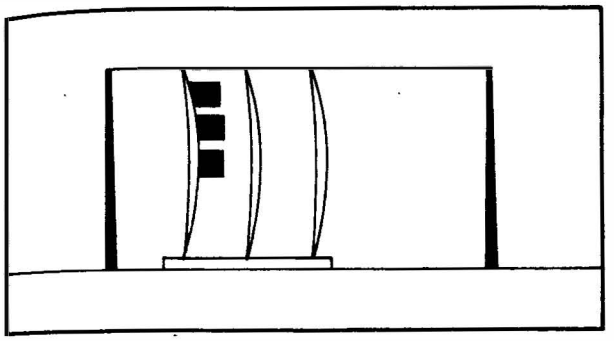


Figure 7-7.—The triatic stay.

Answering

In transmitting a flaghoist, flags initially are hoisted close up (on the ship originating the signal). Ships addressed acknowledge by hoisting the same signal at the dip, except that certain small ships may hoist the ANSWER pennant in lieu of the entire signal. ANS, under the call sign of the originator, may also be used. A flag officer or unit commander (or his administrative flagship) may answer a flaghoist signal addressed to him (or his administrative office) from a ship or unit junior to him by hoisting ANS at the dip, either alone or under the junior's call sign.

Execution

When the ship (or ships) addressed understands the signals, she hoists the signal close up (subject to the rule of visual responsibility). When a tactical signal is made close up, it means that the units concerned are ready to carry out the intent of he signal. Execution of the signal is completed when hauled down by the originator. The unit to whom the message has been addressed for action (or information) then follows the motions of the OTC by also executing (hauling down) the signal and simultaneously taking the required action in the form of tactical maneuvering (if such be the case). Exceptions to this general rule occur when (1) the signal specifies a time of execution, or execution on arrival at some specific location, and (2) an emergency signal is flown. In the latter case, the signal is executed by all addressees immediately when understood.

Responsibility

The responsibility of a ship for a flaghoist signal does not end when the signal has been acknowledged properly. Under the rule of visual responsibility, each addressee is responsible for delivery to addressees beyond herself in the same general direction away from the originator. To do this, the responsible ship may not hoist a signal close up (as understood) until she has determined that those of her sister ships for whom she is responsible also have received and understand the meaning of the signal. To illustrate: In a column formation, the ship ahead is responsible for the ship next astern. However, in first hoisting signals at the dip, and in executing signals, the rule of visual responsibility does not apply; ships act independently in these instances.

Note that flag signaling alone automatically provides for an acknowledgement of the signal by repeating back the tactical signals sent at sea.

When a ship is underway in a formation, flaghoist signaling is reserved primarily for transmitting collective address signals by the OTC, and is used only for sending noncollective address signals in the following instances:

1. Signals directly pertaining to current operation;
2. Reports requested by the OTC;
3. Emergency signals.

Canceling or Correcting a Signal

In flag signaling, the special pennant NEGAT as a separate hoist cancels all other signals

when hoisted on that yardarm. If more than one signal is flying and only one is to be canceled, that signal is repeated under NEGAT. Signals already executed cannot be canceled. In this instance, a new signal is required to meet the new situation.

RELAYING

Relay of visual messages is closely allied with visual responsibility. Signals are relayed by any ship in a position to help by so doing, and, whenever practicable, ships which repeat the OTC's flaghoist signals must do so on halyards corresponding to those of the OTC.

Relaying signals from the OTC is accomplished in the following manner:

1. Signals are relayed at the dip, then hoisted close up when the ships addressed have acknowledged.
2. The originator is not indicated.

Relay of signals from ships other than the OTC is as follows:

1. The originating ship hoists 1st SUBSTITUTE, followed by her call sign, then the call sign of the addressee, and the text. If the identity of the originator will be evident to all ships within visual communication range, 1st SUBSTITUTE, followed by originator's call sign, need not be hoisted.
2. The relaying ship hoists the signal flag for flag at the dip.

When signals from individual units to the OTC are relayed, the call sign of the OTC is considered understood and therefore is omitted.

When a maneuver alters the relative position of units and ships in a formation, visual responsibility for relaying signals does not change until all ships complete the maneuver. Such a rapidly changing situation requires initiative and alertness by each and every unit to ensure prompt and accurate dissemination of visual signals to all ships.

A ship having visual communication duty for a nest of ships in port is considered the communication guard for the nest insofar as visual communications are concerned.

ELEMENTS OF SMART FLAG SIGNALING

Following are some elements of smart flag signaling.

1. Speed and smoothness in hoisting signal and making it close up.
2. Accuracy in correctly repeating and interpreting flaghoist message.
3. Hauling down the display quickly and smoothly without losing it.
4. Use of clean, unfrayed, and untorn flags and pennants.

FLASHING LIGHT

There are two types of flashing light communication: directional and nondirectional.

Directional transmissions are sent by a signal searchlight or a multipurpose lamp pointed and trained directly at the receiving unit so it will be visible through a limited arc. Dots and dashes are made by opening and closing the shutter.

Directional flashing light is the longest range visual signaling method. In daylight, it is possible for a 24-inch carbon arc light to be read from a ship so far hull down that only the light itself can be seen. With the new 12-inch high-intensity signal searchlights, small ships are also able to achieve long-range flashing light communications. Flashing light communication is utilized primarily in peacetime. Normal practice in the Navy, even during peacetime operations, is to use colored filters or infrared equipment for night signaling.

Nondirectional signals are transmitted by yardarm blinker, two small white lights mounted near the outer extremities of the yardarm. On a destroyer-type vessel, these lights usually are actuated by a telegraph key mounted on the bridge wing. This type of light communication has a 360° arc of visibility, affording an effective way to communicate simultaneously with several addressees. Although it occasionally is used underway in company, and only at night, most frequent usage is in port, where administrative traffic addressed to all ships is sent via yardarm blinker.

Executive Method

The executive method is used when it is desired to execute a signal at a certain instant in order to ensure that two or more units take action at the same moment. While the executive method usually is associated only with signals from *Allied Naval Signal Book*, it also may be used for certain other types of messages, synchronization of clocks, for example.

Only abbreviated messages may be used with the executive method. Normally these messages do not include date-time group.

Two types of executive method communications are authorized: IMMEDIATE and DELAYED. In the immediate executive method, the executive signal is made in the ending of the ORIGINAL message. Receiving stations are unable to receipt before the message is executed. In the delayed method, stations receipt for the message when received, and the executive signal is made at a later transmission.

All executive messages carry the prosign $\overline{IX}$ immediately before the first $\overline{BT}$. The executive signal is $\overline{IX}$ followed by a 5-second dash. The $\overline{IX}$ may be repeated a few times while the operator is awaiting the command to send the 5-second dash. Receiving stations repeat the dash as soon as they see it. The end of the dash is the instant of execution.

The immediate executive method is used with directional light only when one ship is addressed. For transmission to more than one ship, the delayed executive method with nondirectional light is used.

Here is an example of the delayed executive method, directional procedure:

NAAT transmits	NRTK transmits
NRTK DE NAAT.	K
$\overline{IX}$	flash
$\overline{BT}$.	flash
TURN.	flash
FOUR.	flash
$\overline{BT}$.	flash
K.	flash
(A pause until NAAT gives the order to execute.)	
NRTK NRTK	K
$\overline{IX}$ (May be repeated a few times simultaneously.)	
(5-second dash) .	(simultaneously)
(5-second dash) .	flash

If the message is sent by the immediate executive method, NAAT would transmit: NRTK DE NAAT $\overline{IX}$ $\overline{BT}$ TURN FOUR $\overline{IMI}$ TURN FOUR $\overline{BT}$ $\overline{IX}$ (5-sec. dash) $\overline{AR}$.

The following is an example of the immediate executive method, nondirectional procedure. Notice that the text is made twice through, separated by $\overline{IMI}$.

OTC transmits	Repeating station (s) (if any) transmit	Receiving stations transmit
ALL ALL (etc.) .	ALL ALL (etc.) .	K's until all are answering.
$\overline{IX}$	$\overline{IX}$	
$\overline{BT}$.	$\overline{BT}$.	
TURN NINE TACK.	TURN NINE TACK.	
SPEED ONE SIX.	SPEED ONE SIX.	
$\overline{IMI}$	$\overline{IMI}$.	
TURN NINE TACK.	TURN NINE TACK.	
SPEED ONE SIX.	SPEED ONE SIX.	
$\overline{BT}$.	$\overline{BT}$.	
$\overline{IX}$ ($\overline{IX}$) ($\overline{IX}$)	$\overline{IX}$ ($\overline{IX}$) ($\overline{IX}$)	
(5-sec. dash) . . .	(5-sec. dash) . . .	
K.	K.	
		RRRR

Special Procedures

No Response Procedures

The prosign F, transmitted four times before a call and repeated as necessary, indicates that the station addressed is not to answer the call nor receipt for the message. Transmission is then made twice. If the message is plaindress or codress, the prosign F is also included in the transmission instructions.

EXAMPLE:

NBGE transmits a no response, plaindress message to NBRF.

FFFF FFFF NBRF DE NBGE -F-R-122356Z GR7 $\overline{BT}$

PROCEED TO RENDEZVOUS X SOA 27 AUTHORIZED $\overline{BT}$ $\overline{IMI}$.

(The message is repeated except for $\overline{AR}$ vice $\overline{IMI}$ at the end.)

Double-Flash Procedure

Double-flash procedure is for use at anchor when a recorder is not available. A ship called desiring to use this procedure transmits the appropriate operating signal (ZJJ). In this procedure, the first flash indicates receipt of a word or group; the second flash indicates that the word or group is recorded and that the receiving station is ready to receive the next word or group.

Steady Dim Light

The special abbreviation OL is used to tell the receiving ship or unit to show a steady dim light. If a station is obviously having difficulty keeping its light trained properly, the receiving ship or unit may be directed to show a steady dim light as a training mark. Flashes to indicate receipt must, of course, be brighter, or a second light used.

Infrared

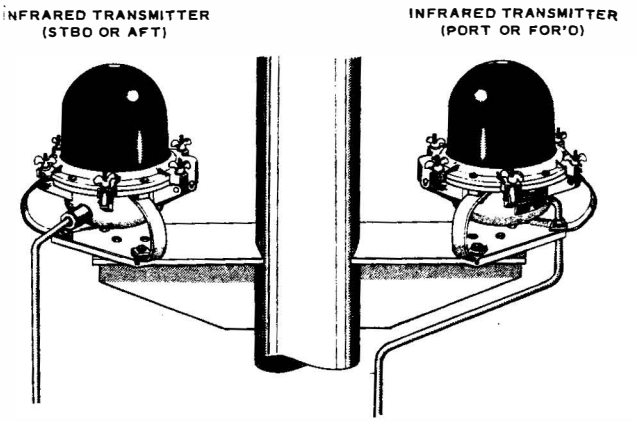
One of the principal characteristics of infrared is its security advantages. The fact that this particular equipment can be made highly directional makes it safe and difficult to jam. Infrared, like light, trends in straight lines, and its rays are only slightly bent by refraction as it passes through the atmosphere. This desirable characteristic, however, also imposes a range limitation to the horizon.

Infrared is absorbed by the atmosphere. Rain, snow, haze, and fog impose limitations as they do in the visible region of the spectrum. Infrared will usually penetrate artificial smokescreens and some kinds of fog, however. Although primarily restricted to night operations, infrared can be used also during daylight, provided the visible region of the spectrum is excluded.

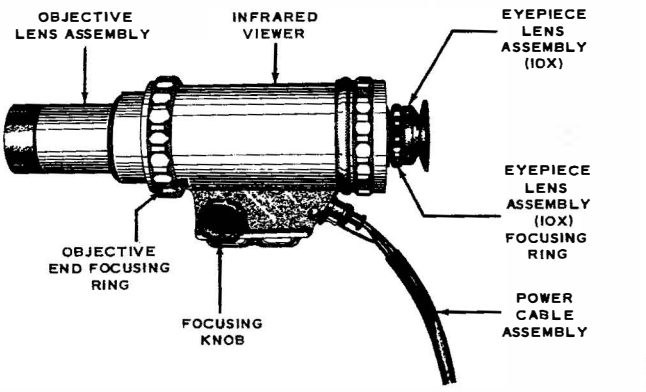
Figure 7-8 illustrates infrared equipment presently installed aboard many Navy ships.

Infrared communication takes two basic forms: directional and nondirectional.

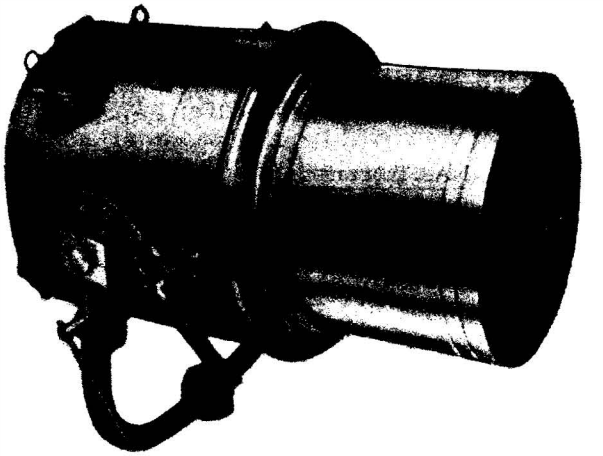
Directional uses the standard signal searchlights with filters, or special purpose equipment. At a predetermined time, or when alerted by the designated code word via radiotelephone, ships having traffic turn on the point-of-train (POT)



A INFRARED TRANSMITTERS



B INFRARED VIEWER



C TYPE H HOOD ON 12 INCH SEARCHLIGHT

Figure 7-8.—Infrared signaling equipment.

light, locate the ships for whom responsible or with whom they wish to communicate, and clear their messages via directional infrared searchlights, using the directional precedure. (The point-of-train light is a steady infrared light that assists the sender in locating the receiving station and in keeping his light properly trained. It is turned on only to indicate that a station is communicating, or is ready to communicate with infrared equipment.)

Nondirectional uses a large infrared yardarm blinker, with nondirectional flashing light procedure. This procedure is principally for multiple-address messages.

Security, of course, is of great importance in communications, particularly during wartime. Security is the primary asset of infrared. NWIP 16-1 states that the relative security of infrared communication system has the highest priority for night communications. Instructions regarding use of this equipment are contained in ACP 129 and also in DNC 5.

Definite periods are usually established for transmitting and receiving communication traffic via infrared. At other times, units will be alerted by a code word transmitted over voice radio. The officer in tactical command normally controls use of infrared communication including guardship assignments. Visual responsibility is similar to that for other means of visual communication.

SEMAPHORE

Another adjunct of visual communications is the use of semaphore flags. The two hand flags used in this process are about 15 to 18 inches square, attached to staffs about 22 inches long, and resemble the naval signal flag OSCAR.

A call by semaphore is made by transmitting the call sign of the ship or unit called, or by making the attention sign. It may be answered either by transmitting the answering sign by semaphore, or the prosign K by flashing light. The call for a semaphore message may be by flashing light. In such a case, it is answered by flashing light. When answered, the transmitting ship or unit then uses the abbreviation SEM to indicate that a semaphore transmission will follow. Prosigns and operating signals are used in semaphore but are signaled as groups.

To call by flaghoist, a ship or unit hoists the call of the addressee(s) above the JULIETT flag, whose meaning when flown close up is "Have a semaphore message to transmit." To call all ships and stations within visual range, JULIETT is hoisted singly. Ships in company (or other units within visual range) hoist the call of the transmitting station above ANSWER at the dip when the above signal is seen. This call is then made close up when ready to receive the message.

Several special characters, are used in connection with semaphore:

1. ANSWERING SIGN is used as an answer to a call. If necessary, the answering sign may be preceded by a call sign to denote the station answered.
2. ATTENTION SIGN is used as a preliminary call by semaphore and to establish communications.
3. DIRECTION SIGN is used after the attention sign to indicate the direction of transmission.
4. FRONT SIGN is used before and after each prosign, operating signal, word, and code group.
5. NUMERAL SIGN is used before and after each group of numerals or group of mixed letters and numerals in the text which are to be recorded and counted as a single group consisting of letters and digits.
6. SEPARATIVE SIGN is a special character. It is made by sending the character II as one group.
7. EXECUTIVE SIGNAL is a special character in semaphore, made by transmitting IX AR.

The semaphore alphabet and some of the special characters are shown in figure 7-9.

Other special semaphore procedure includes the MOVE SIGNS used by a receiving station to direct the sender to move to a better sending position. These four, 2-letter groups are: MD, meaning move down; ML, move to your left as you face me; MR, move to your right as you face me; and MU, move up. When the new fluorescent flags are used, background is not too important, but with the old type cotton flags a good background is essential.

When the ship or unit transmitting has completed sending the message, the receiving ship receipts (after obtaining any repetitions required). Receipt for a semaphore message is

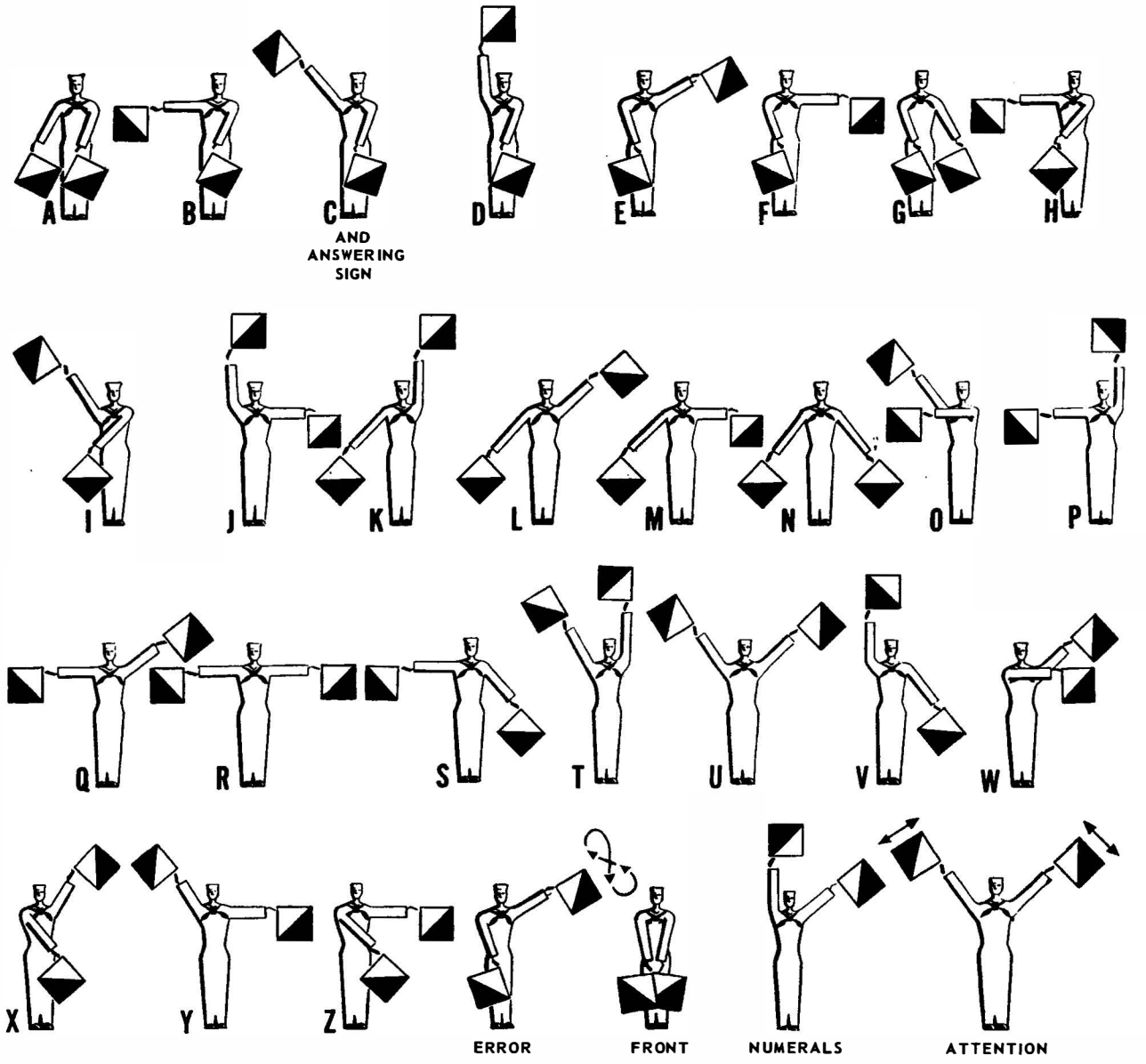
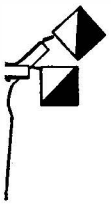
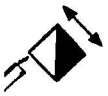


Figure 7-9.—Semaphore alphabet.

given by either (1) the prosign R by semaphore or flashing light, or (2) hauling down the answering hoist.

Semaphore is much faster than flashing light for short-distance transmissions in daylight and may be used to send messages to several addressees at the same time provided that they are in suitable position. Because of its speed, semaphore is better adapted for sending long messages. Often the OTC will send administrative traffic by this means when steaming in company at sea. Despite the fact that its usefulness is somewhat limited by its short range, it is even more secure than light or radio. When radio silence is imposed, semaphore is best for handling administrative traffic. Increasing awareness, in the Navy today, of the fact that electronic silence most probably will be imposed during wartime operations, has led to a sort of revival of semaphore. Actually, its importance never lessened; rather, it had been overlooked





in the face of many new developments in radio equipment.

DNC 5 and ACP 129 delineate the procedures to be followed in the use of semaphore.

USE OF KEY PUBLICATIONS

The Allied Naval Signal Book

Perhaps the most widely used publication for tactical communications in the Navy is the *Allied Naval Signal Book*, ACP 172(A). This publication is kept on the signal bridge, as well as on the bridge, in CIC, and in main radio. It is necessary that the signal officer be familiar with the book. All signals in ACP 175(A) are based on the standard set of signal flags (fig. 7-10) which are used in the U.S. Navy and allied navies. However, radiotelephone transmission of tactical maneuvering signals from ACP 175(A) may be employed when flaghoist will not suffice. In this case, the spoken version of the alphabetical and numerical flags and pennants is used. Figures 7-10 and 7-11 illustrate the spoken phonetic version of the various flags and pennants included in ACP 175(A).

The USN Addendum to ACP 175(A) provides additional basic material that supplements and/or modifies the basic publication for use by the U.S. Navy when operating separately from allied navies. To prevent confusion between the basic publication and the addendum, the latter is printed on colored pages.

ACP 129

Visual signaling procedure is contained in *ACP 129, Communication Instructions Visual Signaling Procedure.* Subjects discussed in the text include message forms, operating signals and prosigns, visual procedure, group count, identifications, corrections, verifications and cancellations, visual responsibility, flashing light, semaphore, flaghoist, and infrared communication.

The visual procedure prescribed in ACP 129 is followed in all transmissions in military visual communications. When messages in commercial form are handled by military systems, this procedure is employed in calling and routing instructions. In communicating with other than military ships or stations, international procedure prescribed in H.O. 87 is used.

Groups from H.O. 87, Volume I, may supplement groups from ACP 175 if military procedure is followed. When international code is used, remember that for (1) flaghoist signaling, the CODE pennant preceding a signal indicates that the group is taken from H.O. 87, Volume I; and (2) flashing light or semaphore signaling, the code group PRB indicates that groups following are taken from H.O. 87, Volume I.

DNC 27

U.S. Naval Flags and Pennants (DNC 27) is a source of information on most matters pertaining to flags and pennants. It describes those used by the Navy, and includes a discussion of the customs and formalities to be observed in their use. Emphasis is placed on the ceremonial aspects of flag display.

H.O. 87

The Hydrographic Office, Department of the Navy, publishes a volume entitled *International Code of Signals* (H.O. 87). Volume I, *Visual and Sound Signaling*, is, in effect, the visual signal book of the international merchant marine. In other words, it is to the merchant marine what ACP 175 is to the Navy.

Signals contained in H. O. 87 are set up on a multilingual basis (English, French, German, Italian, Japanese, Spanish, and Norwegian) to facilitate communications among merchant marine vessels.

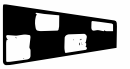
When a naval vessel wishes to communicate with a merchant marine vessel, she is required to display the CODE pennant in a conspicuous place and keep it flying during the entire exchange of communications.

Groups from the *International Code of Signals* may be used alone in military communications, utilizing either international or military procedure. Military procedure is indicated by call signs other than international signal letters, e.g., visual call signs, address groups, etc. When international signal groups are used with military procedure, the signal CODE TACK or PRB TACK, as appropriate, indicates that all groups following are taken from H.O. 87.

FLAG and NAME	Spoken	Written	FLAG and NAME	Spoken	Written	FLAG and NAME	Spoken	Written
 A	ALFA	A	 M	MIKE	M	 Y	YANKEE	Y
 B	BRAVO	B	 N	NOVEMBER	N	 Z	ZULU	Z
 C	CHARLIE	C	 O	OSCAR	O	 1	ONE	1
 D	DELTA	D	 P	PAPA	P	 2	TWO	2
 E	ECHO	E	 Q	QUEBEC	Q	 3	THREE	3
 F	FOXTROT	F	 R	ROMEO	R	 4	FOUR	4
 G	GOLF	G	 S	SIERRA	S	 5	FIVE	5
 H	HOTEL	H	 T	TANGO	T	 6	SIX	6
 I	INDIA	I	 U	UNIFORM	U	 7	SEVEN	7
 J	JULIETT	J	 V	VICTOR	V	 8	EIGHT	8
 K	KILO	K	 W	WHISKEY	W	 9	NINE	9
 L	LIMA	L	 X	XRAY	X	 Ø	ZERO	Ø

Figure 7-10.—Alphabetical and numerical flags.

PENNANT and NAME	Spoken	Written
 1	PENNANT ONE	p1
 2	PENNANT TWO	p2
 3	PENNANT THREE	p3
 4	PENNANT FOUR	p4
 5	PENNANT FIVE	p5
 6	PENNANT SIX	p6
 7	PENNANT SEVEN	p7
 8	PENNANT EIGHT	p8
 9	PENNANT NINE	p9
 Ø	PENNANT ZERO	pØ

PENNANT or FLAG	Spoken	Written	PENNANT or FLAG	Spoken	Written
 CODE or ANSWER	CODE or ANSWER	CODE or ANS	 NEGATIVE	NEGAT	NEGAT
 BLACK PENNANT	BLACK PENNANT	BLACK	 PREPARATIVE	PREP	PREP
 CORPEN	CORPEN	CORPEN	 PORT	PORT	PORT
 DESIG-NATION	DESIG	DESIG	 SPEED	SPEED	SPEED
 DIVISION	DIV	DIV	 SQUADRON	SQUAD	SQUAD
 EMERGENCY	EMERGENCY	EMERG	 STARBOARD	STARBOARD	STBD
 FLOTILLA	FLOT	FLOT	 STATION	STATION	STATION
 FORMATION	FORMATION	FORM	 SUBDIVISION	SUBDIV	SUBDIV
 INTER-ROGATIVE	INTER-ROGATIVE	INT	 TURN	TURN	TURN

SUBSTITUTES

 1st. SUBSTITUTE	FIRST SUB	1st.	 3rd. SUBSTITUTE	THIRD SUB	3rd.
 2nd. SUBSTITUTE	SECOND SUB	2nd.	 4th. SUBSTITUTE	FOURTH SUB	4th.

Figure 7-11.—Numeral pennants and special flags and pennants.

ACP 131

Communication Instructions Operating Signals (ACP 131) is in unclassified allied communication publication containing 3-letter operating signals commonly called the "Q" and "Z" codes. The book is divided into two main sections: decode, consisting of the 3-letter groups; and encode, consisting of meanings under subject headings. Operating signals are discussed in chapter 3.

VISUAL CALL SIGNS, ADDRESS GROUPS AND PROSIGNS

Uses of Visual Call Signs

ACP 118, an unclassified, nonregistered publication, contains information on visual call signs and address groups.

For transmitting groups from authorized signal books, visual call signs, contained in ACP 118, are used to—

1. Address ships, units, or commands (precede the signal).
2. Complete, amplify, or vary the meaning of a signal (used in conjunction with the signal).
3. Denote or indicate ships, units, or commands (follow the signal).

In addition to the call signs in ACP 118, the following call signs are authorized for use in visual communications:

1. Radio call signs (except radiotelephone).
2. International call signs.
3. Tactical call signs.
4. Collective call signs.
5. Indefinite call signs.
6. Task organization call signs.

Transmission

In constructing visual calls to be transmitted by flaghoist, numerals are expressed by numeral pennants (except when numeral flags are specifically indicated—special task organization call signs, for example). Numerals appearing in visual call signs are written as p1, p2, (pennant 1, pennant 2), and so forth.

When using visual communications other than flaghoist, call signs are transmitted by international Morse code or semaphore equivalents. Call signs (except radiotelephone call signs) used in the text of signals are preceded by the prosign $\overline{\text{PT}}$, transmitted as a Morse symbol, meaning "Call sign follows." When more than one such call sign is included in the text, each is preceded by this prosign.

EXAMPLE:

Cruiser with Hull number 123 is transmitted as . . . . . $\overline{\text{PT}}$ C123.

Type Indicator Assignments

Abbreviated call signs are constructed for U.S. Navy use in visual communications. These call signs consist of single-letter type indicators (according to vessel type), plus numeral pennants to identify all or part of the assigned hull number. (Note that the U.S. Naval Vessel Classifications in the USN Addendum to ACP 118 are not in all cases identical to those listed on page 2-6 of this ACP.) The following type indicators are used by the U.S. Navy for U.S. and allied visual communications:

A - Auxiliary type
B - Battleship type
C - Cruiser type
D - Destroyer type
L - Amphibious type
M - Mine warfare type
P - Patrol type
R - Aircraft carrier type
S - Submarine type
Y - Service craft type

To illustrate, the USS *Albany* (CA 123) would have the visual (flaghoist) call sign CHARLIE p1p2p3.

In utilizing these type indicators, plus the hull number of the particular vessel called, certain digits of the hull number may be omitted if the addressee is unmistakable. Thus, the screen commander addressing a flaghoist to a destroyer, hull number 765, may shorten the call sign to Dp6p5 provided no other destroyer in the screen has the same last two numbers in her hull number. Similarly, Dp5 may be used if no confusion will result.

International Call Signs

International call signs identify individual ships or shore radio stations and are assigned in accordance with international agreement. All U.S. Navy ship call signs begin with the letter

N and always are 4-letter groups. When used in visual signaling, international call signs are then referred to as signal letters. For more detailed information, see ACP 113 and ACP 147.

EXAMPLE:

USS *Albany* (CA 123). . .International call. . .NHRF.

Unit Indicator Call Signs

Call signs for organized naval units are constructed as follows:

Unit indicator		Meaning
SUBDIV, DIV, SQUAD, FLOT	. . . . . This	Subdivision, Division, Squadron, Flotilla

EXAMPLE:

Type indicator. . . . . D (for destroyer)
plus
Unit indicator . . . . . SQUAD
plus
Numeral pennant . . . p8
Equals. . . . . D SQUAD p8
Meaning. . . . . Destroyer Squadron 8

To call individual units under a command, the unit indicator, followed by pØ (pennant zero), may be used.

Unit indicator	Pennant	Meaning	
SUBDIV, DIV, SQUAD, FLOT	. . Ø . . Each	Subdivision, Division, Squadron, Flotilla	Individually under my command

EXAMPLE:

(DIV pØ . . .) Each division individually under my command.

Other publications provide address groups for division, squadron, and flotilla organizations. These particular address groups are used when LST Division 11 and LSU Division 11, both with visual call sign L DIV p1p1, are operating within visual communication range of each other.

To form the visual call sign of the commander of an organized flotilla, squadron, division, or subdivision of ships, the unit indicator is followed by the type indicator.

EXAMPLE:

SQUAD D. . . . . Commander this Destroyer Squadron.
DIV D p2p2. . . . Commander Destroyer Division 22.

When, however, single-letter type indicators precede the unit indicator, the meaning of the above signal is changed as follows:

D DIV p2p2. . . . . Destroyer Division 22.

Numeral Pennant Call Signs

Numeral pennant call signs may be used alone or followed by the type indicator and/or unit indicator. To form commander visual call signs, collective visual call signs are preceded by pØ. The collective visual call sign of the command includes the commander thereof and all subordinate commanders therein. Following is a partial list of numeral pennant call signs from ACP 118. That publication should be consulted to obtain detailed information on other call signs.

Call sign	Meaning
pØpØ	Commanders under my command
pØp1	Officer in tactical command
p1	All ships under my tactical command
p2	All ships
p3	Main body
p4	This line
p5	Screen
p6	This task force
p7	This task group
p8	This task unit
p9	This task element
p1p1	All task group commanders
p1p2	All task unit commanders

EXAMPLES:

All destroyers under my tactical command p1D
Division commanders under my command . . . . . pØpØDIV
Commander screen pØp5

Single-letter type indicators may be used following the numeral pennant call signs.

EXAMPLE:

p2D. . . . . All destroyers.

Special Task Organization Call Signs (Flaghoist Only)

The visual call signs given in ACP 118 may be used in flaghoist communications as short call signs within a given task organization. These short call signs always begin with a numeral flag, followed by numeral pennant(s) which indicate the number of the task organization. Type indicators may follow the call sign. The table of task organization visual call signs listed in ACP 118 follows.

Call sign (Numeral flag)	Meaning
Ø	Commander Task Force No. _____
1	*Commander Task Group No. _____
2	*Commander Task Unit No. _____
3	*Commander Task Element No. ___
4	
5	
6	Task Force No. _____
7	*Task Group No. _____
8	*Task Unit No. _____
9	*Task Element No. ___

*Within own task organization.

EXAMPLES:

(Flag)6p4p5. . . . . Task Force 45.

(Flag)Øp4p5. . . . . Commander Task Force 45.

Single-letter type indicators may follow the special task organization numeral flag call signs. To illustrate:

(Flag)6p4p5D (Destroyers of Task Force 45).

Visual Call Signs for Signal Stations, Ship's Boats, and Merchant Convoys

Visual call signs for Government, shore, and military signal stations, as well as boat call assignments, are found in ACP 118. Convoy visual call signs are found in ACP 148.

Tactical Call Signs

Tactical call signs are constructed from letter-numeral combinations to form a 4-letter-numeral group. All task organizations are assigned tactical call signs contained in ACP 112 while other tactical organizations are assigned call signs from ACP 110 series. This type of call sign may be a letter-number, number-letter, or any other 4-unit combination thereof. By way of illustration, TF 88 may be assigned a collective call J5NX, while the commander call might be C319.

Address Groups

An address group is a 4-letter group assigned to represent a command, authority, activity, or unit. You will remember from chapter 3 that there are four categories: collective address groups, conjunctive address groups, geographic address groups, and address indicating groups.

To illustrate use of address groups, assume that USS *Turner Joy* (DD 951), with COMDESRON 28 embarked, is participating in a training exercise. The communication annex to the operation order includes appendixes listing task organization call signs, ship calls signs, and administrative call signs.

In the discussion on tactical call signs, we depicted the collective and commander call signs for the task organization set up with CTF 88 as the OTC. From the appendix listing ships' call signs appears this information:

Ship — *Turner Joy*

Hull number — DD 951

Radiotelegraph — NENB

Radiotelephone — BALL ROOM

The appendix entitled "Admin Call Signs" contains the following additional data:

ADMIN COMMAND — DESRON 28

	Radiotelegraph	Radiotelephone
Collective	ASAP	GUYS
Commander	SPUD	DOLL

In this example we demonstrated the ship's international call (described as signal letters when used visually), plus the collective address group for a naval commander, showing that he has both a commander and a collective address group call.

Special Prosigns for Visual Procedure

The prosigns you learned in chapter 3 and 6 are used also in visual communications.

Certain special prosigns are established for use only in visual communications:

D—Reduce brilliancy or use smaller light. This prosign is restricted to flashing light procedure when the situation requires that a transmitting operator be informed that his light is too bright or too large.

L—Relay or Relayed. Used only in flashing light and semaphore procedures.

NEGATIVE—Exempted addressee. The NEGATIVE pennant in flaghoist signaling is the equivalent of prosign XMT.

WHISKEY—(1) In flaghoist procedure flag W means that addressee following this letter is information addressee.
(2) In flashing light procedure the prosign W means "Your light is unreadable."

CHAPTER 8

THE DIVISION OFFICER

In combatant ships, the requirements for battle shall be the basis for the organization of the ship. The capabilities of individuals to perform the duties required in battle shall, to the extent practicable, be the primary consideration in their assignments within the organization. . . .He (the division officer) shall maintain a corrected copy of the watch, quarter, and station bill and other bills and orders for his division and shall insure that pertinent parts thereof are kept posted where they will be accessible to his subordinates.—*U.S. Navy Regulations, 1948.*

This chapter is concerned with organization. We are assuming throughout that the OC division officer, the communication officer, and the signal officer are one and the same.

In taking over new duties or in trying to find ways of improving efficiency of operation, the communication officer should learn all that he can about the organization of his division, the department, and the ship. This thorough knowledge of organization is basic to taking charge, and, as communication officer of a ship, you will be expected to do just that.

Guide for Ship Organization

The guide for shipboard organization in the U.S. Navy is NWP 50, *Shipboard Procedures.* NWIP 50-1, *Battle Control,* is a supplementary publication to NWP 50 and is concerned specifically with procedures for battle organization. In implementing the procedures set forth in these publications, each type commander promulgates a standard ship's organization and regulations manual for each type ship under his command. This is done to promote efficiency by ensuring uniformity. For example, Commander Destroyer Force, U.S. Atlantic Fleet, publishes a standard manual for each class of destroyer and escort vessel in his force. These manuals are promulgated as COMDESLANT Instructions in accordance with the Navy directives system.

Type commanders prefer that variations from the organization manual be kept to a minimum. It is recognized that differences in individual personnel, and varying circumstances of construction, material, and operating schedules will require some modification from ship to ship. The standard organization manual is only a guide setting up minimum standards, which gives commanding officers sufficient latitude to "tailor" their individual ships.

Administrative Bills

Administration is an integral part of organization and includes all the various facets of supervising the ship. The purpose of the various ship's bills is to formally establish a shipboard organization to facilitate administration.

Organization means much more than a series of flow charts and regulations. Your job as a division officer is only begun when you have mastered the details of organization. From there it is up to you to utilize your men so as to make the organization function smoothly.

Under the broad category of administrative bills we must consider the personnel assignment bill, the berthing and locker bill, and the cleaning and maintenance bill.

PERSONNEL ASSIGNMENT BILL (ALLOWANCE)

OC DIVISION (21)

First Section	Second Section	Third Section
Billet Allow.	Billet Allow.	Billet Allow.
OC-101 QM1	OC-201 SMC	OC-301 SM2
OC-102 SM2	OC-202 SM3	OC-302 QM2
OC-103 SM3	OC-203 QM3	OC-303 QM3
OC-104 RM1	OC-204 RM2	OC-304 RMC
OC-105 RM3	OC-205 RM3	OC-305 RM2
OC-106 YN1	OC-206 RM3	OC-306 RM3
OC-107 YN3	OC-207 YN2	OC-307 PN3

Figure 8-1.--Personnel Assignment Bill.

Personnel Assignment Bill

The purpose of this bill is to provide a policy for the assignment of officers and men to the billets in the various departments of the ship. It prescribes billet assignments based on peacetime allowance. Wartime complement assignments are included in appendix B to the battle organization manual, which will be covered later in this chapter.

It will be your job as OC division officer to see that the following are accomplished for your division: (1) assignment of enlisted men to battle stations and watches in accordance with the battle bill, (2) assignment of enlisted men to sections as illustrated in figure 8-1 and the appropriate appendix of the battle organization manual, and (3) assignment of enlisted personnel to regular duties and watches conforming to the watch organization and ship's bills.

Berthing and Locker Bill

The purpose of the berthing and locker bill is self-explanatory. The considerations involved in making assignments depend on peacetime or wartime operations. While the primary factor in peacetime will be the efficient administration of the division and the morale of the men, during wartime you will be concerned with dispersal and proximity to battle stations.

Whenever possible, assign men according to seniority. The more senior men should be assigned the more desirable berths, usually the upper one in each tier. In addition to important matter of status, this policy will enable the experienced men to look after the cleanliness of their juniors bedding and lockers.

Under no circumstances should bedding be removed from berths for purposes of sleeping on deck unless authorized by the executive officer. In peacetime, in very warm weather, this is sometimes permitted for limited numbers of men in designated safe areas.

All bunks are arranged for head-to-foot sleeping. This reduces the danger of spreading respiratory diseases. You owe it to your men to enforce this rule.

Generally, bunks are required to be made up and lockers stowed in a particular way. Figure 8-2 shows one suggested arrangement. Learn your own ship's requirements in this regard and make sure that your division conforms.

Cleaning and Maintenance Bill

The cleaning and maintenance bill sets forth policies and assigns personnel to duties involving maintenance, preservation, and cleanliness of assigned divisional spaces, machinery, and other equipment. As OC division officer you will be responsible for the assignment of your personnel. It will be your job also, to make sure, by personal inspection, that painting and cleaning instructions, as outlined in the bill and in the type commander's directives, are being carried out by your men.

The first lieutenant has over-all responsibility for cleaning and maintenance, but the division officer has the immediate responsibility for the upkeep of spaces assigned.

In order to reduce the possible areas of conflict, there are certain customs which have been generally accepted for the division of responsibility for various fixtures and openings found in spaces aboard ship. Normally, the men responsible for an individual space will take care of the following items:

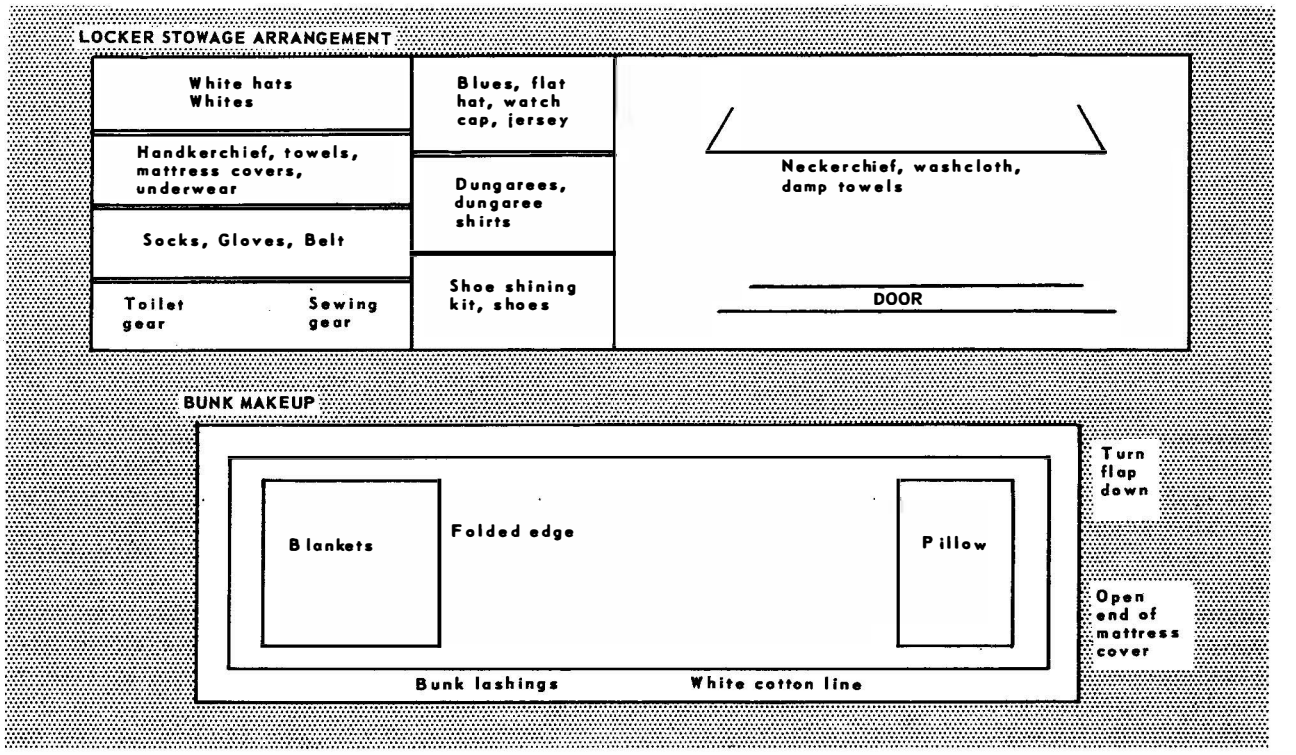


Figure 8-2.—Locker stowage and bunk makeup.

1. Doors, hatches, air ports, and battle ports that swing into the space, including dogs, knife edges, and coamings
2. Ladders resting on the deck of the space
3. Outside casing, cover, knife edges, and screens of ventilation systems opening within a space
4. Escape or access trunks leading to the space
5. Mechanical devices and equipment (including damage control equipment), blades and exterior casings of electric fans, darken ship switches, and the external surfaces of scuttlebutts
6. Exteriors of first-aid boxes and all other lockers except the personal lockers of men not assigned to the division having responsibility for the space
7. Interior of all lockers in which the division gear is stowed
8. All light traps

Figure 8-3 illustrates the detail with which this bill must be prepared. Items shown have been purposely restricted to some of those with which the OC division will be concerned.

Operational Bills

A ship's organization also provides for certain procedures that are incorporated into what are called operational bills. These bills are designed to facilitate the assignment of personnel, individually or by groups, to the stations and duties that are essential to the accomplishment of various ship's evolutions—sea detail, replenishment, rescue and assistance, and the like. These procedures represent the combined knowledge and experience of the Navy on a particular subject. The ability of a ship to perform these evolutions is a direct measure of her degree of efficiency and operational readiness.

CLEANING AND MAINTENANCE

Item	Operate	Inspect and Test	Clean	Repair	Lube
Casualty power cable	Eng	Eng	Note 1	Eng	Eng
Fireplug stations	Eng	Eng	Note 2	Eng	Eng
Office equipment	Note 2	Note 2	Note 2	--	Note 2
Piping systems	--	Eng	Note 2	Eng	--
Portable fire extinguishers	Any	Eng	Note 2	Eng	Eng
Radio, radar and associated equipment	Oper	Oper	Oper	Oper	Oper
Running, signal, and anchor lights	Oper	Eng	Oper	Eng	--
Ventilation systems	Eng	Eng	Note 3	Eng	Eng

VENTILATION

Fitting	Inspected	Cleaned	By
Air filters	Weekly	Weekly	Note 2

Note 1 – Exterior or cover, cognizant department; remainder Engineering Department.

Note 2 – Cognizant department or division.

Note 3 – Mechanism, Engineering; exterior, cognizant department or division.

Figure 8-3.–Cleaning and maintenance bill.

Special Sea Detail

The special sea detail bill is one of the most important of the ship's operational bills. It establishes policy and assigns personnel to stations and duties during those periods that the ship is being maneuvered in restricted waters. The navigator is responsible for the preparation and maintenance of this bill.

Your first responsibility is to see that qualified men are assigned to the stations which your division is required to man. You should not be satisfied with merely making the assignments. You must strive always to keep junior men in training for more responsible positions so that the sudden transfer of a key man does not render an important sea detail station inadequately manned by an untrained individual. As your division includes Quartermasters, you should keep in mind that their assignments normally will be made by the navigator, although you can perform a valuable service in recommending specific men to fill positions as changes occur. Figure 8-4 illustrates but does not include all of the positions and assignments for special sea detail.

There are other functions that you, as communication officer, must perform prior to entering or leaving port. Chapter 11 is devoted to this subject, but one aspect of these duties is noteworthy for this discussion.

Most ships utilize an underway checkoff list which itemizes in some detail the reports that have to be made to the OOD prior to getting underway or entering port. Learn what is required aboard your ship, and know what reports are required from your division. The object of this list is to prevent potential casualties or embarrassing oversights; it ensures that none of the vital functions necessary in handling a ship in confined waters is left to fallible human memory.

SPECIAL SEA DETAIL BILL

ENLISTED PERSONNEL STATIONS (OC Division only)

Station	Division	Rating	Duties
Bridge			
QMOW	OC	QM	Perform duties of Quartermaster of the watch
Navigator's Assistant	OC	QM (senior)	Assist navigator as directed
Steersman	OC	QM	Man the wheel
Port alidade	OC	QM	Man the port alidade
Starboard alidade	OC	QM	Man the starboard alidade
Signal Bridge			
Signal supervisor	OC	SM (senior)	Supervise visual communications
Signalman	OC	SM	Visual communications
Colors			
Colors (gaff)	OC	SMSN	Tend ensign
Anchor shape	OC	SMSN	Tend shape

Figure 8-4.—Special sea detail bill.

Replenishment at Sea

The replenishment at sea bill sets up the procedures and assigns the personnel to duties required for replenishing at sea, and for the transfer of personnel and light freight. The gunnery officer (or, on a noncombatant ship, the first lieutenant) is primarily responsible for preparing and maintaining this bill.

NWP 38 is the doctrinal source for these evolutions. In it are found the answers to most of the questions that are likely to arise concerning these common, but often hazardous, operations. Fueling and the transfer of light cargo and personnel frequently occur at the same time. Heavy cargo and ammunition transfer are more likely to be separate evolutions. You will find that, in spite of many differences in stationing and rigging, the part that members of your division play in these operations is similar. As signal officer you will normally be assigned to the signal bridge to supervise signal personnel in the proper visual procedures involved in coming alongside, while alongside, and when disengaging.

Rescue and Assistance

Those who make the sea a life's work live close to danger. Prudence demands that all seamen be prepared for emergencies. When a call for help is sounded, national and political differences are forgotten, and every effort is made to aid those in distress. All naval vessels include some form of rescue and assistance organization. The following situations are some that the rescue and assistance bill is designed to cover: a plane crash in the water; survivors in the water; distress aboard another vessel; emergency ashore. The last can be a fire, earthquake, violent storm, or practically any of the other destructive forces that plague mankind.

This bill is normally promulgated by the type commander, and its broad aspects are quite uniform within ships of the same type. Basically, it calls for a nucleus of experienced and qualified officers and petty officers who are capable of providing rapid and expert assistance to the victims of a tragedy. The organization calls for these men to be, among other things, mobile and capable of fairly sustained operations away from the ship. Emergency situations vary so much and the need for quick action is so paramount that these considerations of efficiency and mobility must always be kept in mind. Another factor is that the loss of these men for various periods cannot detract from the operating capability of your ship.

In the Atlantic Fleet Destroyer Force, this bill has been broken down into two broad categories: (1) rescue of survivors; and (2) emergency assistance.

Rescue of Survivors

The gunnery officer is responsible for the bill covering rescue of survivors. This bill is prepared with the idea that this team could be called away while the ship is at general quarters. The assignments are made with that in mind. The OC division normally will supply one Signalman for the lifeboat rescue detail. This Signalman will provide semaphore flags, a multipurpose signal lamp, a Very pistol, and a portable radio transceiver. In preparation for an emergency, you should be sure that all the equipment is in satisfactory operating condition, and that the Signalman who has been designated is familiar with his equipment as well as his duties.

Emergency Assistance Bill

The policy and assignment of personnel to the emergency assistance bill are governed by the same rules as the rescue of survivors bill. That is: assign qualified personnel who will be able to handle the situation, and whose absence will not materially affect the operating capability of the ship. The engineer officer is responsible for this bill and you will probably be called on to furnish a Signalman for the lifeboat. His equipment and his job are approximately the same as for rescue of survivors. The members of the emergency assistance party may be expected to be augmented by shore personnel or ship repair parties, if circumstances warrant.

Landing Party Bill

The gunnery officer is responsible for the landing party bill, and he must provide for an organized force that will be capable of performing limited field operations; doing police work in emergency situations ashore; and, less dramatically and certainly more regularly, participating in ceremonies and parades. Two publications contain all the required information for this evolution: NWP 50 discusses it generally, and the *Landing Party Manual, U.S. Navy, 1950*, in more detail. You normally can expect to supply a Signalman and probably one or more Radiomen.

Visit and Search

The requirements of the visit and search bill are often combined with the boarding and salvage, and the prize crew bill. These bills are infrequently used, but are essential because of the delicate nature of the situations in which they would be ordered. The operations officer has been delegated the responsibility of preparing and maintaining these bills.

Investigating or taking possession of a ship normally is accomplished in three progressive phases: (1) visiting and searching; (2) boarding and, if necessary, salvaging; and (3) placing a prize crew aboard. In performing these duties, the officers and enlisted men assigned are governed by *U.S. Navy Regulations, 1948, Law of Naval Warfare* (NWIP 10-2), and current instructions from higher authority. The communication officer assigns qualified personnel to duties illustrated in figure 8-5. He posts these assignments on the watch, quarter, and station bill. He is also charged with the availability of equipment and seeing that it is properly manned.

VISIT AND SEARCH, BOARDING AND SALVAGE AND PRIZE CREW BILLS

Rating	Phase I Visit Search		Phase II Boarding and Salvage		Phase III Prize Crew	
	No.	Div.	No.	Div.	No.	Div.
SM	1	OC	–	–	–	–
QM	–	–	1	OC	–	–
RM	–	–	1	OC	1	OC
RD	–	–	1	OI	–	–
ET	–	–	–	–	1	OE
YN	–	–	–	–	1	OC

Figure 8-5.—Visit and Search, Boarding and Salvage, and Prize Crew Bills – enlisted assignments, operations department.

When visit and search are undertaken, there are several considerations that govern:

1. The belligerent right of visit and search, subject to certain qualifying exemptions, must be exercised with tact and in strict conformity with existing treaty provisions. It may be exercised outside of neutral jurisdiction after the beginning of hostilities. Under these circumstances, the purpose of visit and search is to ascertain the nationality of the ships, the character of the cargo, the nature of employment, and other facts which may have a relation to hostilities.

2. The examining officer wears a sidearm and is normally accompanied on board by unarmed men. (However, arms are carried in the boat.) The examining officer inspects the ship's papers to ascertain nationality, cargo, ports of departure and destination, along with other pertinent data. On completion of these duties, he makes recommendations to his commanding officer for one of the following courses of action:

   a. That the ship be released (when papers or detailed search and inspection prove the innocent character of ship, cargo, and voyage); or
   b. That the ship be captured and taken to port for adjudication (if papers, questioning of personnel, and searches do not result in satisfactory proof of ship's innocence).

Boarding and Salvage

If the result of the inspection of the examining officer, or other circumstances, warrant further detention or seizure of the vessel concerned, the boarding and salvage party is dispatched to go aboard and take command of the ship, restrain the crew, and conduct salvage operations as necessary. These actions on the part of the boarding and salvage party are likely to meet with hostility on the part of the crew of the vessel being seized, and the boarding and salvage crew must be alert to counteract attempts at sabotage, scuttling, and the like.

Prize Crew

The prize crew operates the seized ship, and makes every effort to bring her safely into port for delivery to the authorities for examination and adjudication.

Emergency Bills

General Emergency

The general emergency bill provides for the organization and assignment of personnel, and prescribes procedures for combating the effects of an emergency of large-scale proportions in which the ship has or could sustain severe damage. The bill is prepared by the engineer officer and replaces the collision bill and the abandon ship bill, and has been broadened to include provisions for fire, explosion, and ABC attack.

The existing battle organization is the structure on which the general emergency bill is formulated. It also has sectional assignments in the event that it has to be carried out in port with only a part of the crew aboard. It is not rigid because the situations that it is designed to combat and control vary so much that a guide for action rather than a listing of set procedures is required.

The communication officer's responsibilities for this bill are as follows:

1. Assign personnel to duties and stations according to the provisions of the bill.
2. Post these assignments on the watch, quarter, and station bill.
3. Ensure that all personnel in the division are completely familiar with their assignments and that they have been properly trained in the necessary techniques.
4. See to it that secure stowage of equipment, supplies, and tools is maintained to reduce the danger of missile hazards.
5. Constantly stress the importance of maintaining watertight integrity, removing fire hazards, and ensure that all fire-fighting equipment in your spaces is in good working order.

An important adjunct of this bill is the establishment of procedures and policy for the emergency destruction of classified matter. This bill is provided in cases of dire emergency where capture is likely or when abandon ship has been ordered. As custodian, you hold more classified material than any other officer aboard ship and you may find that you have been detailed the task of preparing or revising the ship's emergency destruction bill, under the direction of the operations officer.

1. Delegate responsibility by duty and watch with an alternate for each assignment.
2. Indicate the priority in which material is to be destroyed.
3. Specify the method of destruction.

You must make certain that a sufficient supply of destruction materials (weighted bags, wire cutters, sledge hammers, and so on) are maintained in the spaces that contain classified matter. If shallow water destruction is ordered, burning will be necessary, and you will have to have adequate facilities aboard for accomplishing this.

Man Overboard Bill

The man overboard bill is set up to provide for the organization of the ship's company to rescue personnel from an aircraft down at sea, or to rescue a man overboard. Detailed information on the subject is found in ATP 1 and NWP 20, and it is from these sources and from orders of the type commander that the gunnery officer prepares your ship's bill. In addition, current operations plans and orders will contain procedures that will govern for a particular operation or exercise.

If you are assigned to a destroyer, you will find that standard procedure on these ships is to accomplish recovery without putting a boat in the water. This is to take advantage of the great maneuverability of these ships.

Shipboard recovery will not always be possible and the bill must provide for boat rescue operations. A Signalman from the OC division will probably be assigned from each watch section for the boat detail. His duties and the signaling equipment that he will carry are approximately the same as for the other evolutions previously discussed in this chapter.

Standard procedure calls for personnel who are not on watch or directly involved in the rescue work to muster at quarters. At this time, the identity of the missing man, if he is from your ship, will be ascertained and this information will be passed to the OOD as soon as possible. The mustering of the crew also serves to keep unassigned personnel, who would have a natural tendency to be spectators, out of the way of personnel involved in the rescue.

On the bridge, the Signalmen and Quartermasters are responsible for:

1. Throwing over a smoke pot or signal flare.
2. Keeping the man in sight.
3. Breaking the OSCAR flag, or operating the man overboard lights.
4. Manning signal searchlights.
5. Maintaining communications with the boat.

When the ship is assigned to the rescue destroyer station while plane guarding for a carrier, the proper guard circuit must be instantly available on the bridge for communications with the rescue helicopter. Setting up this circuit is your responsibility.

Battle Bill

The battle stations to be manned by the complement of the ship shall be set forth in a battle bill, which shall show for each battle station the duties to be performed and the succession to command.—*U.S. Navy Regulations, 1948.*

The division officer is not directly concerned with the construction of the battle bill. He is required to conform to it when making out the watch, quarter, and station bill. The ship's gunnery officer is primarily responsible for preparing the bill and keeping it current.

The personnel assignment bill, already described, includes billet assignments based on the peacetime allowance. Billet assignments predicted on wartime complement are incorporated in the ship's battle bill, which is part of the battle organization manual.

The ship's organization and regulations manual, as previously pointed out, is prepared to conform to the standard ship's organization and regulations manual promulgated by the type commander. The battle organization (which includes the battle bill) is an integral part of the ship's organization and regulations. To ensure uniformity in format and arrangement of contents, the type commander also prepares a standard ship's battle organization manual for each type vessel. This provides information for the guidance of individual ships in the preparation of their battle organization.

In earlier paragraphs we have mentioned complements and allowances. It might be well to amplify on their definitions to show the difference as these terms will be used often in the discussion of the battle bill.

The complement of a ship comprises the number of persons (both officers and enlisted men) determined by the Chief of Naval Operations to be necessary to accomplish the wartime objectives of the ship. The complement is based on the actual number of persons required to man all battle stations. The allowance is based on the number of persons required to operate the ship in peacetime.

The battle bill lists the stations which must be manned for combat, and indicates the personnel required to man these stations, based on the complement. It also indicates the stations to be manned during the various conditions of readiness.

It is the function of the gunnery officer to prepare the detailed battle bill for the ship. In doing this he will assign your men to battle stations, and some of them may discover that they have been given a job that is somewhat alien to their rating specialty. This is necessary so that the ship's over-all fighting ability may be at its peak.

The battle bill is divided into five sections which cover general policy, personnel summary, officer assignment, enlisted assignment, and billet number listing, respectively. Information of this detailed aspect of shipboard organization can be found in NWIP 50-1.

Watch, Quarter, and Station Bill

Description

From the standpoint of administration the watch, quarter, and station bill is the key to your division. It is a detailed summary of personnel assignments based on the requirements of the battle bill, ship's bills, and the ship's organization. Its primary purpose is to inform division personnel of their assignments, and secondarily, to provide supervisory personnel with an authoritative and readily available reference when making or revising assignments. If you report aboard and relieve as OC division officer, you will have to maintain this bill, revising as necessary. If you are assigned to new construction or a conversion, you will have to assemble a watch, quarter, and station bill, and keep it current. It can be pure drudgery, or a relatively simple task. The method outlined in the subsequent paragraphs, if faithfully followed, should render this one of your easier divisional duties.

Let us examine a standard watch, quarter, and station bill form in some detail, and in examining it, outline a strongly recommended way to maintain it. Figure 8-6 shows a form that is in current use. You will notice that the first seven columns do no more than identify the individual and assign him a billet number, bunk, and locker. The other information is necessary and useful but has no direct bearing on the assignment of the man. Proceeding from left to right, note that space is provided for general quarters, condition watches, and all operational and administrative bills. It is intended that each individual's duties in each condition of readiness and under every bill be placed in the appropriate spaces. Thus each man can follow his name across the form and know exactly what is required of him during a particular evolution.

WATCH, QUARTER & STATION BILL

COMPLEMENT
ALLOWANCE
ON BOARD
DATE

SECTION 1 DIVISION OC

BILLET	NAME	BUNK NO.	LKR. NO.	RATE COMP.	RATE ALL.	RATE ACT'L.	CLEAN STATION	BATTLE STATIONS CONDITION I (GEN'L. STA.)	BATTLE STATIONS CONDITION II (SECONDARY)	BATTLE STATIONS CONDITION III	LANDING PARTY	EMERG. GETTING UND'WAY	WATCH DETAIL AT SEA	WATCH DETAIL IN PORT	SPECIAL SEA DETAIL	FIRE STATION	FIRE PROVIDE	RESCUE & ASSIST. PARTY	RESCUE & ASSIST. PROVIDE	COLLISION	ABANDON SHIP STATION	ABANDON SHIP PROVIDE	MAN OVERBD.	SPECIAL DETAIL
C-101	Du Bose	4	4	QMC	QM1	QM1	IN CHARGE					STEERSMAN			PORT ALIDADE						6	NAV INST	STEERS MAN	
C-102	MILLER	7	7	SM2	SM2	SM3	SIGNAL BRIDGE	SIGNAL BRIDGE	SIGNAL BRIDGE			PORT ALIDADE			SIGNAL BRIDGE						4		SIGNAL BRIDGE	
C-103	KURTZ	8	8	SM3	SM2	SM1	PILOT HOUSE	SIGNAL BRIDGE	SIGNAL BRIDGE			STBD ALIDADE			SIGNAL BRIDGE		STANDBY		STANDBY		2	PYRO TANKS	SIGNAL BRIDGE	
C-104	UNGER	12	12	RM	RM1	RM2	RADIO CENTRAL	OPER. RAD CEN	SUPV RAD CEN			RADIO CENTRAL			OPR RAD CEN						3		QTRS	
C-105	DISANTIS	14	14	RM	RM2	RM3	COMM OFFICE	MSGR OPER	OPER RAD CEN			RADIO IJV			MSG RAD CEN						4		QTRS	
C-106	CHADWICK	17	17	YNC	YN1	YN1	SUPV	JA TALKER	STANDBY JA TALKER			IJV MSGR									6		IJV TALKER MSGR BRIDGE	
C-107	TIERNAN	20	20	YN3	YN1	SN	SHIPS OFFICE	MSGR D.C. CENT	MSGR D.C. CENT			BRIDGE									5			

Figure 8-6.—Watch, quarter and station bill, OC division.

Assigning Priorities

Let us assume that you have been assigned to a DD that is operating several months after commissioning. As a result of shaking down and underway training, you have become convinced that your division is in need of reorganization, and you have obtained your department head's permission to go ahead with the task. You decide, quite logically, that the first step is to revise the watch, quarter, and station bill. At this point, you will need a method; that is, a workable way to accomplish this necessary chore.

Initially check and verify your assigned billet numbers and your actual on-board personnel situation. At this time, you should ensure that the complement and allowance figures are correct. Then, by sections, enter all the information that you have gathered. For ship's evolutions, your first concern is going to be with the requirements for general quarters. Consult the battle bill and ship's organization and regulations to see what is required and verify these requirements with the gunnery officer and the operations officer. Repeat this for all bills and evolutions. After these steps have been taken and all information obtained, you are ready to assign priorities.

To accomplish priority assignments, the following method is suggested. Starting with general quarters, make a list of all the stations that are manned by the OC division for each evolution. Then, taking into account all pertinent factors, rate these responsibilities beginning with the most vital and working down. It will not always be possible to make a clear-cut distinction between two closely allied positions, but by exercising discretion and good judgement, and by consulting with your experienced petty officers and the department head, you accumulate an accurate list. To do this properly will require a certain amount of time, but it will be time well spent. When all this information has been assembled, enter it on the watch, quarter, and station bill. Using the general quarters situation as a guide, distribute the priorities throughout the bill. Follow the same procedure for the various condition watches and all the operational bills. Remember, that where an evolution is performed on a section basis, you will be duplicating the same priority list in each section. This should offer little difficulty. The principle is exactly the same; only the numbers of assignments and personnel involved vary. It is well to point out that it is not necessary to place actual numerical values on the bill. Space is at a premium and the location of the assignment will be sufficient to indicate its priority. It is recommended that you keep a supplemental record in your division notebook, so that you will have a worksheet on which to test revisions before transferring them to the bill.

When this has been completed you will be ready to undertake the second part of the method: the assignment of personnel. Until now you will have been guided to a large extent by service-wide doctrine and the desires of command, as expressed in ship's organization and regulations. In the assignment of personnel to the determined priority of billets, the opportunity to exercise personal discretion is large. Your evaluation of a particular man's knowledge, ability, and experience will be the chief governing factor.

Insert the name of the man best qualified for the majority of the priority 1 functions beside the billet number at the head of section 1. No one man will be the best for every duty, so some deficiencies will have to be accepted in making your decision. The next best man, from point of view of over-all proficiency, will assume the priority 2 billet at the head of section 2, and so on. As this unfolds, it is clear that the final positioning will give your division an approximately equal distribution of strength, and this is important where evolutions have to be performed with only a duty section aboard.

At first glance, this system appears very rigid and somewhat artificial. It can be argued that determining the job and then placing the man does not take into account the individual differences in temperament and ability that exist wherever the human factor is present. This method of priority does not suggest that these differences be ignored. On the contrary, they will be factors that have definite bearings when you make your assignments. It does impose a limit, so that once a decision to place a man in a particular billet has been made, there will be little opportunity or need to change unless it is a wholesale shift incurred by transfer or arrival of personnel. The division officer determines and developes the skills of the individual man.

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Training in Depth

This is a difficult goal to realize, and yet the assignment of priorities depends on it, and the two ideas are mutually self-supporting. The common objective is to have each man in the division trained, and eventually qualified, to handle not only the requirements of his billet but also the billet of the man above him. As soon as an individual has demonstrated the required skill level in all the duties for which he is responsible, he should be trained to discharge the responsibilities of the man directly above him. Where this is impractical because of difference of location of stations, then the man should be trained to take over for the next senior man at his particular station. A desirable and practical goal is that each man be trained for the next two higher billets. Supervisory petty officers should be capable of taking over any of the positions on the stations for which they are responsible. As personnel changes occur and you see your leading men transferred, you will be able to compensate for the loss by moving men up to the positions for which they have been trained. It too often happens that a ship is deprived of all, or nearly all, members of a particular rating with no immediate relief. The presence of a striker who can take over immediately will considerably lessen the difficulties inherent in such a situation.

You will discover that from the point of view of the detail work necessary to keep the watch, quarter, and station bill current, this system will lessen the load. Initially, considerable time may have to be spent in getting it started properly. Once established, however, it is relatively simple to maintain. The contribution to legibility of the bill is almost enough in itself to justify any pains taken.

Most Navy ships are operating below allowance and your ship will probably be no exception. Because of this, you will have to leave billets of lesser importance vacant; or, if this is impossible, they will have to be combined with others. As new men report aboard, they should be moved into the highest vacant billet. If the man is experienced and qualified, place him in a billet currently filled by a less experienced individual. When personnel are transferred, the senior qualified man holding a lower billet is moved up, and the bill adjusted accordingly. If your in-depth training has been worthwhile, these changes will occur with little or no reduction in efficiency.

In summary:

1. Determine divisional responsibilities.
2. Rate them by relative importance (priority) using the battle bill requirements as the initial basis.
3. Assign the best men to the top jobs and work down.
4. Train men to positions of greater responsibility.
5. Pursue the training aggressively and keep the bill current.

In Conclusion

Responsibility of the OC Division Officer

U.S. Navy Regulations, 1948 prescribe that you, as OC division officer, are responsible for the organization, administration, and operation of your division. You direct your division through your leading petty officers and report to the operations officer in his capacity as department head and next senior in the chain of command.

Therefore, you have a twofold responsibility: shipboard communications, and your division. In this chapter we have confined our discussion to your responsibilities as an OC division officer. The large part of the publication discusses in more or less detail your communication duties. Actually, any distinction that is made between OC division officer and communication officer is essentially artificial. They are so mutually interdependent that your success in one phase will almost exactly equal your success in the other. If your division is an efficient smoothly-running team, then it will be reflected in the team's ability to work as a reliable communicating unit. One of the most apparent indications of your ship's smartness is its communication ability and technique. Justly or not, many people are going to judge your ship in this way and this way alone. It is quite a responsibility.

CHAPTER 9

TRAINING

In time of peace it is necessary to prepare, and be always prepared for war at sea. — *John Paul Jones*

INTRODUCTION

Shipboard training and maintenance of material are two major factors contributing to battle readiness. Battle readiness, in turn, is the ultimate justification for the existence of the Navy. Training, therefore, is of major importance to the communication officer.

This chapter treats aspects of shipboard training as it affects the communication officer. It discusses training procedures which have become standard through custom and usage, as well as the training concepts stated in governing publications issued by the Chief of Naval Operations, principally NWP 50. This chapter is not meant to replace this important publication. The type commander's written instructions relating to training also should be consulted to provide the reader with a detailed knowledge of what is expected with respect to communication training and readiness.

GENERAL FLEET TRAINING POLICIES

Training is directed by Commanders in Chief of the Atlantic and Pacific Fleets, who exercise their training responsibilities through the type commanders.

Training programs are oriented to develop and maintain maximum proficiency in the missions and tasks set forth in NWIP 1-1, *Missions and Capabilities of U.S. Navy Ships and Aircraft.* These programs must keep pace with the rapidly changing trends in naval warfare and the associated functions of CIC and communications.

RESPONSIBILITIES OF THE TYPE COMMANDER

The training responsibilities of the type commanders normally include the following:

1. General administration and control of the training program of each ship assigned to his administrative command.
2. Final determination of appraisals of performance of the ships under his administrative command.
3. Final evaluation of the over-all performance of each ship.
4. Designation of the required exercises and establishment of the minimum exercise requirements.
5. Selection of exercises to meet specific training requirements.
6. Development and designation of special exercises not included in existing manuals but which he considers necessary for the further development of functions peculiar to a type of ship.

APPLICATION OF MANAGEMENT PRINCIPLES

Proper application of certain principles of management is essential to the establishment and execution of a successful training program. Five major functions of administration are applicable to the shipboard training program. These may be defined as follows:

PLANNING—Establishment of objectives and a determination of the broad means by which these objectives will be accomplished.

ORGANIZING—Arrangement of the required factors and facilities in such a way that objectives will be accomplished effectively.

EXECUTING—Placing the training program in effect, utilizing the facilities with which the training will be accomplished, and motivating personnel to make the required effort.

CONTROLLING—Frequent evaluation of training results to ascertain whether the effort is accomplishing objectives.

COORDINATING—Maintaining balance in the training program in working toward established objectives.

TIME FACTOR

Invariably, when discussing shipboard training, this question is asked: How can we find time for training after we run the ship, hold regular

drills, and do the thousand and one routine things that are necessary?

The answer is that training and operating must take place simultaneously.

Early in the training program, the primary concern is to get the crew operating efficiently. During drills, routine evolutions, and watches, ON-THE-JOB INSTRUCTION should be given until each individual in the watch section can perform the duties expected of him, and each member of a team or detail can do his part in the functioning of that unit.

Every effort must be made to obtain maximum training value from every watch, every drill, and every evolution. The petty officer in charge of a watch section or special detail must know, and plan in advance, the phases of training he is going to cover during a particular watch or drill. Close and continuous supervision and coordination are essential to ensure that training is accomplished during watches and drills.

TRAINING MUST BE FLEXIBLE

Any ship must have two parallel, flexible, and closely integrated parts to its training program—one for teaching skills and operations, the other for imparting related knowledge through classroom instruction. When one part of the training program is delayed unavoidably by circumstances beyond control, the other should be taken up. The need for this flexibility may be occasioned by weather, change in operating schedule, breakdown, or even combat casualties. In each instance, rapid changes in training plans must be made.

As an example, the daily training schedule lists practical instruction in flaghoist drill, but it so happens that the signal bridge is being painted. An immediate change in the training program is indicated. Assume that there is related instruction in the principles of the *Allied Naval Signal Book* that is uncompleted. The division officer therefore makes an on-the-spot decision to switch to classroom instruction. This instruction is not a substitute for doing. The practical phase is merely delayed.

CHARACTERISTICS OF EFFECTIVE TRAINING

"A good ship is a taut ship" is a familiar expression. Actually, this is merely another way of stating a long-recognized principle of good management: All people respond to being required to live up to well-known standards for work and conduct. Adhering to this principle is one characteristic of effective training.

An evaluation of the performance of individuals aboard ship, the transition of men from raw recruits into qualified watch standers within a reasonable length of time, the number of men fulfilling qualifications for advancement in rating, and other similar factors, give reliable indications of whether an adequate shipboard training program exists.

Instruction that is dynamic, progressive, and scheduled regularly will result in effective training. The degree of preparation of the instructor, and his exhibited interest in the subject, also contribute to the success of training. Persons in authority must show real interest in the progress of individuals in matters of self-education and all other forms of training to the extent that they are conspicuously present when instruction of personnel in their departments is scheduled. Finally, the training program must be realistic and within the capabilities of ship's personnel.

THE TRAINING PROGRAM

The objective in training is to increase the ability of personnel to administer and operate the ship effectively under all foreseeable conditions. Requirements of this objective must be met in the shipboard training program.

Objectives for Ship

Five general aims of the ship's training program are to—

1. Outline briefly the subjects and exercises;
2. Provide for a continuing and progressive training program;
3. Schedule the training so that the maximum benefit will be derived during time available;
4. Impart to all hands the technical knowledge and skill needed for the operation, maintenance, and repair of the ship and her equipment; and
5. Increase the proficiency of each officer and enlisted man in his present duties and prepare him for greater responsibilities.

Objectives for Communication Personnel

The communication officer, in conjunction with the operations officer, establishes objectives for the communication division based on the planning board's interpretations of the ship's training objectives.

Training objectives for communication personnel, including visual communications, necessarily include provision for (1) general training of the individual aboard ship to include examination for advancement in rating, qualification for watches on duty stations, and the minimum training requirements for all hands; (2) ordering officers and enlisted personnel to schools; and (3) operational or team training both on board ship and at fleet training centers ashore.

In planning for shipboard training, then, the subject of the training lessons will center on advancement in rating, as well as by qualification for watches on duty stations.

Suggested Training Drills and Exercises

In planning for communication drills and exercises, use as a guide chapter 6 of FXP 3. A suggested communication training program includes the following drills and exercises.

A. Radio
   1. Circuit operation and procedure (CW, radiotelephone, and RATT)
   2. Paralleling radio and visual channels
   3. Frequency shifting and measuring
   4. Simulated tactical drill (radiotelephone and CW)

B. Visual
   1. Simulated tactical drill
   2. Use of signal publications
   3. Flaghoist and semaphore
   4. Flashing light drills (including infrared equipment)
   5. Recognition drills

C. Encrypting and decrypting
   1. Use of cryptographic aids

D. Emergency equipment
   1. Casualty drills

E. Countermeasures and deception
   1. Interference; jamming; heckling.

List of Lesson and Exercise Plans Which Should be Included in Communications Shipboard Training Program*.

	Title	Lesson	Exercise
1	Voice Radio Procedure	x	
A	Tactical Voice Radio Drill	–	x
B	Administrative Voice Radio Drill	–	x
2	Radio Circuit Operation	x	
3	Radio Procedure	x	
4	Use of Frequency Meter	x	
5	Adjustment and Calibration of Radio Transmitters and Receivers	x	
C	Calibration and Frequency Shifting Under Normal Conditions	–	x
D	Frequency Shifting During Conditions of Radio Silence	–	x
6	Flashing Light Instruction	x	
E	Flashing Light–Intership	–	x
7	Instruction in Use of Infrared Equipment	x	
F	Infrared Equipment Drill	–	x
8	Semaphore Instruction	x	
G	Semaphore Inteiship	–	x
9	Visual Signaling Procedures	x	
10	Flaghoist Instruction	x	
H	Flaghoist Drill–Intership	–	x
11	Cryptography and Security	x	
12	Codes, Ciphers, and Crypto Devices	x	
13	Cryptoboard Instruction	x	

List of Lesson and Exercise Plans Which Should be Included in Communications Shipboard Training Program*. (Continued)

I	Cryptographic Drill	–	x
J	Cryptoboard Drill	–	x
K	Radio Interference	–	x
L	Radio Jamming and Heckling	–	x
14	Radio Equipment Transfer Panels	x	
15	Coordination and Dissemination of Tactical Signals Between CIC, Comm, and Bridge	x	
16	Communication Publications	x	
17	Allied Naval Signal Book	x	
18	International Signal Code	x	
19	Security of Classified Publications	x	
20	Encrypted Traffic Handling	x	
21	Authentication Systems	x	
22	Radio Call Sign Cipher	x	
23	Shackle Cipher	x	
24	Transmission Security	x	
25	Distress Traffic	x	
26	Tactical Radio Communications	x	
27	Casualties, Failures, and Use of Emergency Equipment	x	
28	Logs and Records	x	
29	Preventative Maintenance	x	
30	Radioteletype Procedures	x	
31	Teletype Equipment Safety Precautions	x	
32	Maintenance of Teletype Equipment	x	
33	Emergency Destruction Procedures	x	
34	Recognition Procedures	x	
M	Transfer of Control of Radio Transmitters and Receivers to Remote Position	–	x
N	Internal Handling of Tactical Communications	–	x
O	Allied Naval Signal Book Drill	–	x
P	Authentication Drill	–	x
Q	Radio Call Sign Cipher Drill	–	x
R	Shackle Cipher Drill	–	x
S	Equipment Casualty Drill	–	x
T	Main Radio Destroyed in Battle	–	x
U	Rigging and Use of Emergency Antenna	–	x
V	Emergency Destruction of Classified Matter	–	x
35	Telephone Talker Instruction	x	
W	Telephone Talker Drill	–	x

*As suggested by COMFLETRAGRU San Diego.

Program Development

All of the objectives for training communication personnel, plus the exercises and drills listed in FXP 3, form the basis for development of the TRAINING SYLLABUS. This syllabus should provide individual and team training associated with communication demands of the ship's operating schedule for the particular type of ship. From the training syllabus are developed the LESSON PLANS for each unit of instruction required. A lesson plan is the blueprint the instructor follows in his teaching. Some sample lesson plans follow.

LESSON NO: — — —
LENGTH: 55 minutes.
TITLE: Flaghoist Instruction.
OBJECTIVE: To familiarize visual signal personnel with the composition and procedures of flaghoists, and in the use of pertinent signal publications.

MATERIALS:
1. Training aids:
   a. Flags, flag bags, and flaghoist equipment on board.
2. References (effective editions):
   a. ACP 129.
   b. ACP 118.
   c. ACP 175.
   d. *International Code of Signals*, Vol. 1 (H.O. 87).
   e. Flaghoist Exercise No. 13-C(A).
   f. DNC 5.

INTRODUCTION: The instructor should proceed with this phase of the lesson by informing the trainees of the purpose of the lesson, and the procedure to be followed in conducting it. Discuss the importance of the lesson in developing skill and understanding of this important phase of visual signaling. Inform trainees what is expected of them during and after completion of the instruction.

PRESENTATION: The instructor will discuss the following pertinent points:
1. The use of flaghoists in visual signaling.
   a. Advantages and disadvantages.
2. Composition of hoists.
   a. Applicable publications.
   b. Call and address.
   c. The signal.
3. Making up hoists.
   a. Bending on flags.
   b. Closing up smartly.
   c. Execution.
4. Answering hoists.
   a. Report to conn when sighted.
   b. Keep at dip until understood.
   c. Close up smartly when understood.
5. Accuracy and speed.
   a. Read signals carefully and report to conn correctly.
   b. Answer hoists promptly and accurately.

APPLICATION: Give demonstration on all phases covered in the presentation, and ask questions to stimulate discussion in an effort to bring out points which may not have been covered sufficiently.

SUMMARY: Review the material covered, reemphasizing key points, and ask questions to determine effectiveness of instruction.

Lesson No. — — —

EXERCISE NO. — — —
LENGTH: One hour.
TITLE: Flaghoist-Intraship.
OBJECT: To develop skill of signal personnel through actual practice in bending on, hoisting, stowing, and use of procedure in flaghoist signaling.

SITUATION: The signal personnel are in need of training in flaghoist signaling to attain the high standards required in fleet operations.

MATERIALS:
1. Training aids:
   a. Ship's flaghoist signal equipment.
2. References (effective editions):
   a. ACP 118.
   b. ACP 129.
   c. ACP 175.
   d. *International Code of Signals*, Vol. 1 (H.O. 87).
   e. Flaghoist Lesson Plan.
   f. DNC 5.
   g. ACP 131.

PREPARATION:
1. Select the equipment to be used.
2. Select and assign personnel to their stations.
3. Decide on a plan of action, that is, how the exercise is to be conducted.
4. Prepare 20 signals to be used for the drill, and have all the necessary publications on hand.

5. Thoroughly brief all participants on the following pertinent points:
   a. Purpose and importance of the exercise, and the procedure to be followed in conducting it.
   b. Inform each participant what is expected of him during and after completion of the drill.
   c. Explain to trainees how the exercise will help them.

PROCEDURE:
1. Divide the trainees into two teams, and station these teams, one at port and the other at the starboard flag bags. One team should be stationed at the emergency signal station if facilities are available.
2. Designate one member of each team as team captain.
3. Each team will perform as if on separate ships insofar as bending on, hoisting, and stowing flags.
4. The instructor will act as spotter, calling out signals from his prepared list of signals.

EVALUATION: The instructor should observe and evaluate the performance of each trainee insofar as it is possible to do so during the drill; and with the team captains, analyze the causes for errors and discrepancies. Determine the salient points to be covered and discussed at the critique.

CRITIQUE: Review important phases of the exercise. All discrepancies and deficiencies should be discussed and analyzed to determine remedial measures necessary.

Exercise No. — — —

Simultaneous with development of lesson plans and syllabuses will come assignment of instructors. Everyone—from captain to petty officer—is responsible for the training of personnel he commands in action. Each petty officer must instruct his subordinates. It frequently is a timesaver to do a certain amount of basic instruction with men drawn from each watch section. In such instances the division officer should designate the best qualified petty officer available to instruct. Inasmuch as the major burden of teaching rests with the petty officers, each must become a well-qualified instructor before he can meet his responsibilities.

Having determined what instruction is to be given, who is to be instructed, and who is to instruct, the division officer and his subordinates then are ready to proceed with the next step in carrying out the training program.

Detailed explanation of instructional techniques is found in the *Shipboard Training Manual,* NavPers 90110 and the *Manual for Navy Instructors,* NavPers 16103. Bear in mind that the instructor must know the subject thoroughly, display all the qualities of a leader while teaching, and perform his job with enthusiasm.

There is a natural tendency to keep a man in a job that he knows. This stems from a desire to achieve and maintain a smoothly working unit, division, or team. Such action limits the scope of knowledge of the man, does not make provision for casualty replacement or for advancement to positions of greater responsibility. To offset this tendency, there should be a plan for rotating the men through jobs within the division. This does not mean that each man should have a new job each day; rather, it should be approached with the idea that a man should be rotated only after he has reached the standard of proficiency set for the division. Any individual should be thoroughly familiar with the duties of his present rate before he is assigned duties normally performed by a higher rate.

Rotation of personnel will require some planning and controlling to ensure complete coverage of jobs by the trainees. A progress chart is essential to record the jobs performed satisfactorily and point out those in which the trainee has yet to become experienced.

Motivation

Training includes both presentation by the instructor and receipt of the information and/or skill by the trainee. To have only a training program is not enough. The trainees must be willing and want to learn. Development of enthusiasm in the trainee is called motivation.

There are several ways of getting a trainee to take part willingly. Primarily, the training program must be attractive to him. Trainees will respond favorably if they find that the

benefits they receive are commensurate with their time and effort. They will want the program to be immediately useful in solving the problems of their jobs and to assist them in preparing for advancement in rating.

The instruction must be both practical and interesting. Organize a training program in which you can take pride. Then proceed to execute it with enthusiasm. Otherwise, the desired effectiveness will never be attained. Setting a good example of active participation is also a must with all officers and petty officers.

Organization for Training

The Commanding Officer

The commanding officer is charged with over-all responsibility for the safety, well-being, and efficiency of the ship. He approves matters of training policy as well as recommendations of the planning board for training.

Executive Officer

The executive officer is charged with executing orders of the Captain, and with coordinating and supervising the performance and administration of the command as a whole, including, of course, matters pertaining to training. The executive officer is chairman of the planning board for training, exercises over-all supervision of shipboard training, and schedules training activities for the ship on a daily, monthly, quarterly, and yearly basis. He may also serve as training officer or assign this collateral duty to some junior officer to perform as his assistant for training.

Head of Department

The operations officer is head of that department responsible for all matters pertaining to ship operations. Over-all supervision of the

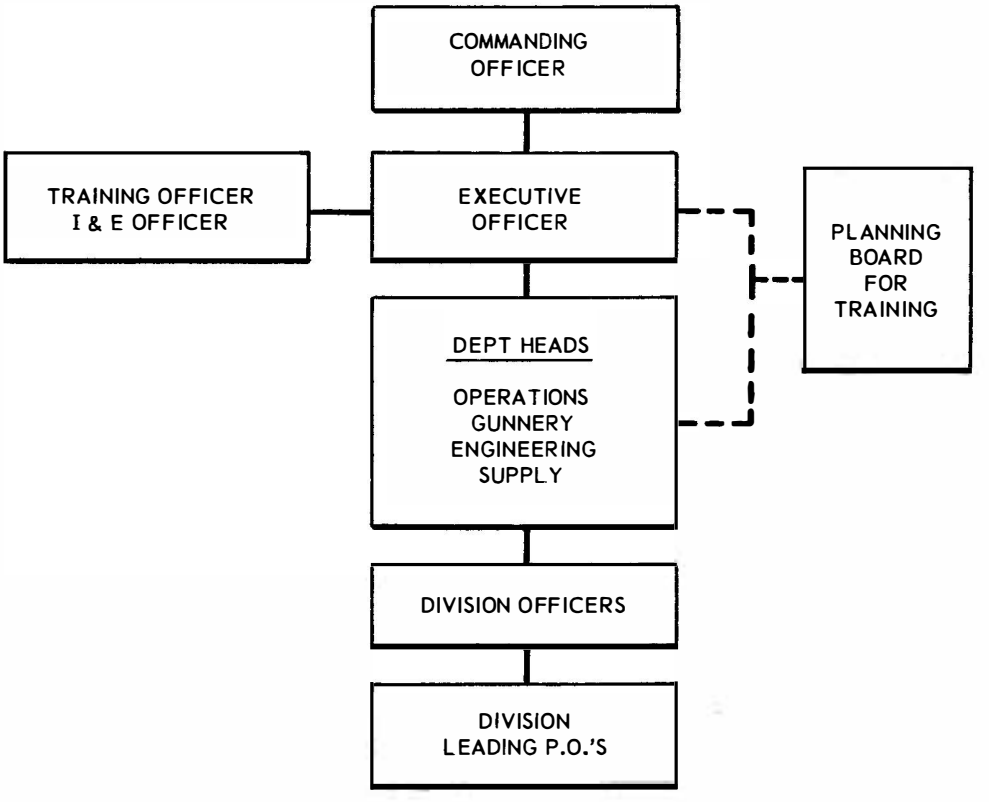

Figure 9-1.—Shipboard training organization (destroyer type).

training in the operations department, and coordination of all type training exercises are other functions of the operations officer. Questions or problems concerning communication training should be discussed with the operations officer. He will also approve syllabuses and lesson plans for communication training.

Division Officer

We now are at a key point in our discussion of the responsibilities and duties of various personnel for shipboard training. The division officer is a key man in the success of the training program. Normally, the small ship communication officer is also the division officer.

As an assistant to the operations officer, the communication officer ordinarily would have the following duties to perform in connection with training:

1. Assist the operations officer in developing a communication training program in support of the training objectives of the operations department.
2. Implement approved training plans and policies within the department.
3. Coordinate and assist in administration of the division training program, including supervision of the preparation of training materials; review schedules and lesson plans; select and train instructors; observe instruction at drills, on watch, and in the classroom; and procure training aids and other material for use in the training program.
4. Maintain division training records and training reports.
5. Prepare and submit division training schedules to the operations officer.
6. Disseminate information concerning availability of fleet and service schools to communication personnel.
7. Assist the operations officer in planning and coordinating training of junior officers and leading petty officers in accordance with shipboard training policy.
8. Keep the operations officer fully advised with respect to the training program for communication personnel.

Chief petty officers and other leading petty officers should plan lessons, observe immediate aspects of the program and offer suggestions for improvement, instruct individuals and groups as required, keep records necessary to control the program, and consistently maintain a high degree of control over all aspects of communication training. Training-minded CPO's and leading PO's are essential to the success and effectiveness of the shipboard training program.

Scheduling of Training

The basic governing factor in determining the ship's schedule for training is the operating schedule or "opsked" promulgated by the type commander for the current fiscal year. A corollary of this schedule is the navy yard overhaul period assigned to all ships of the fleet. Yard overhauls are scheduled at intervals varying from 21 to 28 months, depending upon the many factors affecting fleet planning.

The TRAINING CYCLE aboard ship is likely to be tied closely to the periods of time between shipyard overhauls. (See fig. 9-2.) Usually when ships go into overhaul, there occurs a considerable turnover in personnel. Training individuals and teams aboard ship must start probably from its lowest ebb at THAT POINT. The ship as a unit should reach peak proficiency just before there is another large personnel turnover. This, of course, is not consistently true throughout the fleet, but the training problem in general is most critical immediately after receipt of relatively large numbers of inexperienced personnel.

Long-Range Training Plan

The long-range training plan is a very important document. It is the basic instrument for planning and effectively carrying out the ship's training requirements. This plan, prepared by the training board, combines requirements for the training cycle with requirements for the training (fiscal) year. In the training plan are included all competitive exercises required by FXP 3 and the type commander; trials such as full power trial, administrative inspection, examinations for advancement in rating, operational readiness inspections, and continuous general training of individuals and teams aboard ship and ashore. The duration of the long-range training plan is from the end of one shipyard overhaul to the beginning of the next scheduled overhaul.

TYPICAL LIVING CYCLE (DESTROYER TYPE)

(Operating Schedule not Shown)

Shipyard Overhaul Period	Months out of Shipyard	
Preparation for Refresher Training; Calibration and Alignment of Equipment; RFS; ISE; Commence Refresher Training	1 (Jul)	Training Year
Refresher Training; ORI	2 (Aug)	
25-Knot Economy Trial / Commence Competitive Year	3 (Sep)	
	4 (Oct)	
	5 (Nov)	
	6 (Dec)	
	7 (Jan)	
	8 (Feb)	
Administrative Inspection	9 (Mar)	
Full Power Trial	10 (Apr)	
	11 (May)	
Complete Competitive Year	12 (Jun)	
Economy Trial / Commence Competitive Year	13	
Operational Readiness Inspection	14	
	15	
	16	
	17	
Economy Trial	18	
	19	
Material Inspection (INSURV)	20	
Administrative Inspection	21	
	22	
Full Power Trial; Prepare for Shipyard Overhaul	23	
Complete Competitive Year	24	
Shipyard Overhaul		

Figure 9-2.

Primarily, a long-range training program is one which systematically provides for (1) orientation and indoctrination of new personnel as they come aboard, (2) the upgrading of performance of personnel in the various shipboard divisions, (3) their leading performance factors and examination subjects for advancement in rating, and (4) team training designed to increase the over-all effectiveness of the performance of the ship's crew.

Quarterly Training Schedule

The quarterly training schedule is derived from the long-range training plan, and details the shipboard training plan for the period of the type commander's currently effective quarterly operating schedule. In other words, the quarterly training plan implements the long-range plan and the operating schedule usually contains such information as—

1. Scheduled operations for the 3-month period.
2. Exercises and drills to be accomplished.
3. Details of training of individuals and teams.
4. Reference to the training syllabus as a basis for lesson planning and preparation by instructors.

Details of communication training for the 3-month period is the responsibility of the communication officer. This requires careful planning combined with ingenuity and imagination to ensure that individual and team training are accomplished expeditiously. For example, planning for the January-March quarter must include complete qualification of men going up for third class petty officer prior to the fleetwide exams in February. Figure 9-3 shows a quarterly training schedule.

SAMPLE COMMUNICATION QUARTERLY TRAINING SCHEDULE FIRST QUARTER FISCAL YEAR

DIVSKED	July				August				September				
DESDIV 642	1 UPK	8 TYT (ASW)	15-17 ENR Mayport	17 Special OPS Mayport	1-4 Miami	5 Special OPS Mayport	15-17 ENR NORVA	18 UPK PREP NELM	2 ENR NELM	4 Sea Spray	14 UPK	19 Strikeback	28 NOREUR PORTS
Activity	Exams for E-3 Prepare for ASW and carrier OPS Check equipment during upkeep Review MIL and PROF requirements for personnel SKED to take exams for ADV in rating in AUG				Carrier OPS Fleet exams E4-E6 8 AUG Complete Nelm checkoff Tycom Admin Insp 23 Aug				Prep Flt Ops General COMM exercise last WK month				
Instruction Jul 1-5 8-12 15-19 22-26 29-2 Aug	Exams E-3 28, 29, 15, 32 Asw Comm 4, 5, 17 1, 2, 3, 6, 7, 5 15, 16, 19 8, 9, 10, 17, 18				Aug 5-9 11, 12, 13 Exams E-4--E-6 12-16 27, 33, 34, 35 19-23 Nelm c/o, Admin Insp 26-30 20, 21, 22, 23, 24				Sep 2-6 Inst on Flt Exer Sea Spray 9-13 Inst on Flt Exer Strikeback 16-20 24, 25, 26, 35 23-27 Inst on Conduct of Z-21-C				
Drills Jul 1-5 8-12 15-19 22-26 29-2 Aug	C, G, I As Sked by Divcom During Asw Tyt A, B, C, E, F, G, H A, B, C, E, F, G, H G, H, O				Aug 5-9 I, J 12-16 S, T, U, V, W 19-23 Nelm c/o, Admin Insp 26-30 P, Q, R				Sep 2-6 As Sked Flt Exer 9-13 As Sked Flt Exer 16-20 As Sked Flt Exer 23-27 Z-4-C, Z-8-C, Z-13-C, Z-15-C, Z-21-C				
Schools	Swabo Sn Qm Scol Ftc Npt 1-27 Jul Ham Sa Radio Code Ftc Npt 1 Jul – 30 Aug												

Note: Numbers and Letters Refer to Lesson and Exercise Plans listed Pages 129 and 130.

Figure 9-3.

Weekly and Daily Training Schedules

Weekly and daily training schedules, the latter usually incorporated in the plan of the day, supplement the basic training plans. These schedules should include such final details as names of instructors, where training is to be accomplished, subject of training, time, and other necessary details to fit special conditions.

The communication officer must see that these weekly and daily training plans are closely integrated with the ship's operating schedule. They must be worked out in advance, and all communication personnel must be advised of the plans. Stress simplicity and ensure proper integration with the over-all ship training schedule. Forehandedness is essential. Leading petty officers should perform initial planning, final details and approval being the responsibility of the communication officer.

APPLICATION OF TRAINING PROGRAM

The primary training concern of the communication officer should be to have each man function at maximum efficiency. To do this, it is necessary to ascertain exactly what each is expected to do in a particular rate or rating or in a specific team effort situation. Each man must know exactly what is expected of him and what his responsibilities are. It is not sufficient to tell a sailor, "Know your exercises;" he must be told what exercises. Under "Learn Safety Precautions"—which ones? "Learn the jobs of nearby people"—fine, but exactly which people?

You cannot train, measure progress, or define achievement unless you define what you are trying to achieve.

Billet Analysis

Analysis of communication billets aboard ship is helpful in solving the above problem. An examination of the jobs assigned to the man as shown on the watch, quarter, and station bill is helpful and important in making the analysis. Another source of information is to prepare lists of all machines operated, logs and records kept, and all other duties performed by all communication personnel.

Several publications prepared by the Bureau of Naval Personnel are excellent sources of information for billet analysis. These publications should be used to obtain the best possible determination of required billet performance. They also serve as a means of evaluating the performance of the incumbent. These reference books include the *Manual of Navy Officer Billet Classifications* (NavPers 15839), *Manual of Enlisted Navy Job Classifications* (NavPers 15105), *Manual of Qualifications for Advancement in Rating* (NavPers 18068), and *Officer and Enlisted Duty Specifications for Destroyers* (NavPers 18346).

Whatever the method used, the objective is to determine and describe accurately what jobs there are and who is to be trained to do them. After this has been done to the best of your ability, next determine:

1. The order in which training will be given.
2. How much each man already knows.
3. Time, place, and methods for providing the training.

Order of Priority for Training

In establishing priorities for training, the determining factor usually is the ship's operating schedule. The immediate training needs are those that center around the most commonly used equipment. Sometimes a sequence of events will dictate the order of training. For example, the supervisor of the radio watch section who is scheduled to stand the weekend duty in port becomes ill and is not able to set up the frequencies for an operation beginning Monday morning. If all the qualified supervisors are away on weekend liberty, another man will have to be trained quickly so that the ship will be able to answer up when the circuits are tested at 0600 Monday morning.

An unexpected event occasionally will present a training opportunity that can be used to good advantage. For example, the division commander issues an order to stand by for tactical drills while steaming in company, evolutions to be indicated by flaghoist. Action: Order all Signalmen and strikers to the signal bridge, along with all officers not on watch, to participate in the training.

Too frequent breakdown of equipment, abuse of tools and equipment, and uneconomical or inefficient operational performance are all manifestations of a need for training. Other symptoms are situations where petty officers are doing the work while nonrated men run errands, stand by, or just plain loaf. Low morale may be caused by a feeling of unimportance or incompetence stemming from a lack of training. Such conditions may indicate lack of leadership and also reveal that some officer or petty officer is not taking advantage of training opportunities.

When a man breaks down or fails, the communication officer must feel the same responsibility that he does when a radio receiver or transmitter is out of adjustment. Use the same observation, attention, and care with the man that you do with the machine. Study human failure as you would examine the reasons for mechanical or electronic failure. Undertake solutions of human problems with the firm belief that the personnel you control and lead can be ruined or improved by your own individual efforts, by your own observation, foresight, care, and intelligence.

Determine How Much Each Man Knows

A determination of how much each man knows is equally important. Nothing is more detrimental to interest in training than to require personnel to attend instruction in something they already know. Examine each individual by written and practical tests, by observation of his daily performance of duties, or evaluation of his past experience. When the extent of knowledge of duties has been determined accurately, the communication officer will have a more positive basis on which to proceed in developing the training program.

On-the-Job Training

Primary emphasis should be placed on on-the-job training of personnel to perform the duties assigned them as individuals or in crews, parties, or teams. Instructions may take place during watches, drills, or other evolutions. All officers and petty officers are responsible for on-the-job training of personnel and should take advantage of every opportunity to conduct some phase of instruction in men's duties.

On-the-job instruction is primarily for teaching skills. It is the best method for complex operations. This method teaches skills rapidly and—more important—completely. When instruction is finished, the trainee can perform. Because emphasis is on subject matter, and the method itself is simple, the practical man will find it relatively easy to teach by this method. There are limitations, of course. Other methods are better for teaching principles and theory. Another limiting factor is the number of trainees who can be taught at one time. This limitation, however, is more apparent than real. On board ship, the number of times that more than 6 men (for example) are to be taught one skill at the same time is unusual. This is particularly true of ships like destroyers. Do not confuse this with team training, in which each man is learning a different phase of a bigger job, e.g., CIC team.

Summary

To summarize, on-the-job training is—

1. Training in a production situation.
2. Useful in small, noisy spaces where number of trainees is limited to not more than 5 or 7.
3. Used most advantageously for training of opportunity.
4. Best method for teaching complex skills.

On-the-job training requires—

1. Complete knowledge of subject by instructor.
2. Complete analysis of subject.
3. Ingenuity and initiative on the part of instructor.
4. Alertness on the part of instructors (leading petty officers) to take advantage of training opportunities.

Classroom or Schools

While all skills and some of the related information may be taught on the job, certain basic information which leads to a better understanding of the operations may be taught best in the classroom. Such instruction should be scheduled regularly, but should not be allowed to substitute for on-the-job instruction.

Courses of instruction in established BuPers or fleet schools are also available to naval personnel. Fleet schools, such as the fleet training centers, feature short operational or team training courses. BuPers schools, on the other hand, provide basic and advanced technical instruction applicable to the specific ratings.

Normally, the type commander controls the input to these schools from the forces afloat. The executive officer will have information concerning availability of quotas and the method of obtaining them. The communication officer should first determine training requirements for communication personnel at BuPers or fleet schools, obtain the approval of the operations officer, and forward the request to the executive officer for action.

The current *Catalog of U.S. Naval Training Activities and Courses* (NavPers 91769) is a valuable compilation of training available at BuPers and fleet schools.

Individual Study

Individual study by all hands should be encouraged. In fact, self-study is mandatory if the enlisted man is to complete the requirements for advancement in rating and gain further knowledge of subjects required to improve the efficiency of the ship. Officers also must devote time to individual study in order to be considered for promotion and gain knowledge of special skills. To ensure a successful training program, self-study requirements should be established for all communication personnel. For enlisted personnel, such requirements can be in the form of Navy training courses and correspondence courses. *Training Publications for Advancement in Rating* (NP 10052) contains information concerning study opportunities for communication personnel. For officers, currently effective instructions issued by BUPERS dictate required reading and completion of correspondence courses. Some form of control, such as a

checkoff list, should be used to require personnel to complete the required individual study.

Use of Navy Training Courses

Use of Navy Training Courses (NP 10050) has been prepared by BUPERS as an aid in carrying on a training program to help enlisted personnel qualify for advancement in rating. This pamphlet is also a must for the communication officer to assist him to provide the maximum in planned training advantages.

Navy training courses are written to supply information the enlisted man needs to perform the duties of his rating. The value of the training course will be increased if its content is correlated closely with on-the-job instruction. Supervision of the use of the training course is the responsibility of the division officer, who must assure proper correlation. The officer assigned collateral duty as information and education (I and E) officer is in charge of procurement and issue of training course books. The communication officer must determine if all publications needed actually are available on board, and if not, request that they be ordered. Most of them will be originally supplied to your ship but replacements must be ordered.

Advancement in Rating

It is not the purpose of this text to repeat the detailed requirements and regulations governing the Navy system of advancement in rating. A thorough knowledge of the appropriate directives is mandatory for all officers and key enlisted personnel in the administration of the shipboard training program. The following constitute the governing references pertaining to advancement in rating:

BuPers Manual.

Instructions for the Administration of Servicewide Examinations for Enlisted Personnel (NavPers 15828).

Manual of Qualifications for Advancement in Rating (NavPers 18068 (through latest change).

Training Publications for Advancement in Rating (NavPers 10052).

Orientation of New Personnel

Every new man reporting aboard should be given immediate instruction in topics which will speed his assimilation into the crew. This program is carried out on a shipwide basis, but the individual division officer must devote enough time to this phase of training to ensure that new personnel receive guidance. The program is directed primarily toward personnel new to the Navy, but everyone reporting aboard should receive some orientation. This takes the form of reading both the ship's and operations department's organization and regulations manuals, becoming acquainted with the watch bill, policy on leave, liberty, and so forth. Essentially, every new man should be instructed in ship's regulations, organization, history, and what is expected of him as a crew member, and, in turn, what he may expect. This training should emphasize the necessity for complete knowledge of his job by the individual and the need for teamwork in making the ship an efficient fighting unit. A checkoff list should be established for uniformity of orientation of communication personnel.

Training Requirements for All Hands

As a part of the orientation of new personnel, and as a benefit to all hands onboard, each ship usually develops "Know your ship" or "Minimum requirements for all hands" training courses. Accomplishing this program will help develop the smartness and efficiency which distinguish a capable and well-trained ship's company. The communication officer is responsible for seeing that his personnel qualify in each of these requirements. A checkoff list should be maintained for such purpose.

TRAINING DURING SHIPYARD OVERHAUL

During shipyard overhaul, training must be subordinate to the primary objective—the best possible overhaul. Most yard overhauls are trying periods. Work items listed under "ship's force accomplish," or SFA as it is commonly abbreviated, often take all available personnel for the seemingly endless jobs to be completed in accordance with an exacting time schedule.

In addition, there are personnel requirements for communication watches in the shipyard communication office, messenger watches, fire watches, shore patrol, and so on and on. Do not assume that it is the sole responsibility of the communication officer to work out all these problems. Such matters can be resolved by chief and leading petty officers. They have the experience and, most important, should be the people to work out these personnel problems to your satisfaction.

Prior to entering the shipyard, it is a good idea to brief personnel in its organization. Explain the need for detailed work requests, including sketches and thorough inspections carried out before, during, and after the yard work. As a related training item, it is very important that key personnel understand the importance of making a careful check of yard work prior to recommending acceptance. The ship bears the ultimate responsibility for all work performed by the yard.

Ship's Force Work

All work within the capacity of the ship's force should be done by ship's company. When work is performed by the shipyard, the cost is considerably higher, due to the higher labor and overhead costs included in the price quoted for the work item. A schedule of communication work items should be prepared to include (1) names of persons responsible for accomplishment; (2) estimated date of completion; (3) estimated number of man hours required; and (4) assistance required from the yard in the form of materials or tools.

The communication officer is responsible for timely submission of a list of communication work items to the operations officer for approval and further routing to the repair officer who, on a small ship, is normally the chief engineer. The repair officer will incorporate it in the over-all schedule of ship's force work to be submitted to the yard. A copy of the communication work list should be posted in a conspicuous place and the items checked off as each is completed.

Planning for Personnel Administration

Planning for administration of personnel during the shipyard overhaul should include instruction regarding their employment in special tasks, duty assignments, and watch, training, and leave schedules.

Leave

Leave for personnel must be planned during shipyard overhaul periods. Equable distribution of leave is necessary to ensure that sufficient qualified personnel are always on board at all times so that ship routine and work will continue uninterrupted.

Watches

The regular watch bill must also be adjusted during the yard period to take care of vacant billets due to personnel away on leave or at school. It is essential that planning for the yard period include listing required watch stations and the communication personnel who will man them. Obtain a copy of shipyard regulations in advance of preparation of this list to assure that required watches are planned for. Normally, the shipyard will forward a copy of instructions and regulations to the ship prior to beginning the overhaul. If this information is not received by the time you are ready to plan personnel assignment to watches during the overhaul period, it is best to request it from the shipyard. This is a matter under the cognizance of the executive officer.

Planning for Training

Begin planning for training during the yard overhaul by determining objectives to be accomplished. Such objectives will be based largely on the personnel situation in the individual ship. Training is secondary to a good overhaul but should be conducted insofar as practicable. Local training facilities (shipyard training facilities and nearby fleet schools) may be used. Deciding how much training can be accomplished away from the ship is not easy because of the heavy demands on personnel while the overhaul is in progress.

The navy yard in which the ship will receive her overhaul is always known in advance. Ascertain local training facilities available and make use of them if this will benefit the ship's personnel situation. If the overhaul is in a shipyard near a fleet training center, the excellent training facilities available at this type of activity can be used to good advantage. Sending personnel to the more formal, long course of instruction should be kept to a minimum, although this decision depends upon ship's needs.

Name	Rate	Course	Duration	Location	Dates
Smith	RM2	Teletype maint	6 wks	ScolsComd NorVa	1 Nov-15 Dec
Hatch	SN	Radio code	10 wks	FleTraCen Newport	3 Sep-26 Oct
Brush	SN	QM school	4 wks	FleTraCen Newport	1-30 Oct
All communication personnel		Fire fighting	5 days	FleTraCen Newport	(*)

*Send 2 men each week for 10 weeks.

Remember that training to be accomplished must be worked out carefully in advance of the overhaul. This means a comprehensive review of communication personnel requirements, both present and future. This review will encompass both officer and enlisted training, will include requirements for trained personnel in the operation of specific equipments, and team training in such important functions as fire fighting. Training plans should be worked out with key enlisted personnel, then submitted to the operations officer for approval. He, in turn, will submit the over-all operations department shipyard training schedule to the executive officer for final approval and inclusion in the ship's integrated training schedule for the yard period.

One must not overlook the fact that a navy yard overhaul experience is an education in itself. Actually, there are many opportunities for on-the-job training while completing ship's force work. Personnel can learn a great deal by observing installation of new equipment and facilities. Where mutually agreeable, ship's personnel can often learn by working with yard personnel in the installation or overhaul of equipment.

Sample Shipyard Training Plan

Assume that your ship has been assigned to the Boston Naval Shipyard for her regular overhaul. Communication training requirements during the yard period have been determined and include the following:

Formal training away from the ship is an adjunct of the ship's long-range training program and of the training objectives listed for accomplishment by the end of the yard period. The above illustration is an example only and does not suggest limits on training during an overhaul.

REFRESHER TRAINING

Introduction

A major phase of the training cycle is the refresher training period, which follows completion of the shipyard overhaul. Prior to reporting for refresher training, and after departure from the yard, the ship will be assigned intervals in the operating schedule known as the READY FOR SEA (RFS) and INDEPENDENT SHIP EXERCISE (ISE) periods.

Planning for Leaving the Shipyard

Planning, relative to termination of the overhaul, must be carefully detailed. It must cover the final weeks of the overhaul as well as the RFS and ISE periods so that all operational tests of equipment and training prerequisite to the refresher training are scheduled and conducted. Emphasis at this time should be shifted from overhaul routine to operational routine. Communication personnel should be kept fully informed of what is expected of them during the final weeks of the yard period. Prior to departure from the yard, it is also desirable to brief communication personnel on the ISE operating schedule and the general schedules to be followed while undergoing refresher training. It is suggested that this review include a brief talk by the communication officer on what he expects of the division, emphasizing over-all ship requirements for communications from the commanding officer's point of view.

Final Weeks of Overhaul

Training-wise, plans for the final weeks of overhaul should provide for the following:

1. Organization of communication personnel in accordance with ship's organization book.
2. Completion of schedule for training and operational tests of equipment during RFS and ISE periods.
3. Completion of the training command's Communication Arrival Inspection Checkoff List.
4. Return of personnel from leave and schools, and inauguration of the new watch, quarter, and station bill.

Keep in mind that refresher training is the ship's next big assignment. By now, the ship should have received the arrival inspection checkoff lists plus other information pertaining to the refresher training period. The type commander's requirements for items to be completed prior to beginning refresher training should be studied, and plans made to assure compliance. Review the training command's standard training requirements for your type ship, which will include the communication exercises required during the refresher training.

Ready for Sea

The ready for sea, or RFS, period is assigned by the type commander to give the captain time to ready the ship for sea upon completion of the overhaul. Time allotted is usually about 5 days, during which the ship literally is made "ready for sea." For communications, this operation involves a multiplicity of items including loading spare parts, calibration of equipment, cleaning up the ship, and stowage of gear. All yard work items must be reviewed for completeness, and a final report of their status made to the operations officer. On completion of the RFS period, the captain is expected to report to the type commander and other interested commands that the ship is in all respects ready for sea. The communication officer's responsibility is to see that all things affecting communications have been taken care of, that equipment is in good operating condition, and that the watch bill is squared away.

Individual Ship Exercises

The ISE period is assigned to provide time for orientation of ship's company to operational functions, and to make adjustments to organizational matters and material prior to commencing refresher training. Basic training is conducted in communication drills and exercises including walk-through of exercises listed in the training command training requirements.

The organizational requirements of the ship's organization and regulations manual should be checked carefully to be sure all communication requirements are met, and that personnel are briefed on what to do. Pay particular attention to the duties of communication personnel for operational and emergency bills such as special sea detail, replenishment at sea bill, and so forth.

The instruction and drills to be conducted should be planned in advance for each day of the ISE period and integrated carefully with the overall ship training. The communication officer should hold a short meeting each day with key enlisted personnel to discuss the next day's training schedule and instruction assignments. These personnel then pass the word on to the communication gang. Each man must know in advance what training will be conducted. The communication officer must also plan far enough ahead so that his proposed schedule can be approved by the operations officer and submitted to the executive officer for inclusion in the daily and weekly training plans for the ship.

Training Command

Refresher training of all fleet units is under the cognizance of the training command, which is a type command of the fleet organization. It is essentially concerned with training groups of men into teams and crews. Commander, Fleet Training Group (COMFLETRAGRU), is the local representative of the training command. He supervises fleet schools and directs the afloat training conducted by the underway training unit (UTU). The UTU is composed of officer and enlisted shipriders (as they are known in the training command) who conduct intensive shipboard training of the crew for periods varying from 3 to 11 weeks, depending, among other considerations, on the type of ship. During this period the ship undergoes a progressive series of exercises culminating in a comprehensive battle problem to evaluate her battle readiness.

All intensive refresher and team training conducted with the assistance of the training command is, of course, in addition to those drills, schools, and exercises held aboard the ship as part of the regular training program carried on continuously under the direction of the type commander.

Arrival Inspection

On reporting for refresher training, the ship will be accorded a welcome in the form of an arrival inspection. This is a combined administrative and material inspection to determine if the ship is ready to commence training. This inspection is based on the arrival inspection checkoff list. Emphasis is placed on items which if they are not in good order, would tend to handicap training. If effective effort has been made to meet requirements of the arrival inspection checkoff list, and all communication equipment is in good operating condition, the communication division will be declared ready to commence refresher training.

For the officer dealing with the training command for the first time, the refresher training period may prove a trying experience. For a period of about 6 weeks, 5 days a week, expect to be up at 0500, underway at 0600, and to return to port anywhere from 1700 to 1900.

Team Training

Emphasis during the refresher training period will be on team training. Team training consists of instruction in the techniques, methods, and procedures of operating machinery and equipment on battle and watch stations (in a team situation). The CIC team and damage control repair parties are, perhaps, the best examples of operational team performance. Effective communications also demands team performance and many of the training exercises required of destroyer types reflect this fact.

Lesson Plans and Syllabuses

Training commands in both the Atlantic and Pacific Fleets have prepared extensive lesson plans and syllabuses to assist ships in the planning and conduct of training. These references are readily available, and may be used to ensure inclusion of all important elements of team training in the ship's daily training plan. However, this in no way prevents the ship from developing her own lesson plans or syllabuses. As has been said before, this should be done by the ship long before commencing refresher training.

Underway Refresher Training

Once the refresher training period is underway, the ship is expected to perform her own training. The fleet training group will schedule exercises that require services and assign shipriders to assist in on-the-job training. These shipriders are personnel especially qualified in the various phases of shipboard operations, such as damage control, CIC, ASW, communications, etc. They assist the ship by inspecting or instructing during exercises. These same shipriders grade the ship on battle problems.

During the refresher training period, the ship schedules and conducts the various communication, damage control, gunnery, and other exercises required by the training command and applicable NWP and FXP publications for training for her type of vessel. With shipriders observing, assisting, and coaching, the ship goes through the scheduled exercises—those involving the assistance of servicing ships and aircraft—and the internal drills in damage and engineering casualty control, first aid, ABC attacks, and the like.

Battle Problems

Exercises during the early part of the training period are paced at a deliberate rate. Gradually, the number and complexity are increased, together with the emphasis on realism that is a primary factor in training.

Midterm Battle Problem

Midway in the training period, the ship will probably receive a midterm battle problem. This is an event designed to simulate as nearly as possible conditions that might prevail during actual combat, and affords the ship an evaluation of her progress in training. The fleet training group normally provides a full inspection team for this problem, and conducts a critique afterward to apprise the ship of any weaknesses in operation. Emphasis in training from this point on is directed to correct these shortcomings.

Operational Readiness Inspection

The final battle problem, or operational readiness inspection (ORI), is similar to the midterm problem. It is the official evaluation of the ship's combat readiness on completion of refresher training.

Refresher Training Summary

To review the communication officer's responsibilities for training during the period of refresher training: Remember that the basic requirements for training plans are (1) FXP 3, plus the training command's standard training requirements for your type ship; (2) arrival inspection report of deficiencies; (3) weaknesses already known to the communication officer; and (4) the daily shiprider reports submitted by the UTU listing deficiencies noted during the daily underway training.

It is important also to remember that training in communications has to be integrated with the over-all ship training schedule for any given day. Obviously, drills in shifting frequencies cannot be conducted when the ship is engaged in an exercise in which maintenance of communications is very important. Ingenuity and imagination are essential, plus of course, good commonsense planning.

The ship's daily and weekly training plans are built around the weekly operation schedule, promulgated by the fleet training group, which lists exercises to be conducted by the ship requiring services. Think and plan ahead: When the ship is scheduled for fueling from a tanker, arrange visual communication drills while joining up. Similarly, plan to conduct infrared drills with a carrier during night plane-guarding operations.

Plan daily and weekly training schedules with leading petty officers. Review the next day's training each evening for any last-minute changes. It is vital that the communication officer impress key personnel with the importance of maintaining lines of communication within the division so that personnel are briefed each day on training planned for the following day.

The training-minded communication officer also should bear in mind that the training schedule he has prepared for the refresher training period must be flexible and subject to change, depending upon conditions which may vary from day to day.

All of the foregoing are essential to the success of communication training during the refresher training period. Most important is to ensure that leading petty officers play a major role in all training.

TYPE TRAINING

Type training includes training in the various tasks assigned to naval vessels of a particular type. In type training, the self-sufficiency and smartness displayed by the ship indicate to a marked degree her state of training. This training encompasses tactics, screening, emergency ship handling, underway replenishment, rescue operations, competitive exercises, and participation in various operations—including distant deployment designed to provide training in anti-submarine warfare, air defense, or escort of convoy. Other features of type training provide annual qualification in shore bombardment, gunfire support, and so on. Communications, of course, is vital to the success of type training operations.

The primary concern of the communication officer in type training, as in all other operations, is to ensure that the media of intership exchange of information is as near perfect as possible.

Competitive Year

Closely allied with type training is the requirement for completion of certain competitive exercises by vessels of the same type. The "Competitive Year," as it is called, parallels the fiscal (or training) year, and runs from 1 July to 30 June of the following year. The Battle Efficiency Competition between ships of the same type is designed not only for training but also to serve as a measuring device for evaluation of combat readiness. Controlled exercises designated for this evaluation are taken from FXP 3, the basic training exercises publication, and are mutually agreed upon by the appropriate type commander in both the Atlantic Fleet and Pacific Fleet.

In the destroyer force, for example, orders and standards for controlled battle readiness (competitive) exercises are incorporated in a classified publication, *Orders and Standards for Battle Readiness Exercises,* short title DESBATREAD. Communication exercises are discussed in chapter 6.

The foregoing should not be interpreted to mean that only exercises listed in DESBATREAD will be conducted during the training year; they represent the type commanders' MINIMUM REQUIREMENTS for valid evaluation of the ship. Actually, these selected exercises conducted for the battle efficiency competition comprise only a small fraction of the entire type training program.

It is the communication officer's job to incorporate in the training schedule as many as possible of the communication exercises listed in FXP 3. Particular attention is required to ensure that the prerequisite communication exercises listed in DESBATREAD are completed prior to the conduct, semiannually, of the OVERALL COMMUNICATION EXERCISE for competitive purposes. The ship must prepare to conduct all applicable exercises lised in chapter 6 of FXP 3. In fact, the destroyer force commander's policy is that the squadron commander will require ships to conduct other and more advanced exercises leading to full battle readiness.

In addition to the specific criteria provided at the end of chapter 6 of FXP 3, the following considerations have been established to govern evaluation of exercises:

1. Teamwork rather than individual proficiency.
2. Efficiency in handling daily communications.
3. Alertness in handling traffic.
4. Ability to handle casualties.
5. Proficiency during fleet problems and tactical exercises.
6. Adequacy of shipboard training program.
7. Condition of registered publications and RPS files and accounts.

The above items purposely duplicate information contained in other publications, but also give the communication officer an indication of the basis on which his ship will be evaluated so that training can be planned to stress these qualities.

Division Tactical Exercises

A portion of the time allotted to type training will normally be devoted to tactical drills underway under supervision of the division commander for refresher purposes or to familiarize personnel with basic elements for naval tactics and formations. Tactical drills are both interesting and informative, and generate a high degree of enthusiasm in all officers.

Maneuvering instructions are set forth in a number of tactical publications, principally ATP 1. These instructions are important to all officers and to the communication officer in particular. Another important set of maneuvering instructions, the *Rules of the Nautical Road,* is universally applicable and must be mastered by the naval officer. Besides learning these basic maneuvering instructions, the communication officer has to be familiar with signals employed in tactical maneuvers. They are set forth in the effective edition of ACP 175. It must be the goal of the communication officer to be thoroughly familiar with this signal book and with interpretation of signals in terms of tactical maneuvering.

Destroyer Services

Rescue Destroyer

During normal type training, your ship may be assigned as rescuedestroyer. Such an assignment may come at any time, inasmuch as the destroyer is required to perform such tasks as a part of the regular routine. Proficiency in rescue work is a product of training, and it is expected that a destroyer so assigned will be ready to meet any contingency. Plane guarding, search and rescue, lifeguard, ready duty, etc., are examples of rescue destroyer assignments. Organizational requirements for these tasks will be found in the ship's organization and regulation manual. The communication officer should implement organizational requirements by appropriate preparation of the watch, quarter, and station bill for his personnel. He also must have a good working knowledge of the operational communication requirements for the various rescue destroyer tasks.

Plane Guard and Lifeguard

When ships are conducting flight or replenishment operations, they are committed to a particular course and speed, and are unable to maneuver to recover personnel from the water. To recover personnel under these circumstances, destroyers are assigned as lifeguards and plane guards whenever such operations are in progress. Lifeguards are stationed astern of replenishing or refueling ships to watch for and recover personnel who may fall into the sea.

For carrier flight operations, plane guard destroyers are stationed to act as rescue ships. In addition to rescuing personnel in downed aircraft, plane guard destroyers at night may be assigned the additional function of serving as reference vessels to indicate the horizon for the takeoff and the landing pattern for recovery operations. If a forced landing occurs in the vicinity of a carrier operating aircraft, the rescue destroyer renders assistance without further orders.

Ready Duty Destroyer

In accordance with current instructions, a ready duty destroyer is assigned for a 24-hour period each day. The purpose is to provide prompt assistance in the event that the services of a rescue destroyer are required or for other emergencies of a classified nature. For these reasons, the ready duty DD must be able to get underway on short notice. In port, the entire crew remains on board for the duration of the duty day. The signal flag ROMEO flown from the yardarm identifies the ready duty ship in port.

The communication officer has considerable responsibilities in connection with ready duty. He must have the applicable SAR communication plans and orders ready for immediate use. Additionally, ASW communication plans should be readily available in event of a requirement to get underway to investigate an unidentified submarine contact. The message from the destroyer assuming the ready duty must be prepared for release and sent promptly at 0800 on the duty day. An alert visual watch must be maintained on the signal bridge, and all required frequencies set up, tested, and properly guarded.

Assist Ship Services

Another type of service the destroyer may have to provide is that of ASSIST SHIP. The assisting ship is a target for certain gunnery exercises, or may be a target for calibration of surface radars. These and other similar examples may be included in the category of assist ship services.

Deployment Training

Current fleet operations schedules in both the Atlantic and Pacific require distant deployment to the Mediterranean, Western Pacific, and other areas for several months at a time. With regards to deployment, training is concerned with two distinct phases: (1) preparation for deployment, and (2) actual day-to-day training during deployment. Type commanders generally promulgate checkoff lists for use in preparation for deployment, although these are concerned principally with administrative items.

Insofar as communication training is concerned, the primary task is to ensure that personnel are indoctrinated in the use of special publications and techniques. In the Mediterranean, for example, allied communication publications are employed, shackle code is always used, recognition signals are set up each day, and so on. Special consideration must also be given to use of cryptographic aids because of the extensive use made of encrypted messages. Communications is on a wartime footing, and training must reflect this. Shipboard training in communications will continue, as before, to be organized and executed in accordance with the OPERATING SCHEDULE and the LONG-RANGE TRAINING PLAN. This means that the communication officer must carefully integrate training with the employment schedule so as to take full advantage of the opportunities available to develop the necessary skills in his personnel.

ANALYSIS OF TRAINING

Controlling, in its administrative sense, is evaluation of progress or results. It is concerned with determining facts relative to direction and amount of achievement so that future corrective action may be taken. Any device used to collect these facts is called a control device. Inspections are control devices used at the point of activity. The supervisor sees at firsthand what has been or is being accomplished. Because this practice is not always possible, other control devices, usually records in the case of training, are used.

Two principles must be borne in mind in establishing or using any system of control: (1) The system of control must be accurate, effective, and impartial; and (2) a practical system of control can exist only in relation to a standard.

If the communication training program has no objective, no policy, no method, none of the control devices serve any useful purpose.

Earlier in this chapter, the development of policy, objectives, and methods was discussed. These factors should be set forth in the training program. As soon as the training program gets underway, the control devices are applied.

Control Devices

The specific purposes of having a control system on the training program are to determine if (1) the objectives of the program are being met according to plan; (2) prescribed methods are used; (3) each person responsible is doing his part; (4) basic policy is observed.

Because the program is aimed at improving individuals, these additional questions must be answered:

Which individuals are being trained?
What training are they receiving?
How well are they being trained?

Inspections

Inspections as a control device for a training program do not differ materially from other inspections. The inspector has to know what he is looking for, and must use uniform standards in judging units inspected. If the inspector does not use standards, or does not obtain meaningful facts, irrelevant considerations enter into his judgment and his opinion loses validity.

Progress Charts

The primary purpose of progress charts is to display graphically the progress of the trainee. Such a chart should give essential information on the situation so that the communication officer can ascertain quickly the degree to which each trainee has completed the units of instruction, and what remains to be done. Use of checkoff lists or progress charts is essential to the training program.

Training records must be maintained not only for progress with respect to advancement in rating of the individual but also for showing qualification in team aspects such as fire fighting and damage control. Examples of many types of records that can be maintained are available, and determination of the exact format to be used is a matter of individual choice.

To summarize, the communication officer must maintain a training and educational record for each man in his division to show special qualifications set forth in the *BuPers Manual*, records of completion of training and educational courses, and progress of training for advancement in rating. A copy of such records should be prepared and posted in main radio so that the individual can note his progress.

Evaluation of Instructions

The communication officer should also check the on-the-job performance of instructor personnel of his division. Some may be graduates of the Navy Instructor's School and may actually have been assigned to instructor duties at some time. Others may not have had the benefit of such training or experience. But all Navy men must become qualified instructors, because training is a continuing process.

Basically, three factors can be employed in evaluating the instructor: (1) knowledge of subject matter, (2) knowledge and application of instructional techniques, (3) instructor characteristics (i.e. voice, diction, delivery). Both the *Shipboard Training Manual* (NavPers 90110) and the *Manual for Navy Instructors* (NavPers 16103) contain excellent checkoff lists which can serve as guides for instructor evaluation.

Efficiency of Administration and Operational Readiness

Control devices may also be applied to the following aspects of communication administration and operations to reflect the effectiveness of a training program:

1. Performance during maneuvers and exercises, including display of self-sufficiency and grades attained in exercises and inspections.
2. Military character and qualities of leadership displayed by communication personnel.
3. State of morale of communication personnel.

NAME	AN/SRT-15	TED-7	AN/GRC-27	AN/URT-7	SSB-1	AN/SRR-11	AN/SRR-13	AN/URR-21	AN/URR-35C	MOD 28 TTY	MOD 14 TTY	URM-82	AN/URA-8	AN/SGC-1A	TT-23/SG
ALLMAN, R.L. RM 1	5-7	5-5	6-1	5-6	7-2	5-5	5-5	6-12	6-15	5-8	5-8	5-10	5-13	5-13	5-12
BEATON, J.E, RM 2	5-7	5-10	6-5		7-5	5-5	5-5		6-18	5-8	5-8		5-13	5-15	5-12
DIAZ, F.J. TE(RM)3	5-10	5-12		6-5	7-5	5-5	5-7	6-14		6-1	5-10		5-18	5-21	6-1
DOBBINS, J.E. RMSN			7-1			6-1	6-1			5-9	5-9		5-15		5-29
DOVER, P.R RM 3	5-10	5-10	5-22	5-30	7-5	5-12	5-15	6-17		6-5	6-5		5-15	5-13	6-1
GOSHERT, J.D, RMSN				6-10		6-5	6-5			5-21	5-21		6-5		
JOHNSON, J.C.TE(RM)3	5-11				7-9	5-17	5-20	6-15	6-3	5-9	5-10			5-15	6-5
LUCHTE, A.J. RM 3	5-7	5-12			7-9	5-5	5-2		7-1	6-5	6-4	5-12	5-21	6-5	5-27
McGILVARY, D.E, TE(RM)3						6-2	6-15			6-30	7-5		8-1		
OSOWSKI, D.J, RMSN			7-5		7-13	5-2	5-2	7-1		5-18	5-15				
RATHBUN, G.L. RMSN					7-15	5-4	5-4			5-10	5-10				
RODERMUND D.W. RM 2	5-7	5-12	6-1	6-15	7-10	5-12	5-12		7-5	5-8	5-8	6-2	5-13	5-25	5-12
RUTHERFORD, J.N. RMSN	5-30	6-2				5-18	5-21		7-5	6-1	6-1				
WILBER, C.H TE(RM)3	5-16	6-1	7-8			5-17	6-1	7-12		5-8	5-9		6-5	6-15	6-3
WILLIAMSON, R.E. RM2	5-8	5-11	5-30	5-27		5-5	5-5	6-15	6-15	5-8	5-8	5-15	5-13	5-20	5-12

Figure 9-4.—Equipment qualification chart.

4. Material condition of the communication spaces and equipment, including ability of personnel to take corrective action promptly when material casualties occur.
5. Proportion of men engaged in bettering themselves by educational pursuits and percentage passing fleet exams for advancement in rating.
6. Speed, orderliness, and efficiency with which drills and daily evolutions are carried out.
7. Smart appearance of communication spaces and personnel at all hours.
8. Knowledge demonstrated by personnel in such matters as insurance, savings programs, ship's regulations, and operating schedule.

SUMMING UP

Responsibility for Training

U.S. Navy Regulations and NWP 50 amply state the training responsibilities of all officers. It, therefore, is not necessary to elaborate here on the subject of responsibility. Suffice it to say that the communication officer has full responsibility for the training of his personnel in all the many and varied phases of communications, and must prepare himself accordingly.

The communication officer aids and advises the operations officer in the administration of training within the division, and coordinates the program with the departmental and over-all training program of the ship.

A review of the duties normally associated with administering training within the communication division includes the following:

1. Plan, develop, and coordinate the division training program in accordance with the departmental and ship's training objectives.
2. Plan, develop, and ensure the preparation of division training schedules, and obtain space and materials required to support these schedules.
3. Select and train instructors within the division.
4. Supervise preparation of training materials, and review syllabuses and lesson plans prepared within the division.
5. Obtain, maintain custody, and issue required training aids and devices.
6. Supervise preparation, administration, and correction of tests in practical factors within the division, and arrange for examinations for advancement in rating.
7. Observe instruction given at drills, on watch, and on stations, and make recommendations as appropriate.
8. Maintain training records and prepare required reports.
9. Keep personnel informed of training progress, using charts and other records.
10. Submit requests to the operations officer to schedule drills and exercises.
11. Keep communication division personnel informed of available training courses, correspondence courses, fleet and service schools, and encourage their use.
12. Consult with the operations officer in all training matters affecting the division.

A QUESTION OF KNOWLEDGE

Ideally, an officer should be able to do the work of any man serving under him. If he not only has this capability, but demonstrates it so that his men begin to understand that he is thoroughly versed in the work problems which concern them, he can command them in any situation. This is the real foundation of command capacity, and nothing else so serves to give an officer an absolutely firm position with all who serve under him.

The greater part of modern naval operations, however, is noted for its diversity and complexity. Instead of becoming more simplified, the trend nowadays is toward greater elaboration. Therefore, it is virtually impossible to expect any general line officer to know more about radio repair than his technicians, or more about the workings of the ECM gear than a specialist in electronics repair.

It readily can be understood that there must be a different approach to the question of what kind of knowledge an officer is expected to possess, otherwise the requirement would be unreasonable and unworkable. The distinction lies in the difference between the ability to do a thing well and that of being able to judge when it is well done.

Leadership Teaches

Training without leadership (or vice versa) is impossible. Whatever his rank, the naval officer stands before his subordinates as a leader. Whether he is training men for action, or merely performing some routine duty, he represents naval leadership to those under him. Matters of correct attitude, personal conduct, and awareness of moral obligations and of obligations to the Navy and the men he commands do not lend themselves to control by a set of rules. They must be lived by the individual. The naval officer must set a high standard, and inspire confidence in those under him. In the final analysis, the success of any officer's efforts depends upon his setting the very best example in everything he does, and practicing what he preaches.

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CHAPTER 10

SECURITY

INTRODUCTION

Security is a means—not an end. All the rules and regulations which are spelled out in the many directives on the subject of security will not guarantee results. In a sense absolute security can be obtained easily by locking all classified matter in safes and throwing away the keys. Everything would then be safe except our country because the people who need to know classified information in order to do their jobs would be working in a vacuum. In administering security it is important that a balanced and commonsense outlook be maintained. Security is a personal and an individual responsibility. Each of us must learn to exercise proper discretion in carrying out all our duties so that maintenance of proper security is an automatic and integral part of our work. Knowledge or possession of classified material is permitted only to persons having a "need to know." We must all suppress our natural desire to have the inside information in order to ensure that we do not inadvertently disclose classified information to unauthorized individuals.

Classifications

Material which is considered to be of such importance that its disclosure to unauthorized persons would be detrimental to our defense effort is said to be classified. "Classified material" is any matter, document, product, or substance on or in which classified information is recorded or embodied. Three general categories of classification are authorized for such material. They are in descending order of importance: Top Secret, Secret, and Confidential.

Top Secret

Top Secret material or information is that of which the defense aspect is paramount, and the unauthorized disclosure of which would result in exceptionally grave damage to the Nation. Such grave damage might consist of but is not limited to—

1. Leading to a definite break in diplomatic relations affecting the defense of the United States, an armed attack against the United States or her allies, or a war.
2. The compromise of military or defense plans, or intelligence operations, or scientific or technological developments vital to the national defense.

Notice the words "grave," "definite," "attack," "war," and "vital." As here used they are words of emphasis. Top Secret material is of tremendous importance to our country. For this reason the classification Top Secret should not be used indiscriminately, but orginators should ensure that if a Top Secret classification is required, it is assigned.

Secret

The classification Secret shall be limited to defense information or material the unauthorized disclosure of which could result in serious damage to the Nation. Its disclosure might jeopardize the international relations of the U.S., endanger the effectiveness of a program or policy of vital importance to national defense, compromise important military or defense plans or technological developments, or reveal important intelligence operations.

Confidential

The Confidential classification is limited to defense information or material, the unauthorized disclosure of which could be prejudicial to the defense interest of the Nation.

The term Confidential—Modified Handling Authorized may be used to identify certain categories of Confidential information requiring lesser security safeguards in stowage and transmission. These are specifically defined in the *Department of the Navy Security Manual for Classified Information.*

Proper Classification

The important words in the three definitions, in descending order of importance, are grave, serious, and prejudicial. It would seem that there is much room for interpretation in such wording. As a guide the effective OPNAVINST of the 5510.1 series, called the *Department of the Navy Security Manual for Classified Information,* has been issued by the Chief of Naval Operations and lists various illustrative examples of the type of material which should be included in each category. In addition, commands are designated which are authorized to classify information Top Secret, Secret, and Confidential. It is important that each drafter recommend the security classification which he is convinced the information or material requires. If such classification is higher than his commanding officer is authorized to assign, the document should be forwarded to higher authority.

Overclassification

Overclassification causes as much harm as underclassification. One often hears that in classification one should err on the high side. This is not true. Overclassification causes an increase in administrative handling to such degree that vital information may be dangerously delayed. The lowest classification consistent with the requirements for safeguarding material and information is the correct classification.

CLEARANCES

Personnel authorized access to classified information must be—

1. Of unquestionable loyalty, integrity, and trustworthiness.
2. Of excellent character and of such habits and associations as to cast no doubt upon their discretion or good judgment in the handling of classified information.

Types of Investigations

There are two types of personnel security investigations—the national agency check (NAC) and the background investigation (BI).

A national agency check consists of the investigation of records and files of the following agencies, as appropriate:

1. Federal Bureau of Investigation.
2. Office of Naval Intelligence.
3. Assistant Chief of Staff, Intelligence, Department of the Army.
4. Office of Special Investigations, Inspector General, U.S. Air Force.
5. Civil Service Commission.
6. Immigration and Naturalization Service.
7. Central Index Personnel and Facility Security File.
8. Bureau of Naval Personnel and/or Headquarters, U.S. Marine Corps.
9. Other agencies as determined by the Chief of Naval Operations (Director of Naval Intelligence).

The background investigation is much more extensive than a national agency check. It is designed to develop information as to whether the access to classified information by the person being investigated is clearly consistent with the interests of national security. It inquires into the loyalty, integrity, and reputation of the individual. It consists of the following elements:

1. National agency check.
2. Verification of birth records.
3. Education, including verification of last school or college attended, checking school records, and interviewing people who knew the individual while at school.
4. Employment—examination of records of present and past employment to determine period of service and efficiency record. Fellow employees are interviewed to determine character and reputation.
5. References—an interview of the majority of individual's references plus others who have knowledge of subject's background and activities.
6. Neighborhood investigation as deemed necessary to substantiate or disprove derogatory information.
7. Criminal records including police and law enforcement agency records in areas where individual has resided for substantial periods.
8. Military service—length of service and type of discharge.
9. Foreign connections—connection individual has had with foreigners or foreign organizations both in the U.S. and abroad.
10. Citizenship status.

Interim and Final Clearances

Security clearance is an administrative determination that an individual is eligible, from a security standpoint, for access to classified information. It is emphasized again that merely because an individual is "cleared" for Secret does not mean he may have access to all Secret material or information. He also must "need to know."

Security clearances are of two types:

1. A final clearance is granted upon completion of all the various investigative requirements for the particular degree of clearance.
2. An interim clearance is a determination of temporary eligibility for access to classified information. It is granted as the result of a lesser investigative process. It is to be granted only when the delay in waiting for completion of the necessary steps for final clearance would be harmful to the national interest. All requests for necessary investigations to enable a determination of final clearance to be made should be initiated simultaneously with the procedures to issue an interim clearance.

Granting and Recording Clearances

Security is a function of command. In spite of the fact that the various investigations are carried out by naval intelligence, the final decision to grant clearance is made by the individual's commanding officer or immediate superior. The commanding officer must ensure that necessary steps are taken to initiate the request for proper investigation and, when completed to his satisfaction, he issues the clearance.

The mechanics of preparation of requests for background investigation and/or national agency checks may vary among commands. On your ship, ensure that such a procedure exists. The request may be prepared in the executive officer's office, the captain's office, or even the operations officer's office. The important thing is that it be done. As communication officer you will have direct responsibility for the performance of the crypto board, and assignment to such board is dependent on proper clearances.

Check each new officer's record. It may already contain evidence of a proper security check. If it does, well and good; if it does not, ensure that a request for investigation is properly prepared for the captain's signature. It is the policy of the Navy Department that individual clearances be granted as the result of previous investigations whenever feasible.

Each clearance will be indicated by properly executing a Certificate of Clearance, OPNAV Form 5521-429. The certificate should be made a permanent part of the individual's service record. For final clearances the original of the certificate of clearance must be forwarded to the Chief of Naval Personnel or Commandant of the Marine Corps, as appropriate, for inclusion in the individual's personnel record. The original and all copies are signed by the commander granting clearance, and the ship's seal is properly affixed. Except where the clearance is granted as the result of a background investigation or national agency check, issuing a certificate of clearance to handle Confidential matter is not necessary. No individual should be issued a personal copy of his certificate of clearance, although he may be authorized to carry his records containing such certificate. A statement setting forth the degree of clearance may be included in letters or official orders when necessary.

Investigation Requirements

Prior to being authorized to handle classified material, certain minimum investigative requirements must be met which vary with the category of classification. The requirements as they apply to military personnel are as follows:

1. Top Secret:
   a. Final clearance:
      (1) Background investigation; or
      (2) National agency check plus continuous honorable service in the armed forces, or a combination of such active duty and civilian employment in the Government service for 10 consecutive years immediately prior to the current investigation; or
      (3) Serving in a specific office in the naval establishment to which appointed by the President by and and with the advice and consent of the Senate.

b. Interim clearance:
   (1) National agency check; or
   (2) Continuous honorable service in the armed forces, or a combination of such active duty and civilian employment in the Government service for 5 consecutive years immediately preceding the current investigation plus a check of ONI case history files and Bureau of Naval Personnel or Headquarters, U.S. Marine Corps files.

2. Secret:
   a. Final clearance: national agency check.
   b. Interim clearance: Check of ONI case history files and Bureau of Naval Personnel or Headquarters, U. S. Marine Corps files.
3. Confidential:
   a. Final clearance: No formal investigation required providing the records available to the issuing command contain no derogatory information.
   b. Interim clearance: None required.

Security investigations will remain valid and may serve as the basis for issuance of future clearances unless—

1. Derogatory information becomes available, indicating a need for further investigation; or
2. The individual is assigned to a particularly sensitive billet requiring greater clearance than indicated above; or
3. Continuous active service in the armed forces and/or civilian employment in the Government is broken by a period longer than 90 days.

PHYSICAL SECURITY

Physical security has to do with safeguarding classified information by physical means. It includes the storage and custody of the material; accounting for its use, disposition, or destruction as required; transmission, and dissemination. In other words, here we are concerned with the ways to prevent unauthorized persons from obtaining physical custody of classified matter. Naturally, if the clearance procedures previously discussed in the chapter fail, allowing disloyal persons to have access to the classified material, no amount of emphasis on physical security will safeguard it. One should never forget that wars are fought by men, and man is the ultimate weapon.

Stowage and Custody

Classified material not in actual use by appropriately cleared personnel or under their direct personal observation, should be stowed in a prescribed manner. It stands to reason that the physical makeup of the stowage facilities must afford a greater degree of safety for Top Secret material than for Secret. Similarly the safety standards are higher for Secret than for Confidential.

To provide a specific basis for establishing security protection for the various categories of classified material, the numerical evaluation for classified material in stowage has been developed. This sytem is designed to enable any officer responsible for classified material to determine that an adequate level of protection is attained.

The system, covered in detail in the *Department of the Navy Security Manual for Classified Information* makes use of two tables. They are:

1. A table of numerical equivalents, which establishes numerical values for various items which individually or collectively may be incorporated in the stowage protection system. (Refer to table A.)
2. An evaluation graph, which establishes minimum levels of required protection based on the classification and the strategic and intrinsic importance of the material concerned. (See fig. 10-1.)

The numerical evaluation system is used as follows:

1. Select appropriate numerical equivalents for each applicable element in the security program, as set forth in table A, and total them. A value must be assigned for each lettered subsection in the table, but only one value will be used for each subsection except paragraph 1 of table A. In that case two values may be used, if appropriate. Thus, for paragraph 1a, a metal, combination lock used aboard a commissioned ship would be 15 plus 15 or 30. The number 30 would then be added to the figures from each of subsections 2 through 5, taking one from each lettered subsection, interpolating as necessary to reflect the existing situation.

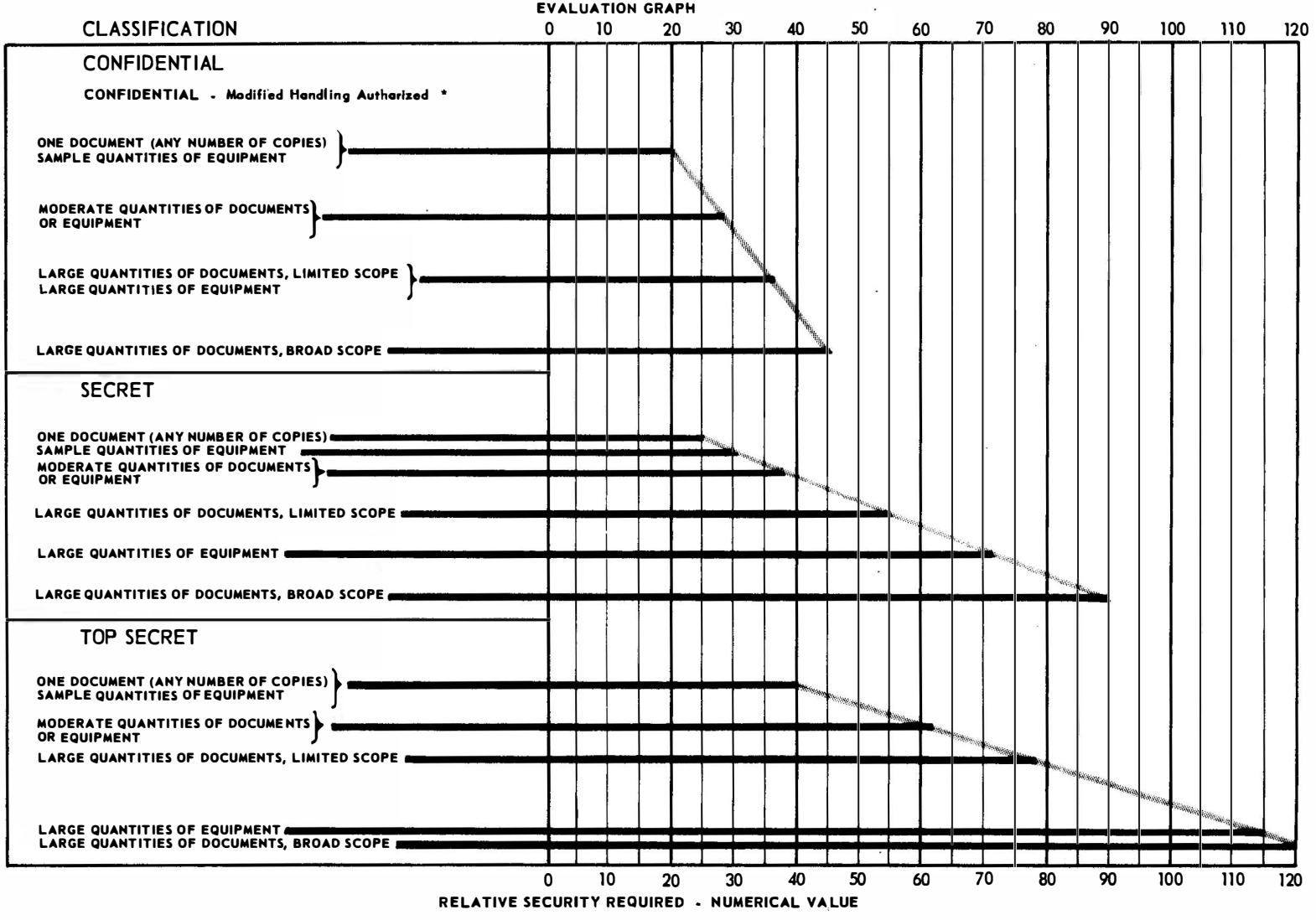
Table A.—Table of Numerical Equivalents

Element of Security	Value
1. Stowage container (two items may be selected where applicable).	
a. None	0
Portable, any type	0
Wood, any lock	2
Metal, key lock	5
Light room or building	10
"In service" ship or MSTS charter vessel	10
*Metal, combination lock	15
Heavy room or building	15
Commissioned ship	15
*T-20 safe	20
*Light vault	20
*X-60, TX-60, or TR-60 safe	30
*Merchandise vault	35
*Bank vault	40
2. **Guarding.	
a. None	0
Civilian watchman in general area	5
Civilian watchman check of container every 2 hours	10
Civilian watchman check of container every hour	15
Civilian watchman check of container each ½ hour	20
Civilian watchman in attendance at container	25
Military guard in general area	15
Military guard check of container each hour	20
Military guard check of container each ½ hour	25
Military guard in attendance at container	35
b. No supporting guard force	0
Supporting guard force—Civilian	10
Supporting guard force—military	20
c. Aboard ship in areas where only ship's company have access or visitors are under constant escort	25
3. Protective alarm system (refer to appendix 1).	
a. No alarm on container	0
System to detect opening container	15
System to detect opening or tampering with container	20
System to detect opening or tampering with and approach to container	30
b. No general area alarm	0
System to detect entry into general area	25
4. Control of personnel access to container when closed or to contents when open.	
a. System necessary but not in effect	−20
System not required	0
System in effect	5
5. Separately protected surrounding area.	
a. None	0
Controlled area, security measures	5
Limited area, security measures	10
Exclusion area, security measures	15

*If equipped with so-called "manipulation-resistant" or "manipulation-proof" combination lock, add 5 points.

**No value shall be allowed if guards or watchmen assigned to protect United States installations abroad are non-United States citizens. Where policy prevents the use of firearms by guards or watchmen, indicated values shall be reduced by one-half.

EVALUATION GRAPH
0 10 20 30 40 50 60 70 80 90 100 110 120
CLASSIFICATION



* DOCUMENTS AND MATERIAL DESIGNATED CONFIDENTIAL-MODIFIED HANDLING AUTHORIZED WILL NORMALLY BE STORED IN THE SAME MANNER AS OTHER CONFIDENTIAL MATERIAL. WHEN THIS IS NOT FEASIBLE, SUCH DOCUMENTS AND MATERIAL WILL BE STORED IN A CONTAINER EQUIPPED WITH A REASONABLY SECURE LOCKING DEVICE OR IN ANY OTHER MANNER DETERMINED BY COMPETENT AUTHORITY WHICH WILL AFFORD ADEQUATE PROTECTION. THIS DOES NOT PRECLUDE A MORE SECURE MEANS OF STORAGE IF DESIRED.

Figure 10-1.

2. In figure 10-1 select from the left of the graph a subcategory which best describes the material to be stowed. Here again interpolation may be used. Moving across the graph to the right to the slanted line for the appropriate classification and then down to the bottom line gives the numerical value which must be equaled if the stowage is to be considered adequate. If the present stowage is inadequate, immediate steps must be taken to meet the prescribed standard.

Accounting

All Top Secret documents and equipment must be serially numbered. At the time of preparation each document or equipment is numbered as follows:

Copy No.____ of ____ copies.

Top Secret documents may be reproduced only with the express permission of the originator or higher authority. In the event higher authority grants permission, the originator should be informed immediately and the reproduced copies serially numbered. If a command has custody of copy number 12 of a Top Secret document and makes three additional copies, a suggested serialization system might be:

Copy No. 12/1 of 3 copies.

A continuous chain of receipts for Top Secret information and a list of names of all persons having knowledge of a particular item must be maintained. Such control procedures are the responsibility of the Top Secret control officer.

Each command is required to establish administrative procedures for recording all Secret material originated and received, and maintain a receipting system for such material distributed or routed within the command.

A system which will ensure accountability for all Confidential information originated or received by a command must also be maintained.

Disposition and Destruction

Classified material which is not required should not be allowed to accumulate. It should either be sent to stowage at a naval records management center or be destroyed. The effective revision to SECNAV Instruction 5212.5 relates the procedures for transferring records. In the case of classified material so forwarded, the proper safeguards must be taken to ensure against loss or compromise. Extra copies and nonrecord material may be destroyed after their usefulness has been served.

Classified documents should be destroyed either by burning or pulping. Burning is the most commonly used method in the fleet. Pulping may be used for destruction of classified RPS-distributed documents only when a pulping machine approved by CNO is available. The pulp should be inspected regularly to ensure complete destruction.

When classified papers are burned, such destruction must be witnessed by two commissioned officers. If sufficient officers are not available, warrant officers, enlisted men, or civilians may witness the burning, provided they are cleared at least for the highest category of material being destroyed. The witness must watch the burning until the destruction is complete, after which the residue should be completely obliterated by scattering or reduction to sludge. When appropriate, a certificate of destruction should be prepared and signed.

We have been speaking here of routine destruction of classified material under conditions which allow regular safeguards to be used. It should be recognized that in time of war, emergency destruction might be necessary to prevent vital information from falling into the hands of an enemy. All ships have a bill designed for such an eventuality. Such a bill is discussed in more detail in chapter 8 of this text.

Transmission

Classified material must be safeguarded during transmission from one place to another as well as when held within a single command. Due to the very nature of the problem, compromise or loss is more probable at this time than any other. As a result, specific rules have been set up to ensure maximum security consistent with the need for rapid communication of the information.

Top Secret material may be transmitted in one of three ways:

1. Direct personal contact of officials concerned;
2. Armed Forces Courier Service;
3. Electric means in encrypted form.

The United States postal system may not be used to transmit Top Secret nor may that of any foreign nation. Secret may be transmitted by any means authorized for Top Secret and in addition U. S. registered mail may be used. Confidential may be transmitted by any means authorized for Secret, or by U.S. certified mail. Exceptions: Confidential cryptographic and cryptologic material, Confidential RPS distributed material and Confidential material of CENTO, NATO, and SEATO may not be transmitted by U.S. certified mail.

All of the above rules apply within the continental United States only. When the national borders must be crossed, the above rules are modified slightly. Secret and Confidential can be transmitted by U.S. registered mail provided it stays within the U.S. military postal channels. Within the continental U.S., Canada, and Alaska, Secret and Confidential may be sent by registered mail with registered mail receipt. Confidential—Modified Handling Authorized may be sent by regular first class mail which is under the control of the U. S. or Canadian Governments.

Commanding officers are authorized to establish systems for the transmission of classified material within the confines of their commands. Such systems must ensure that—

1. Top Secret material is always controlled by Top Secret control officers.
2. Top Secret material is transmitted only by commissioned or warrant officers who have been granted Top Secret security clearance.
3. Personnel transmitting Secret or Confidential material have security clearances for the highest category they are allowed to handle.
4. Personnel whose primary duties involve transmission of classified material are authorized in writing for such duties.
5. All personnel entrusted with transmitting classified material are properly instructed as to their duties.

Armed Forces Courier Service (ARFCOS)

The Armed Forces Courier Service is a joint agency of the three military departments to provide for the secure and expeditious transmission of material requiring protected handling by an officer courier. Security is paramount—speed secondary.

A series of courier transfer stations have been set up within the various Navy, Army, and Air Force commands in the United States and overseas. Each transfer station serves the various commands in its area by arranging expeditious transmission of the authorized classified material which is originated by or addressed to them. During transit the material normally is placed in custody of a designated courier. The courier is designated by the officer in charge of courier transfer station, called the courier transfer officer. If no qualified officer is available to be designated courier, the courier transfer officer may act in that capacity himself to expedite movement of classified matter.

The courier normally is designated from among the passengers traveling in the same ship, aircraft, or vehicle. Any officer of the armed forces who has written evidence that he is cleared for Top Secret can be designated a courier regardless of the mode of travel. Such evidence of clearance is not required for designation of an officer as a courier for transmission of ARFCOS material on a flight between two ARFCOS stations. A specifically designated Department of State courier may be additionally designated to convey ARFCOS material. Instructions covering the designation of couriers are included in OPNAV Instruction 2260.1A or subsequent revisions. Suffice it to say that by designating an officer who is traveling to the destination of the material as courier, it is possible to ensure the security of the material throughout its transmission. Prior to departure the courier inventories and signs for the material from one courier transfer officer and on arrival delivers it to another; or, if he is going to the same destination, he may be ordered to deliver the material directly to the addressee.

The following types of material are authorized for entry into the Armed Forces Courier Services:

1. Top Secret material.
2. Qualified cryptographic material.
3. Qualified cryptologic material.
4. Qualified registered publication system material.
5. Communication material which cannot be transmitted electronically because of circuit casualties and which is certified to require urgent delivery.
6. Material approved by the Chief of Naval Operations.

7. Material which cannot be maintained in U.S. custody by any means other than an officer courier.
8. State Department diplomatic pouches.
9. Qualified material of the Central Intelligence Agency.
10. Qualified material of the National Security Agency.

Dissemination

Classified material, to be useful, must be made available to those who "need to know." At the same time security demands that classified information not be disclosed needlessly. No person is entitled to knowledge or possession of classified information solely by virtue of his rank, office, or position. Responsibility for determining whether a person's official military or other Government duties require that he possess or have access to any classified information, and whether he is authorized to receive it, rests upon each individual who has possession, knowledge, or command control of the information involved, and not upon the prospective recipient. This is important. You, as an individual having possession of classified matter, are responsible for ensuring that a potential recipient "needs to know" and possesses proper clearance.

We discussed earlier the requirement that Top Secret material be controlled by a system of continuous receipts. In addition a disclosure record form must be attached to each Top Secret document within a Navy command or activity, and each individual gaining knowledge of its contents is required to place his name on the form. The disclosure form should remain attached to the document as long as it is held by the activity. In case the material is transmitted to another activity, the disclosure sheet is removed and kept on file for 1 year, after which it is sent to a records center for retention. Similar regulations apply to oral discussions of Top Secret information. The minutes of a conference should include the names of all person in attendance.

Transmission Security

Transmission security is that component of communication security which results from all measures designed to protect transmission from interception, traffic analysis, and imitative deception. Every means of transmission is subject to interception. In the case of radio transmission we must assume that all transmissions are intercepted. To assume anything less is dangerous.

Basic Elements

Certain basic elements improve transmission security. They are:

1. Circuit discipline and operator training.
2. Defenses to minimize interception and direction finding.
3. Defensive measures against traffic analysis and imitative deception.

Means of Transmission

Within the requirements of precedence and security, the most appropriate means of transmission should be selected. The generally available means of transmission in order of security are these:

1. Messenger authorized to carry classified material;
2. Registered mail;
3. Approved wire circuit;
4. Ordinary mail;
5. Nonapproved wire circuit;
6. Visual;
7. Sound systems;
8. Radio.

Speed Versus Security

The three fundamental requirements of a military communication system are reliability, security, and speed. Reliability is always paramount. Security and speed are next in importance, and, depending on the stage of an operation, are interchangeable. For instance, during the planning phase, security is obviously more important than speed. During the execution phase, speed surpasses security in importance. This is not to say that either can ever be ignored completely. Modern high-grade crypto systems permit security with speed. However, in tactical operations, when speed is so important that time cannot be spared for encryption and the transmitted information cannot be acted upon by the enemy in time to influence current operations, messages of any classification except Top Secret may be transmitted in the clear over any non-approved wire or radio circuit. Each message must be approved and released separately. Linkage to previously encrypted messages should be avoided. Such transmissions

include the word CLEAR at the beginning of the text to indicate the message contains classified material. Upon receipt, such message is marked "Received in the clear" and is handled as Confidential. If the information must be further transmitted, an entirely new message should be drafted.

Wire Systems

There are two categories of wire systems with respect to transmission of classified information. They are approved and nonapproved. Such wire systems include telephone, telegraph, teletypewriter, and facsimile facilities.

The many requirements to be met prior to designating that a wire circuit is approved will not be taken up in this text. An approved circuit may be designated as such only by the various Chiefs of Staff or the Chief of Naval Operations, the supreme commander of a theater of operations, or such officers as they may designate. The number of approved circuits should be kept to a minimum consistent with operational requirements. Each approved circuit is rated according to the highest classification of information authorized to be transmitted over it in the clear. Under no circumstances, however, will information classified higher than Secret be so transmitted. With the exception of those situations previously discussed, where speed is more important than security, no classified information may be transmitted in the clear over nonapproved circuits.

Visual Transmission Security

The various means of visual transmission, in order of security, are these day and night groups:

Day:

1. Hand flags;
2. Directional flashing light;
3. Panels;
4. Flaghoists;
5. Pyrotechnics;
6. Nondirectional flashing light.

Night:

1. Infrared communication systems;
2. Directional flashing light;
3. Pyrotechnics;
4. Nondirectional flashing light.

Transmission by visual means, of a classified message, in plain language is authorized only after careful consideration has been given to the possibility of interception by unauthorized persons. The aperture of directional flashing light equipment will be kept as narrow as possible and filters used to reduce the detectable range at night. Under no circumstances will translations of encrypted messages be transmitted by visual means. This subjects the cryptosystem to possible compromise and that is a serious security violation.

Radio Transmission Security

When a message is transmitted by radio, it is sometimes possible to know a few of the receivers, but all of them will never be known. It must be assumed that the enemy receives every transmission. Properly prepared messages using modern cryptosystems may prevent the enemy from understanding the message but he still can learn a lot. For instance, as the time of a planned operation approaches, the number of messages transmitted increases so markedly that, although the enemy may not be sure of its exact nature, he knows that something will soon break and he can alert his forces accordingly. STRICT RADIO SILENCE IS THE PRIMARY DEFENSE AGAINST RADIO INTELLIGENCE.

The amount of radio traffic is not the only indicator used by the enemy. He can be expected to run statistical studies of message headings, receipts, acknowledgments, relays, routing instructions, and services. Communication experts can learn much about our operations, past and future, from such studies. By means of direction finders they determine from where the messages are transmitted—a valuable aid in their studies.

Although we cannot prevent traffic analysis by the enemy, it can be made more difficult and less reliable. Such measures as the following can be taken;

1. Maximum use of communication means other than radio.

2. Maintenance of strict circuit discipline.
3. Use of the broadcast method where possible.
4. Rotation of call signs and address groups.
5. Reduction of use of service messages.
6. Use of codress messages when authorized.
7. Encryption of all classified messages.
8. Reduction of test transmissions to minimum.
9. Avoidance of use of external routing instructions.

Circuit Discipline and Operator Training

You, as a communication officer, can do something to improve transmission security. You must train your radio operators to adhere to prescribed circuit procedures. The importance of this is emphasized by the fact that radio is inherently the least secure means for transmitting messages. No variations, elaborations, or shortcuts in prescribed procedures are acceptable. Even individual operators are recognizable by skilled Radiomen. Training should be such as to produce anonymity.

The following practices which endanger communication security must be avoided.

1. Linkage or compromise of encrypted call signs and address groups by association with their unencrypted versions. Example: Use of unencrypted call signs in the callup, and encrypted call signs in the message heading.
2. Misuse and confusion of call signs, routing indicators, address indicating groups, and address groups by association with other call signs, routing indicators, address indicating groups, and address groups. This could result in the nondelivery of an important message, a compromise, or the linking of classified and unclassified call signs and address groups.
3. Violation of radio silence.
4. Unofficial conversation between operators.
5. Transmission in a directed net without permission.
6. Excessive repetition of prosigns or operating signals.
7. Individual mannerisms in transmitting.
8. Use of plain language in place of applicable prosigns or operating signals.
9. Use of unauthorized prosigns.
10. Unnecessary transmissions.
11. Identification of unit locations.
12. Identification of individuals belonging to an organization.
13. Excessively long calls. A unit may fail to answer, when called, due to a condition of radio silence. Put the message on a fleet broadcast or transmit to any available station, using indefinite call signs if necessary, rather than continuing to call. Blind transmissions are sometimes useful.
14. Failure to stand prescribed radio watches.
15. Transmitting at speeds faster than the receiving operator's ability to copy.
16. Use of excessive transmitting power.
17. Tuning transmitters with antennas cut in.
18. Excessive waste of time tuning, testing, shifting frequencies, or adjusting equipment. Drill your Radiomen to use their equipment properly. This is the job of a Radioman, not an Electronics Technician.
19. Operating equipment off frequency. This can cause excessive repetition or even failure to establish communication and increases the enemy's chances of interception and direction finding. Operate transmitters within allowed tolerances and check guard receivers on frequency at least once an hour.

Radiotelephone

Most radiotelephone nets are operated at such high frequencies that some operators tend to be careless and thus security suffers. There are too many cases of interception of VHF transmissions at distances of many thousands of miles for this condition to continue. A large percentage of those using radiotelephone nets are officers, many quite senior, so your problems in educating the operators will be complicated. Certain rules apply, and all persons having occasion to use a radiotelephone should be thoroughly familiar with them. They are:

1. Use each circuit for its intended purpose only. Keep the number of transmissions to a minimum.
2. Think out contents and wording before starting the transmission in order to reveal no information of military value, even by implication.

3. Write the message before transmission if practicable.
4. Keep all transmissions brief, concise, and clear.
5. Transmit no classified information in plain language, including plain language references to classified titles, units, places, chart references or persons which may reveal the nature of the headquarters, task force, or other unit concerned.
6. Avoid linkage between radiotelephone call signs and any other call signs.
7. Follow prescribed radiotelephone procedure outlined in chapter 6 of this text.

Classified Material Control Officer

The commanding officer or officer in charge of each ship, activity, or facility where classified material is handled is required to designate an officer to serve as classified material control officer. This duty may be assigned as a primary and collateral duty. It may be assigned to the communication officer or one of his assistants.

The classified material control officer performs the following duties:

1. Serves as the commanding officer's advisor and direct representative in cases pertaining to security of classified material.
2. Assures that all persons who are to handle classified information are properly cleared and instructed.
3. Formulates and coordinates security control measures within the command.
4. Maintains a program of declassification and down grading of information.
5. Prepares classification guides for approval by his commanding officer. They are used to provide guidance for proper classification of material originated within the command. Preparation of such guides is usually limited to shore activities, bureaus, and large afloat staffs.
6. Exercises security control over visits to and from the command.
7. Initiates action to correct erroneous classifications assigned by subordinates of the command.
8. Maintains records of current classification of information for which the command is responsible.
9. Reviews proposed press releases and indicates classified information which must be deleted therefrom.
10. Performs the duties of Top Secret control officer if a separate officer is not so designated.

Top Secret Control Officer

A Top Secret control officer is designated for all commands which initiate, receive, or process Top Secret documents. The Top Secret control officer is subordinate to the classified material control officer. He is responsible for the receipt, custody, accounting for, and distribution of Top Secret information within the command and its transmission outside the command.

The following basic rules govern the performance of Top Secret control officer's duties.

1. Avoids unnecessary dissemination of Top Secret information.
2. Releases to a subordinate echelon only the absolute minimum of Top Secret information necessary for proper planning or action.
3. Transmits Top Secret information within the command by direct personal contact.
4. Maintains a continuous chain of receipts for Top Secret material.

Cryptosecurity Officer

The commanding officer or officer in charge of any activity having cryptomaterial assigns responsibility for cryptosecurity to a suitable officer. This designated officer will be either the communication officer or one of his assistants. The cryptosecurity officer is responsible for the accurate, secure, and efficient operation of the cryptocenter.

The cryptosecurity officer, together with the commanding officer, executive officer, communication officer, and any member of the cryptoboard having access to cryptomaterial which requires cryptographic clearance must have a cryptographic clearance. The procedures to obtain a cryptographic clearance are similar to those for Top Secret except that such clearance may be issued only to persons under his command by a commanding officer who has

himself received cryptographic clearance. If you are a cryptosecurity officer, and a change of command takes place, ensure that your new commanding officer receives a cryptoclearance from his immediate superior. The effective OPNAV Instruction of the 5510.37 series covers the subject of cryptographic clearances.

The following are among the duties of the cryptosecurity officer:

1. Provides for and supervises the training of all crypto personnel. Recommends cryptoboard members for qualification by the commanding officer.
2. Ensures that all suspected compromises or violations of security are reported promptly. Great danger to the safety of the nation can result from failure to report a compromise.
3. Ensures that a qualified cryptoboard member is available at all times to encrypt and decrypt messages.
4. Requests message drafters to make changes as necessary to prevent errors of classification and precedence.
5. Supervises cryptoboard personnel in performing their duties.
6. In the event a cryptosystem has been declared compromised, he determines those messages originated and encrypted locally in that system, and reports their contents to his commanding officer. The commanding officer should then report to his immediate superior in command any compromise of significant information.

CHAPTER 11

ENTERING AND LEAVING PORT

GENERAL

Two officers were driving down one of the causeways which run between Miami and Miami Beach. A destroyer was standing in and was a beautiful sight to behold. The ship was well painted, her numbers and waterline sharp. The crew was at division parade in sparkling whites. She was flying new colors which snapped briskly in the breeze. A Signalman transmitting a message to the tower, at about 10 words per minute, attested to the high degree of competence of her crew. As professional naval officers the observers were impressed and properly proud of the appearance of this destroyer.

The casual observer may have taken this destroyer's appearance for granted, but the two Naval officers were aware of the many tasks that must have been accomplished in order to produce such a smart ship. Even as they watched the engineers were standing a taut watch below in a temperature of 115°; radiomen were copying broadcast schedules and guarding harbor circuits; and a watch was available on the quarterdeck to effect a smooth transition to the inport routine immediately after mooring. This destroyer may have made it look easy, but many hours of advance preparations had been spent. Let us examine some of the advance preparations required as they apply to the communication department.

PRIOR TO ENTERING PORT

Assume that you are communication officer of a destroyer and that your ship is expected to arrive at Norfolk, Virginia in about 3 days. Your destroyer must send a logistic requirements report to the Commander, Norfolk Naval Base, at least 48 hours prior to arrival. (This report will be covered in some detail in chapter 12 of this text.) Since destroyers normally travel in company with a division, the division commander will compile the report for all ships. You must send your requirements to him sufficiently in advance to allow him to meet the 48 hour deadline. If in company with a larger force, the senior officer present prepares the LOGREQ, and it would be to him that your division commander would send his compilation. Either way, your first preparatory steps to enter port are taken from 2 to 3 days prior to arrival.

The logistic requirements report is a coordinated document requiring information from every department in the ship. As communicator, you might be designated to prepare it. Certainly, you would have to ensure that it includes a request for technical assistance to effect repairs to communication equipment if necessary.

ENTERING PORT

Fleet Guide

The U. S. Navy Hydrographic Office has prepared a number of publications covering the various ports throughout the world at which U. S. naval bases are located. They are called fleet guides and normally are in the custody of the navigator with his other charts and publications. A separate volume is devoted to each naval base.

The fleet guides contain a wealth of information of value to all Navy ships. Separate chapters are devoted to the command setup, navigation, operations (including communications), repair, ordnance, and supply. You should study this publication. It contains information concerning frequencies, training facilities, location of registered publication issuing offices, mail and telephone services, and many other items that have a bearing on good communications.

If your ship is approaching a harbor for which no fleet guide is *issued,* study of the *U. S. Coast Pilot* or *Sailing Directions* may produce much useful information. Be foresighted and prevent embarrassment for failure to comply with standing regulations.

Degaussing

Many naval bases have a degaussing range. Pearl Harbor's is so located that a ship cannot pass through the main channel without running the range. Ensure that you have equipment set up on the proper frequency to communicate with the degaussing station and that your signal gang knows the visual call. Prepare a message in advance, giving the coil settings of your ship. The coil settings in use can be obtained from the navigator. The message is sent to the degaussing station and, shortly after running the range, you will receive an answer stating whether your equipment is functioning properly.

Arrival Report

An arrival report must be sent immediately after arrival. (The movement report system is described in chapter 12.) Prepare an arrival report, including all the required information except the actual time of arrival, and as soon as you are moored, fill in that time and present it to the Captain for release. If you fail to send an arrival report, you will soon receive an inquiry via fleet broadcast, advertising your error for all to see. On such details rests your Captain's reputation.

Harbor Radio Nets

You will have to ensure that your ship is up on the prescribed harbor radio nets prior to entering port. In some cases, certain frequencies must be guarded while in port. The circuits which are used in each port are listed in the *U.S. Naval Communication Frequency Plan* (JANAP 195). The fleet guide will also include the prescribed harbor frequencies, as will the SOPA instructions. You must realize, however, that SOPA instructions rarely will be available prior to entering port.

The general rule is to check out on the harbor nets as soon as you are near enough for effective communication. Although berthing instructions usually will be included in the answer to your logistic requirements report, in some cases you might receive last-minute changes, or your berth might be foul. The harbor net is available for this traffic.

Visual Communication

Each naval base has a visual communication tower and its call is included in the fleet guide. Messages can be addressed to the naval port control officer (NAVPORCO) either visually or by the harbor radio net. Where possible, visual means should be used.

During time of war, most harbors are protected by a series of antisubmarine nets and various listening devices which can detect a submarine attempting a sneak submerged entry. The activities of the various harbor defense units are coordinated at a harbor entrance control post (HECP). Ships must receive permission to pass through the nets from the HECP, so make sure your Signalmen are familiar with the location and proper calls.

Special Sea Details

A ship entering or leaving port is on parade. The public is watching and wants to be proud of our Navy. Your ship is a part of that Navy and is able to make a significant contribution to the esteem in which it is held by the public. Ensure that your division contributes constructively to the appearance of the ship.

Fly your best set of colors during special sea details. Make sure the ensign is close up and not fouled in the halyards. The ship's international call sign should be flying from the yardarm. Make sure the flags are not torn, with loose ends whipping in the breeze.

The bridge watch is required to bring certain equipment during special evolutions, for instance, the portable electric megaphone. You may enter and leave port a score of times without having need of it. Naturally, the first time it is needed, someone will forget it. Prepare a checkoff list and make sure everything is on hand. Have the batteries of the megaphone checked a day in advance by the ship's electrician. And then, just to be sure, supply a standard cone megaphone as a safety measure.

A Quartermaster should be assigned the task of cleaning all the binoculars on the bridge. When the Captain or navigator asks for them, they have a right to expect them to be clean. The same goes for the plastic wind screens. If covered with salt spray, visibility may be seriously impaired.

Your Signalmen should be alerted for visual signals. Make sure all sectors are watched closely. Allow no skylarking. This is not the time for it.

Those of your division who are not assigned a specific special sea detail station should assemble at quarters. An officer or leading petty officer should be in charge. You will have no trouble getting the men to quarters on a warm, sunny day when entering a strange port. About the tenth time in 10 consecutive days that you steam into Key West, however, it will be old stuff. That is when you can tell a smart ship with sailors having pride in their outfit.

Your men should be at division parade, in ranks at all times. Make sure they know how to render passing honors. This is not the time for the camera fans to be at work. Uniforms should be immaculate. Granted, some of the line handlers may be wearing less than perfect clothing. But, until your men are pulling on a line, accept no complaints.

IN PORT

The first job of a ship upon entering port is to prepare for sea. A ship not ready to sail is not ready to fight. As a result, an in-port period is not just a period for the crew to rest and have liberty, important as they may be. There is much work to be done.

Security of Materials

As soon as the word is passed to secure the special sea detail, all classified and pilferable materials should be stowed in appropriate safes or lockers. The various publications which are necessary for maneuvering a ship at sea should be collected by the various responsible individuals and placed in an approved safe. Binoculars, long glasses, sextants, and the pilferable items should be accounted for and placed under lock and key. All spaces containing classified equipment must be locked.

Watches

It is common practice for destroyers to moor in nests with several other destroyers. Invariably arrangements can be made for each ship to stand communication guard watches for the whole nest, rotating the duties daily. In small ships this should be done when possible. It allows equipment to be shut down for preventive maintenance or repairs. Spaces can be cleaned properly for the first time in days. The Radiomen and Signalmen can get a good night's rest. Have your leading Radioman or RMC arrange their watches as soon as you are moored. Your men will appreciate it.

In some ports, depending on instructions of the SOPA, a voice guard may be required on the harbor net. Check the SOPA instructions before securing any net.

Some of your men may be required to stand petty officer or messenger watches on the quarterdeck during in-port periods. Generally, the in-port enlisted watch bill is coordinated by the gunnery officer. Make sure a copy is posted on your division bulletin board.

SOPA Instructions

At each U. S. naval base, a set of instructions covering almost any detail of in-port activities has been prepared. Invariably these instructions, together with other useful information of a more temporary nature are presented to the executive officer by a boarding officer. SOPA instructions are generally compiled in book form. This is an extremely important publication. Familiarity with it will save you many hours.

A section will be devoted to the various communication facilities available at the base. At some ports the communication guard will be assumed by the communication station for the ship. The location and hours of the RPIO will be indicated. Availability and means of obtaining electronic repair assistance are usually included. Drill circuits and ship's responsibilities for manning them are also delineated. All in all, SOPA instructions are good to know.

Basegrams

A messenger should be sent to the basegram authority at the naval base to obtain any general messages transmitted by that system which have not yet been received aboard. The basegram system was mentioned in chapter 3 of this text. Essentially, it is a system for delivery of those general messages which are not considered to be of such importance as to warrant transmission to all addressees by rapid means.

Visit RPIO

You, as communication officer, may be custodian, or perhaps one of your assistants performs that duty. Either way, ensure that a visit is made frequently to the RPIO.

Enter changes and corrections to all publications while in port. This makes a visit to RPIO, shortly after arrival in port, doubly important. It is also easier to remove tactical publications from the bridge and CIC, for correction, in port than at sea.

Equipment Repairs

At many naval bases, both overseas and within the continental limits, mobile electronic technical units (METUs) are organized. The units consist of civilian electronic engineers who are available to ships for training and repair. Their basic function is training. No work will be performed unless your repair personnel are present. For instance, while at sea you may have had a transmitter casualty which the Electronic Technicians on board were unable to repair. Arrange with the electronic repair officer to request the services of the METU upon arrival in port. This request may be included in the LOGREQ. The METU personnel will come aboard and help your electronics personnel to effect repairs. In this way, the equipment is fixed and your men learn how to restore a similar casualty should one occur.

At some bases a repair facility may be located or a tender might be stationed. Investigate the procedures necessary to get repair assistance. A good communication officer exhausts all avenues in attempting to make his department ready for sea. On this point, a word of caution: Young officers occasionally fail to report to the Captain that equipment is inoperative. Usually this is because they sincerely believe it will be returned to satisfactory condition within a matter of days or hours. At best, this attitude is imprudent; at worst, dangerous. Report every casualty immediately, and report daily the progress being made to effect repairs. The status of material, including a list of inoperative equipment, ordinarily is required at 8 o'clock reports. If this is not done in your ship, make an individual report to your department head daily and, with his concurrence, to the executive officer and Captain.

Telephone Service

Immediately after mooring, attempt to have a telephone installed on the quarterdeck and in the Captain's cabin. If this cannot be done, determine the location of the nearest telephone ashore and publish this information to all hands. The home phone numbers of all officers should be available on the quarterdeck; and the Captain's location, when ashore, should always be known to the officer of the deck.

Crypto Devices

Crypto devices, used for encoding and decoding messages, manage to break down at the most inopportune times. Qualified repair personnel are limited in number so that most ships do not have repairmen assigned. You must therefore take advantage of every opportunity to have your equipment inspected and tested.

The general rule is that a preventive maintenance inspection is made at quarterly intervals and an overhaul is performed annually. Under unusual conditions, or where exceptionally heavy usage is the rule, more frequent inspections should be scheduled. The important point is that with technicians at a premium, you will be well advised to obtain their services whenever and wherever you can. A ship which is unable

to decode important messages is less than useless to the fleet commander. Your performance is judged by results accomplished, not by effort expended.

Training

Training will not take care of itself. You must plan it, direct it, and evaluate it. Your objective is to attain that level of accomplishment that will help your department attain a high mark in the competitive exercise Z-21-C (over-all communication performance). If you point all of your training toward that end, the odds are you will be adequately compensated.

Check SOPA instructions for the schedule of drill circuits. Put your strikers on those circuits. Arrange visual drills within the division. Check the local training group officer for availability of schools. Some CW operator schools tailor their courses to any number of weeks you desire. Depending on your operating schedule and the competence of your strikers, you may arrange 1 week, 2 weeks, or even 16 weeks of operator training. Remember that the petty officers you deploy with next year are strikers today.

PREPARATION FOR DEPARTURE

Getting underway is every bit as difficult as entering port. In addition, there is an added disadvantage due to the fact that there is a complete change in routine for your men. The operation will run smoothly only if careful attention is given to detail.

Movement Report

A departure report must be sent at least 24 hours, but not more than 72 hours, prior to sailing. The only exception is when a ship is in port less than 24 hours. A departure report may not be filed prior to the arrival report for that port. If steaming independently, and you are designated to prepare the movement report, consult with the navigator to ensure that the times and route are correct.

Accountable Publications

A publications draw should be made about a day prior to sailing. If all the corrections have been made from your previous draw, and you have not let too much time elapse between visits to the RPIO, you should be able to make these last-minute corrections prior to sailing. Remember: It is not sufficient that the publications be corrected; those who have need to know should be made aware of the change and its effect on past doctrine.

Basegrams

A messenger should be sent to obtain the latest basegrams prior to sailing.

Recognition Signals and Shackle Codes

You, or your custodian, have the necessary publications on board for preparation of daily recognition signals and shackle codes. Because of security, they will not be discussed in this text. Be sure to have the code sheets prepared and—most important—instruct the appropriate personnel in their use. This includes Radiomen, Signalmen, Quartermasters, CIC, and bridge control personnel.

Operation Order

Chapter 13 of this text is devoted completely to the operation order. In essence it is the detailed instructions on what the force is to do and how to do it. The great majority of operations at sea are carried out in compliance with operation orders.

As you will see, paragraph 5 of the basic order, and the communication annex thereto, are of most interest to you as communication officer. Study the directive thoroughly. As soon as you have a general knowledge of the over-all concept of the operation, attack the communication annex in detail. Prepare a detailed communication plan for your ship. There will be many frequencies which must be set up, and careful consideration should be given to the most

judicious use of equipment. In conjunction with the operations officer, CIC officer, gunnery officer, and antisubmarine warfare officer, prepare a workable plan acceptable to all. This is not easy, as you will quickly realize. Wherever possible, standby equipments should be scheduled.

A radio check undoubtedly will be scheduled a day or so prior to sailing and again several hours before getting underway. Come up on the various circuits smartly. Correct any casualties as rapidly as possible. Report completion of the radio checks to your department head and to the Captain.

Reevaluate your standard underway communication watch bill in the light of the planned operation. Is it sufficient? Can you augment it readily to handle high workloads? Now is the time to think the problems through.

Passing the Word

For all but the most routine operations, a pre-sailing conference of all officers will probably be held in the wardroom. On many occasions the task force commander conducts a pre-sailing briefing in his flagship. The communication officer invariably attends. The purpose of both conferences is to give key officer personnel an appreciation of what the problem is, how it is to be carried out, and what is hoped to be accomplished.

You, as communication officer, will find that your men will respond favorably to a pre-sailing briefing covering the many facets of communications. Within the limits of security, tell the men the mission of the force and how they can contribute to its successful conclusion. Explain the schedule of events. Show them how the ship's communication plan, which you based upon the operation order, will accomplish the communication phase of the mission. It is not sufficient that the Radioman knows he is supposed to set up a particular frequency on RPU 2 on the bridge at 1015. He must know what the circuit is for and what is happening to require it. If your men feel that they are a part of something important, they will perform above their heads.

Forehandedness in Posting Call Signs

As task groups join or break up, there is often a need for a whole new set of call signs. A complete list of all the call signs is useful, but of far greater importance is a list showing only those the Captain and officer of the deck need to know during each phase. Prepare the call sign lists and have them ready for posting in a conspicuous place on the bridge when needed. If a formation change combining several task groups into one larger group using different calls is scheduled for 0800, arrange to have the new list posted about 0630 and the officer of the deck notified. Such attention to detail gives the Captain confidence in your department.

Equipment Failure

It sometimes happens that a transmitter or receiver fails just prior to getting underway. It may seem rather insignificant if other equipment is available covering the same frequency range. Do not be misled. Report the casualty to your department head immediately. Some commanders require an equipment failure report to be made for all derangements. You can verify this by checking the annex of the operation order having to do with reports. When repairs have been effected and the equipment is once again operating satisfactorily, another report may be required.

Visual Communications

As when entering port, be prepared to handle any visual traffic. During wartime, communication with the HECP will be required. Be sure the call sign and location are known to your signal gang.

Special Sea Detail

About one-half hour before the scheduled time to get underway, the special sea detail will be set. If you have done your work well, and organized your division properly, this should be a routine event. A last-minute muster and check of your spaces is made, and you are ready to report to the operations officer, "Communication department ready to get underway, Sir."

CHAPTER 12

REPORT COMMUNICATIONS

MOVEMENT REPORTS

Movement Report System

Largely as the result of the investigation of the sinking of the USS *Indianapolis* in 1945, the U. S. Navy established in 1947 a procedure for reporting ship movements which has developed into what is now called the movement report system. Stated briefly, a movement report is a written operational communication concerning the location, movement, or change in the status of units or individuals throughout the world which are of interest to the U. S. naval service.

Purpose

The purpose of the movement report system is to collect and disseminate, to those who need to know, current information on the status of certain flag commands of the operating forces and on the location and movements of important persons, commissioned fleet units, aircraft units, and ships under the operational control of, or whose movements are of interest to, the Navy.

Functions

The movement report system operates to furnish information of movements to certain operational and administrative commanders of ships and units, and to others who need to know. Such information serves to provide for tracking, diversion in time of emergency, expeditious unloading, provision of fuel and supplies, routing of mail and communications, defense of convoys and independent ships, and search and rescue in time of necessity.

Organization

The basic organization consists of the movement report control center (MRCC) located in Washington, D. C., which is the controlling agency for the entire movement report system, and five zones. Each zone is headed by a movement report center (MRC) which is the office responsible for the operation of the movement report system within an assigned zone of responsibility. Under each MRC there may be one or more movement report offices (MRO's) which are responsible for the operation of the movement report system within assigned sub areas of their zone. Lateral exchange of information takes place between the movement report offices of each zone. Figure 12-1 shows the zones of responsibility as presently assigned in the movement report system.

The movement report control center, Washington operates directly under the Chief of Naval Operations (OP-333) and controls that portion of the movement report system that applies to the U. S. Direct liaison is maintained between appropriate offices of Chief of Naval Operations (short title OPNAV) and the office of the titular head of the Canadian Navy, Chief of Naval Staff (short title COMNAVHED). This facilitates operation of the Canadian counterpart of the movement report system. Ships of the U. S. Navy report to the appropriate Canadian MRO/MRC when operating in zone 5, and Canadian naval vessels report to the appropriate MRC in United States territory when operating in zones 1, 2, or 3.

As you can see from figure 12-2, authority is delegated to CINCLANFLT and CINCPACFLT for operational control within their areas of responsibility. Operational control of the movement report system is exercised principally by the MRO's. These offices operate directly

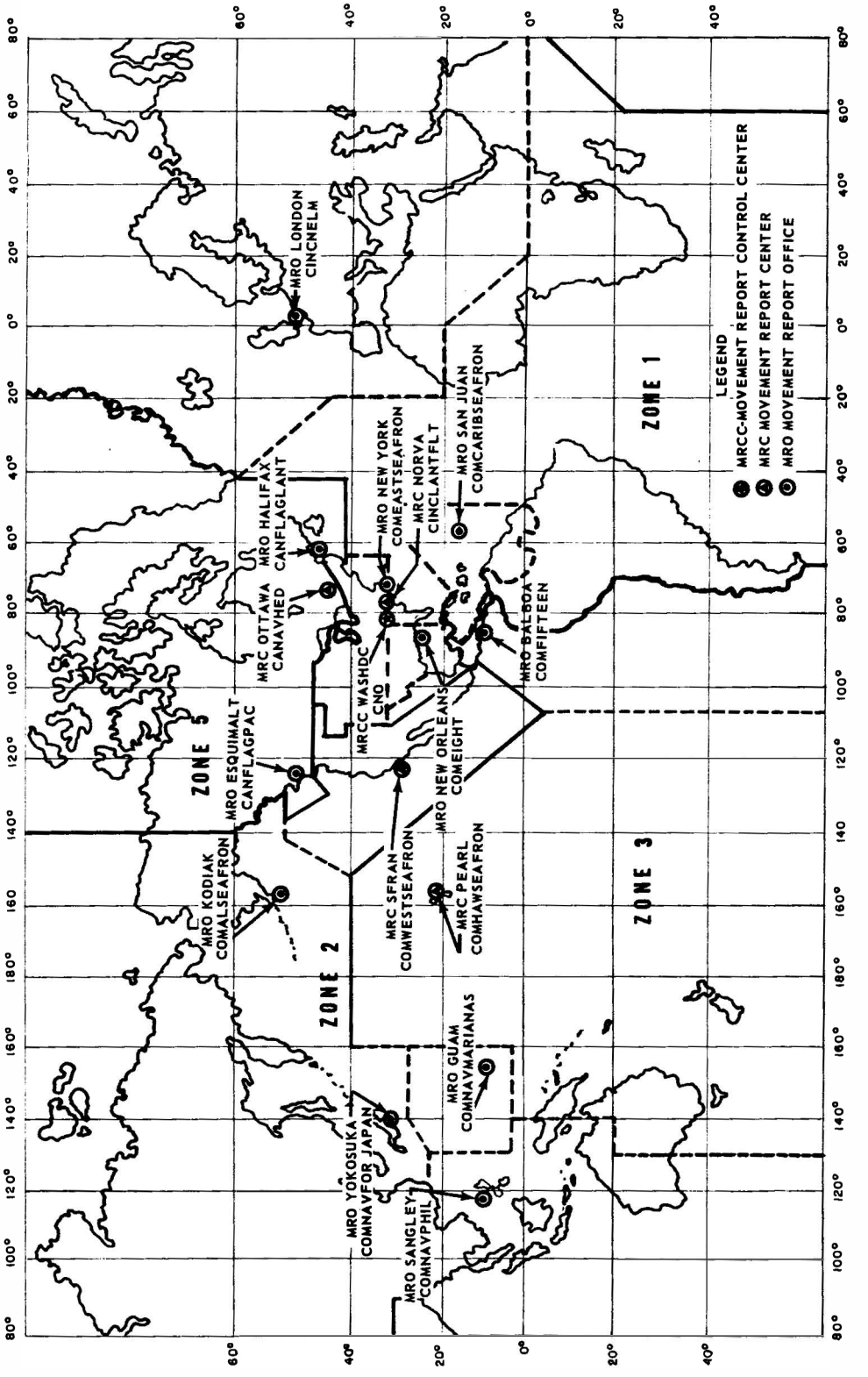


Figure 12-1.—Movement report zones.

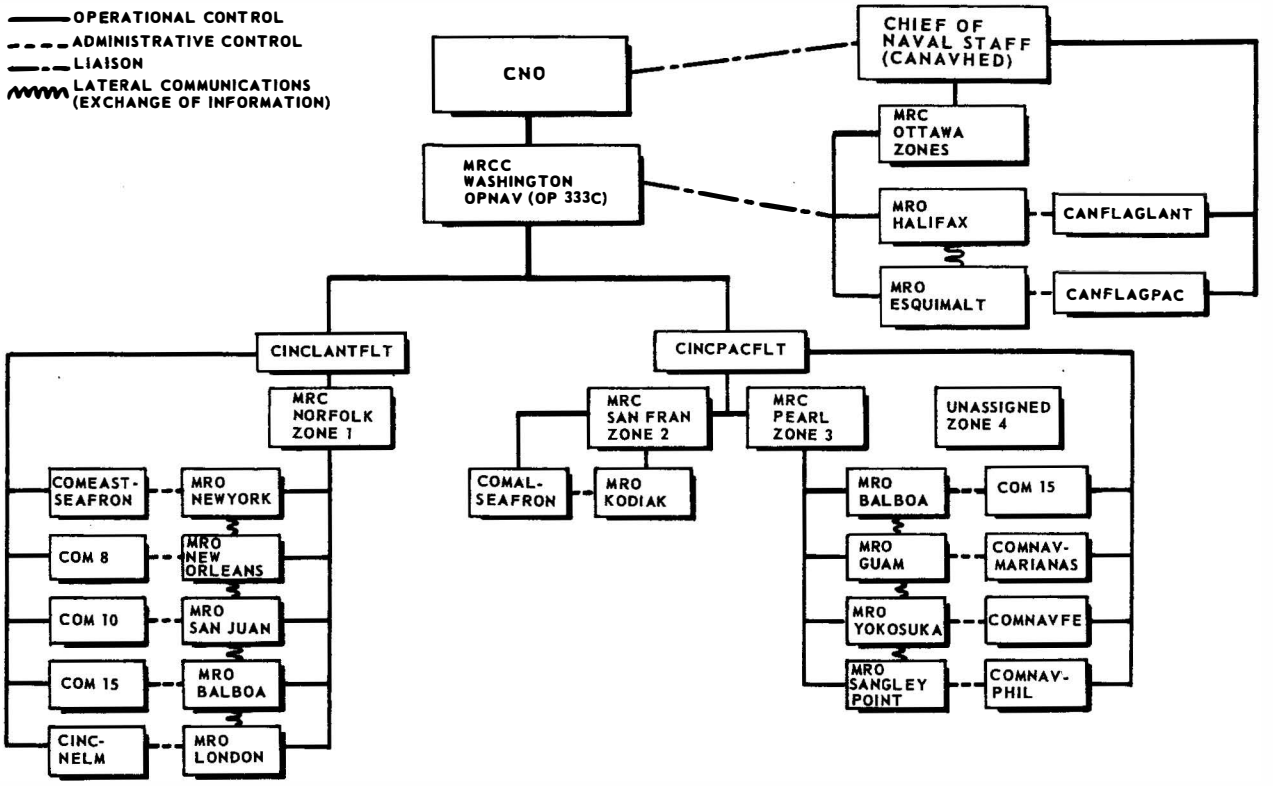


Figure 12-2.—Organization of movement report system—operational and administrative control.

under the operational control of the MRC within the assigned zone of responsibility. The movement report center—

1. Screens movement report traffic to ensure that all MRO's in their zone have reports of movements within their areas;

2. Ensures that units and their type commander are informed of errors in filing reports;

3. Informs MRO's of errors in transmitting reports; and
4. Ensures that commands who need to know are alerted when an MRO reports that a unit has failed to report arrival.

Commands exercising administrative control over MRO's, such as Com 15 over MRO Balboa, are responsible for coordination to ensure that movement information is properly disseminated to all who need to know within that particular area of responsibility.

When Movement Reports are Required

In accordance with the provisions of the basic principles covering operation of the movement report system, reports are required on departure, on arrival, and when units are diverted after the movement report has been filed.

Departure

Departures are reported at least 24 hours prior to getting underway, when possible. Chapter 6 of NWIP 16-1, the governing publication, states that "Under no circumstances shall a departure report from a port be filed prior to actual arrival at that port, or prior to filing the arrival report for that port." Departure and arrival reports for ships which stop at intermediate ports while en route to final destination are required at each port of call, in addition to the original report. Additionally, when ships file to an operating area (except to local areas not to remain overnight) or a geographic reference point as destination, arrival as well as departure reports are mandatory. An example of this is as follows:

FROM: YOSEMITE (AD 19)
TO: MRO NEW YORK
YOSEMITE AD 19 ETD NPT Ø921ØØZ SOA 15 LOCAL OPS AREA 16 UNTIL 13Ø2ØØZ THENCE RHUMB LINE ETA NORVA 1318ØØZ X MIKE ROMEO BCST SHIFT TO NOVEMBER ROMEO BCST 13ØØØØZ X MAIL NPT

Departure reports are required to contain the following information, as applicable:

1. Task designation, when assigned;
2. Title of commander of ships proceeding in company and ship in which embarked;
3. Name, type, and hull number of ship(s) making movement;
4. Actual time of departure or estimated time of departure and name of port or point of departure;
5. Speed of advance;
6. Route indicated by one of several methods—
   a. Great circle, listing point of departure;
   b. Rhumb line, listing point of departure;
   c. Great circle and/or rhumb line between points along route;
   d. Usual coastal route;
   e. Name of strait or passage traversed (for inland waters, where only one route is possible, the route may be stated as DIRECT);
7. Estimated time of arrival and destination;
8. Communication information;
9. Instructions for forwarding mail;
10. Date-time group of change of operational control (CHOP) for units proceeding in accordance with movement directive ordering a change of operational control, and abbreviated title of commander to whom operational control passes;
11. Departure reports from intermediate reports or points shall reference the original departure report and include only ship's identity, port and ETD if no change is necessary.

When ships depart a port in company for different ports of arrival, the departure report may include the points and times of separation. When the port and time of arrival are not known, the departure report must include the known information and a qualifying phrase or statement to indicate indefinite operations. When the necessary information is available, an amended report is filed.

Arrival

Reports of arrival of units, etc., are required immediately on arrival. The normal procedure is for the movement report message to be partially prepared ahead of time so that the navigator or operations officer can insert the actual time of arrival, upon arrival, and thus get the message expeditiously on its way for release and transmission to the appropriate MRC or MRO.

Reports of arrival normally include the following types of information, modified, of course, by the existing situation—

1. Final task designation and composition;
2. Title of commander of ships arriving in company and ship in which embarked;
3. Name, type, and hull number of ship, or ships, arriving; and
4. Time of arrival and geographical location.

An example of an arrival report involving no change in communication arrangements is as follows:

TU 2ØPT8PT2 X CTU COMDESDIV 81 IN BARRY X
JOSEPH P KENNEDY X JOHNSTON X PERRY X NPT 1Ø15ØØZ

In this example the hull numbers were omitted because the listed ships are all part of DESDIV 81 and that unit is indicated in the message. This is a permitted deviation from the rule requiring the use of hull numbers.

Diversion

A correction to an original departure is required to indicate a change such as a diversion; such a message is addressed to the MRO/MRC serving the area. An example of a message concerning a change due to a diversion follows. Assume the originator to be USS *Mississinewa* (AO 144), action addressee MRC San Francisco.

MISSISSINEWA AO 144 Ø117ØØZ X CHANGE ONE X
DIVERTED FROM 41 DASH 15 NORTH 135 DASH 3Ø WEST AT Ø3235ØZ SOA 18 ETA PEARL Ø613ØØZ

Responsibilities for Making Movement Reports

Ships Operating Independently

Combatant or naval auxiliary ships proceeding independently are specifically required to file a fleet movement report meeting all the requirements set forth in the appropriate section of chapter 6, NWIP 16-1.

Ships in Company

The officer in tactical command of units proceeding in company is responsible for submission of the required movement reports for all of them. The unit commander includes his administrative title in the movement reports. In the case of ships operating together for a training exercise, the responsible officer (the officer who directly orders the movement) provides for movement reports normally by directing in the operation or movement order that the designated OTC make the movement reports.

Drafting and Sending the Movement Report Message

A basic principle of the movement report system is to simplify reporting procedure for the ship or unit by requiring a report to one addressee only. Departure reports are sent to the MRO or MRC serving the port of departure, and arrival reports to the MRO or MRC serving the area in which the arrival port is located. These are not necessarily the same MRO. The MRC or MRO disseminates movement information within its zone or area of responsibility directly to those who need to know. At the same time, this information is relayed to other MRC's or MRO's which need the report, depending upon prevailing circumstances. The Naval Communication System is utilized for rapid dissemination of movement reports to the various MRO's and MRC's.

Phrasing the Text According to Proper Format

It is imperative that the originator properly prepare the movement report message using the format and phraseology shown in chapter 6 of NWIP 16-1. Content of messages is in accordance with the discussion of departure and arrival reports earlier in this chapter.

Sequence of information must also be in the same order as the content listing. It is important to include both the administrative and operational titles of the unit commander if this is applicable. If, for example, the communication officer is serving on the staff of a destroyer division commander, he will be responsible for filing movement reports concerning his commander. The movement report, for example, might correctly begin: TU 5ØPT3PT2 X COMDESDIV 221 IN FARRAGUT X (etc.).

Corrections

A correction to an original departure report to indicate a change such as diversion, detachment, or joining of units in company, storm evasion, change of ETA, and so forth, is made by one message addressed to the MRO-MRC serving the area. This message identifies the original report by including in the text the following:

1. Originator (OTC or ship's name);
2. Date-time group of original report;
3. Repeat of task organization or ship's name (if not already shown as originator);
4. Change number; and
5. Brief additional text delineating the correction.

Normally, a correction report made in accordance with this article is originated by the senior officer of the unit(s) included in the

correction report. When two or more ships in company are engaged in storm evasion and are submitting evasion reports (other than movement reports to local area commanders), corrections to original movement reports are submitted every 24 hours, giving navigational position, general area of operations or general direction of intended movement, and time next correction report will be made. Upon completion of evasion maneuvers, a correction summary report of changes to the original report is submitted to the appropriate MRO or MRC.

An example of a corrected movement report as the result of storm evasion might read as follows:

COMDESDIV 182 Ø81728Z X DESDIV 182 X CHANGE
TWO X POSIT 3Ø DASH ØØ N CMM 77 DASH 3Ø W X PROCEEDING GENERALLY SOUTHWEST EVADING HURRICANE BARBARA X NEXT REPORT 2516ØØZ

Cancellations

The normal procedure for cancellation of messages applies to movement reports.

Time

Time is expressed as GMT in all movement reports.

WEATHER REPORTS

Weather Communication Requirements

All ships of the U. S. Navy in commission are required to make routine weather reports. In addition, any ship, irrespective of type, must report unusual or dangerous weather conditions or significant or radical changes in the weather. Such reports are transmitted in plain language. The precedence must be compatible with the seriousness of the weather phenomenon observed. This is in order that the information may be received promptly by the cognizant aerological activity and transmitted over the appropriate fleet broadcast. Weather messages, to be useful, must arrive at the weather facility within a few hours of the actual observations.

Routine weather reports on ships without aerological units, such as destroyers, are prepared by the Quartermaster force under the direction of the navigator. These reports must be in accordance with H. O. 206, *Radio Weather Aids*. The communication officer is responsible for transmission of these reports to the nearest weather central or facility, using the appropriate circuit to the nearest shore station with which the ship is in contact.

Control of Weather Information

Principles

Weather information which affects military interests, except when related to a classified subject, is identified as weather controlled (WECON). It is governed in accordance with principles set forth in chapter 7 of NWIP 16-1. This information is not repeated herein inasmuch as it is not considered essential to the performance of duties of the shipboard communication officer. However, it is necessary that he know where to find it. WECON procedures will be placed in effect in time of war or other emergency as directed by the Joint Chiefs of Staff.

Weather Services Available to Forces Afloat

The U. S. Fleet Weather Central, Washington, and the several weather centrals and facilities are the chief sources of meteorological information and related services for the operating forces. These activities are located as follows:

Balboa, Canal Zone	San Diego, Calif.
Port Lyautey, F. M.	Seattle, Washington
Norfolk, Va.	Kodiak, Alaska
Miami, Florida	Pearl Harbor, Hawaii
Argentia, Nfld.	Guam, M. I.
San Francisco, Calif.	Sangley Point, P. I.
	Yokosuka, Japan

Receipt and Interpretation of Weather Data

In order to disseminate information on weather schedules and storm warnings, weather centrals and weather facilities must first evaluate and interpret all available information. This is why it is important that all fleet units submit timely and accurate weather reports in accordance with current directives.

Weather Broadcasts

Weather schedules—composed of storm warnings, forecasts, map analyses, and collections of weather reports—are transmitted on the primary and secondary general broadcasts of the Naval Communication System facilities. Facsimile weather charts are transmitted on the primary or secondary fleet facsimile broadcasts of the same activities. Weather information may be obtained from any fleet weather central or facility on request.

Drafting and Sending Weather Reports

All commissioned naval ships are required to make weather reports of both routine and unusual or dangerous weather. When one stops to realize the vastness of the ocean areas in comparison with the small number of naval vessels at sea, it can readily be seen that the sources of weather reports are sparse. In order to obtain a sufficient number of reports to properly analyze the weather for various areas, the U. S. Weather Bureau urgently needs the cooperation of all ships in the timely submission of weather reports.

Ships in Company

Where naval ships are steaming in company, the weather reports are submitted only by the ship in which the OTC is embarked or by the ship or unit so designated by the OTC.

Form of Reports

Weather reports from ships at sea are submitted in accordance with the format prescribed in H. O. 206, *Radio Weather Aids*, 1958. NWIP 16-1 requires that weather reports from ships follow Form FM21A which is included in H. O. 206. It is quite possible, however, that fleet commanders may require more frequent submission of weather reports. Therefore, the communication officer must be cognizant of any additional requirement for weather reports in addition to the times specified in NWIP 16-1. An additional source of information concerning the preparation of weather reports is the *Manual of Synoptic Weather Observations for Ship's Deck Log.*

Addressing Weather Reports

Weather reports are always addressed for action to the U. S. fleet weather central in whose area of responsibility the ship is operating. These reports are transmitted to the nearest naval communication activity ashore with which she is in contact. Figure 13-3 shows the areas of responsibility of the various weather centrals.

Indefinite call signs are used for the originator in unclassified weather reports (including those in unclassified weather codes) and in all transmissions incident to handling, including establishment of communications. When indefinite call signs are employed, caution must be exercised to prevent identification of the ship in the text of the weather report. Fleet and area commanders may require ships to use their international call sign to readily identify the originator of the report. When call sign encryption is prescribed for the Navy, encrypted vice indefinite call signs will be used in the same manner as prescribed for indefinite call signs.

Schedules and Precedence

Weather reports on surface conditions are submitted in accordance with a definite schedule, except that reports concerning unusual or dangerous weather may be transmitted at any time. The accompanying schedule is taken from chapter 7 of NWIP 16-1.

Observed Wind speed		Interval between observations (hours)	Times of observation GMT	Precedence of message
Beaufort force	Knots			
0-6	0-27	6	0000, 0600, etc.	PRIORITY
7-9	28-47	6	do	OPERATIONAL IMMEDIATE
10 and greater	48 and greater	3	0000, 0300, etc.	EMERGENCY

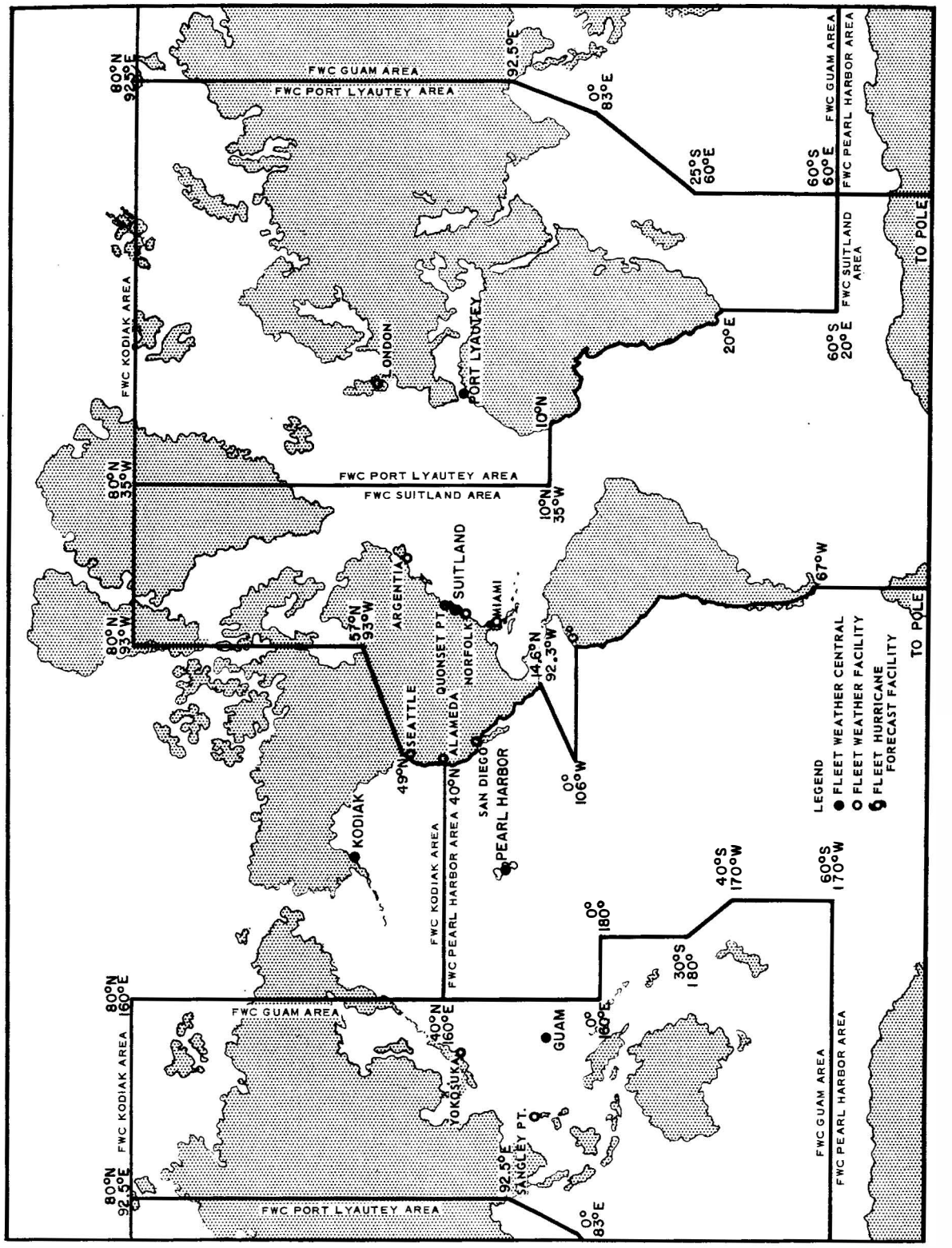


Figure 12-3.—Weather central areas of responsibility.

HYDROGRAPHIC REPORTS; MINE SIGHTINGS, ICEBERGS, ETC.

Dangers to Navigation

All naval vessels are required to report dangers to navigation in any form. By custom and tradition, seafaring men for centuries have depended on the reports of those who have sailed before them for safe navigation. Officially, reports of dangers to navigation are required by *Navy Regulations* and by the Chief of Naval Operations through the Hydrographer of the Navy who directs a functional component of the Office of the Chief of Naval Operations.

The International Conference on the Safety of Life at Sea requires that each ship observing dangerous ice, derelicts, tropical storms, or any other imminent danger to navigation, report the danger.

The Hydrographic Office publication, H. O. 606-a, *Navigational Observations*, contains information desired by the Hydrographic Office incident to the sighting of dangers to navigation and various other marine phenomena. Information of this type may be reported by letter, on the several forms prepared by the Hydrographic Office, or by radio if danger is imminent.

It may be argued that the origination of messages regarding dangers to navigation rarely falls on the communication officer. True, but all naval officers who are eligible for command at sea depend for their success in great measure on the many reports and observations which have been filed through the years by their predecessors. You, as communication officer, can do your brother officers a great service by instructing them in what to report and how to report. Study the H. O. 606 series of publications, which either the navigator or operations officer will have in his files, and make sure that all officers of the deck are familiar with them.

Each radio report of a danger to navigation should answer, briefly, three questions: (1) what, (2) when (in GMT), and (3) where (in latitude and longitude). Answer these three questions accurately and in detail.

Reports are addressed in the following manner:

U. S. inland waters . . .	Commander local CG district.
Atlantic, Gulf of Mexico, and Caribbean	Hydrographic Office, Washington, D. C.
Pacific	Branch Hydrographic Office, Honolulu.
All other areas	Nearest shore station.

Reports of dangers to navigation and other hydrographic information are carefully studied by the Hydrographic Office in Washington, D. C., or hydrographic activity in other areas. After careful analysis of the report, and comparison with other data, if available, appropriate action is taken. If the report is of urgent nature so that it affects the safety of navigation, this information is broadcast on the earliest Hydro schedule. If less urgent, it is included in the *Daily Memorandum* and later in the *Notice to Mariners.*

Figure 12-3.—Weather central areas of responsibility.

EVENT SUBMISS OR SUBSUNK

Event SUBMISS or SUBSUNK is placed in effect when a U. S. or friendly submarine is missing (and presumed to be in need of assistance) or known to be sunk. When either of these events occurs, the appropriate operational commander immediately notifies the Chief of Naval Operations as well as the fleet, type, sea frontier, and area commanders concerned. Detailed instructions, in the form of an operation order, pertaining to such an event are issued by the submarine forces commanders in the Atlantic and Pacific. These operation orders, entitled SUBMISS/SUBSUNK, together with NWP 37 and NWIP 23-6 *(Rescue of Submarine Personnel)*, constitute the principal sources of information regarding action to be taken in the event of a submarine disaster.

For the individual ship, such as the destroyer, two alternatives may be considered to exist wherein she would be a participant in a submarine search and rescue: (1) where the ship is at the scene of action participating in ASW exercises with a submarine; or (2) where the destroyer is ordered to proceed to the area in which a submarine is missing or sunk to assist in the rescue operation.

When operating with a submarine, a destroyer having positive indication that the sub requires assistance should immediately notify Commander Submarine Refitting and Training Group, giving full details. This is considered especially important in the case of overdue surfacing reports. Example: If submarine surfacing report is overdue, a message based on the following format would be sent:

USS_____(SS) SUBMERGED AT_____Z
OVERDUE AT_____Z
FREQ_____X POSIT LAT_____LON _____X
COURSE_____X
SPEED_____X VOICE CALL_____CW
CALL_____X

A destroyer, or other type vessel, ordered to assist in a submarine search and rescue, reports for duty in accordance with the communication section of the submarine force operation order. COMMENCE EVENT SUBMISS/SUBSUNK is always the first sentence of a message announcing initiation of prescribed procedure. This message is sent plain language, EMERGENCY precedence.

Generally Event SUBMISS is executed when the safety of the submarine is in doubt, or the surfacing message is 1 hour overdue. Event SUBSUNK is executed under conditions where: (1) the submarine fails to surface promptly following known accident, (2) there is reason to suspect the sub has suffered casualty, or (3) the surfacing message is 2 hours overdue.

The SUBMISS/SUBSUNK operation order has a detailed communication annex. The important thing to remember here is that you, as communication officer, should immediately obtain and study that plan as soon as your ship is ordered to participate. If you are assigned ready duty, you should study it in advance. Know what frequencies are required, and work out a plan to set them up in a hurry on the available equipment. It might turn out to be a drill; and then again, it might not.

SUBMARINE CONTACT PEACETIME PROCEDURE

All unidentified sonar contacts on known or suspected submarines are to be reported to proper authority. The Chief of Naval Operations has delegated the responsibility for establishing control and reporting procedures to the commanders of the Atlantic and Pacific Fleets. In essentials the procedures are similar. Certain responsibilities rest on the ship's communication officer in preparing the reports, so a general outline of the Atlantic Fleet procedure will be covered here. You must check the appropriate instruction and study it in detail. The following discussion should not be considered authority to prepare the various message forms. The actual instructions are of higher classification than this text.

Scene-of-Action Commander

The senior officer, normally the officer in tactical command of a group of ships making sonar contact with an unidentified submarine or a suspected submarine, is automatically to assume the duties of the scene-of-action commander. As such he will take various actions, as appropriate, to either maintain contact or to attack and, in addition, orginate reports to superior authority. Specifically, he must—

1. Make immediate contact report followed by the necessary amplifying reports on circuit A4.3. This is an Atlantic Fleet ship-shore frequency.
2. Conduct searches as directed by Commander Antisubmarine Defense Force, U. S. Atlantic Fleet (COMASDEFORLANT).
3. Request assistance, as needed, from U. S. forces within range or COMASDEFORLANT.
4. Attack—but only if the submarine takes, or attempts to take, certain actions as outlined in the basic instructions.
5. Remain at scene until relieved or the incident is declared closed by COMASDEFORLANT.
6. Attempt to interrogate the submarine by flashing light or sonar hand key.
7. Take no hostile action except in self-defense.
8. If contact is lost, attempt to regain until incident is closed by COMASDEFORLANT.

Reports

You, as communication officer, will be most closely concerned with the preparation and transmission of the required reports. There will not be sufficient time to study the basic

instructions after contact is made. The instructions require (and it is only commonsense) that you have the various report forms prepared in advance and available for use.

A suggested method, that has proved effective, is as follows:

1. Prepare sample forms for each of the various messages, leaving blank spaces to be filled in when the contact is made.
2. Have the forms laminated in plastic by a tender or other repair facility.
3. Include on each form the necessary instructions for filling in the blanks.
4. Include a space for initialing by the releasing officer.
5. Ensure that an understanding exists, preferably in the form of a ship's instructions, between the commanding officer, evaluator, and you as communication officer, regarding the releasing of the contact reports. It might be desirable for the evaluator to release the messages since they most properly are kept in CIC. The message contents should be cleared verbally by internal communication with the commanding officer in each case.
6. When released, the message may be transmitted directly from the form by the radio operator. Normally the blanks are filled in with grease pencil.

A ship operating alone, which makes contact or had contact, will, in addition to the regular contact reports, make a routine transmission to her operational commander at least every 30 minutes. The function of this message is to show that the ship is still in operating condition, and failure to transmit will be interpreted as meaning the ship is out of action. An exchange of call signs is sufficient for this purpose.

Four possible situations are conceivable in the event of submarine contact. They are defined in detail in the basic instruction cited above. Suffice it to say here that the situations vary, based upon the area of contact, the action taken by the submarine, and whether an attack is made. The situation affects the precedence of the message and the text.

Each situation is identifiable by a code word which will be the first word of the text. The code words are six-letter pronounceable words. Four words are assigned for each situation, the originator choosing any one of them.

Initial Contact Report

The initial contact report will be addressed for action to COMASDEFORLANT and information to SECNAV, CNO, and CINCLANTFLT. Readdressal or relay will be made by the action addressee.

In the case of situations 1, 2, or 4, assign FLASH precedence (Z); for situation 3, OPERATIONAL IMMEDIATE (O) or higher may be used, depending on the circumstances.

The initial contact reports are transmitted in plain language. The code word will identify the situation so that a reasonable degree of security is maintained. The text should answer the questions what, where, and when as follows:

What—Code name for submarine contact.

Where—Latitude and longitude of contact.

When—GMT date-time group of first contact.

Example: Assume that an available code word for situation Z is LOTBOY. It, of course, would be one of four available, any of which might be used. A message might be as follows:

FROM: USS MADDOX (DD 731) PRECEDENCE — FLASH TO: COMASDEFORLANT

INFO: SECNAV/CNO/CINCLANTFLT

LOTBOY LAT 29—ØØN LON 79—ØØW Ø71615Z

In the event the contact fell in situation 4, an additional statement giving the circumstances, own ship's condition, and any required assistance would be added to the text.

Amplifying Reports

Amplifying reports should be made as soon as practicable, using the same procedure and the same addressees. The messages should be numbered serially. A precedence of OPERATIONAL IMMEDIATE should be assigned unless attack occurs, when EMERGENCY is appropriate.

Amplifying messages are classified Confidential if no attack has been made and Top Secret if either attacked or attacking. After the first amplifying report, an additional report is required every 4 hours. For these "no change" in plain language is satisfactory if applicable and consistent with cryptographic procedures. These reports are in addition to the routine transmissions to the operational commander every 30 minutes in the case of those ships operating alone.

The initial amplifying report should indicate how contact was made, contact's behavior, own actions and intentions, classification of contact, damage assessment (if applicable), and other pertinent information.

Frequency Plan

If the ship making contact is operating with other vessels under an established communication plan, that plan is continued in effect. If operating singly and being joined, initial communication should be established on C11(a) fleet common circuit. The scene-of-action commander may then assign frequencies from the applicable section of JANAP 195.

Final Report

A final report, including an action report if applicable, should be forwarded to CINCLANTFLT in accordance with NWIP 10-1 and the applicable CINCLANTFLT instruction.

Conclusion

This particular situation has been covered in some detail to illustrate the duties and responsibilities of the communication officer. Similar actions may be required for other contacts or occurrences. A few hours of thumbing through the files of the fleet and type commanders' directives to ensure readiness for all such occasions would be well spent.

ENEMY AIR CONTACT

The enemy air contact report is made in accordance with instructions in NWP 16, NWIP 16-1, and ATP 1. Detailed instructions are usually incorporated in operation orders. Contact and other enemy reports concerned with air defense are also covered in NWP 32(A), *Fleet Anti Air Warfare*. Fleet commands also issue instructions, in the 3360 series, pertaining to peacetime reporting instructions for unidentified or hostile airborne contacts.

CIRVIS/MERINT REPORTS

JANAP 146 (C), *Communication Instructions for Reporting Vital Intelligence Sightings from Airborne and Waterborne Sources*, is the publication governing preparation and submission of reports by commercial air and sea transportation units. CIRVIS reports are those related to commercial aircraft reports, whereas MERINT reports are those initiated by commercial sea shipping.

Reports from either source are confined to those of intelligence value to the United States. The content of such reports relates to guided missiles, unidentified flying objects, submarines, groups of military vessels, aircraft which appear to be hostile, or individual surface vessels, submarines, or aircraft apparently engaged in suspicious activity in an unusual location, or following an unusual course. Amplifying reports are submitted when the situation first observed changes sufficiently to so warrant, in the opinion of the observer.

Format of the report is more or less standardized and always includes as the first word in the text either CIRVIS or MERINT, whichever is applicable. (The destroyer communication officer is not going to have to prepare such reports, but it is necessary that he be familiar with them and know the governing publication.) Immediately following the word CIRVIS or MERINT is the identity of the unit reporting. Also included (for MERINT reports), in the order listed, are the ship's position at time of sighting, object or objects sighted, direction of sighted objects' travel, and date-time group of sighting in GMT. These reports are classified and are transmitted with high precedence.

GETTING SPECIAL URGENT REPORTS ON THE AIR WITHOUT PRIOR WARNING

Peacetime procedures and reporting instructions for unidentified or hostile surface ship, airborne, or submarine contacts are contained in appropriate instructions issued by fleet commanders in the 3360 series of the Navy directives system.

CASUALTY REPORTS

Casualty reports are concerned both with personnel and material and are known in the Navy as CASREPS. Reports included in this category are limited to those casualties considered significant by appropriate authority. The effect of the casualty or casualties on planned operations, ability to effect timely repairs, and other factors have to be considered.

Content

The casualty report always begins with the abbreviation CASREP. This is followed by information in concise form regarding the nature of the casualty; extent of material damage and/or personnel injury immediately apparent; cause, if known; extent of impairment of operational readiness and, in particular, the capability to continue on present assignment; and such other information considered appropriate and necessary to the report. A second report may follow, giving a brief analysis of the casualty, if the commanding officer considers it warranted.

Address

Message reports of casualties are addressed, for action, to the operational commander and the type commander; for information, to Chief of Naval Operations, fleet commander, and squadron and division commanders. Pacific Fleet units are also required to include appropriate service force, fleet, and squadron commanders as information addressees.

LOGREQ REPORTS

Requirements

Forty-eight hours prior to the arrival of a commissioned naval or fleet auxiliary vessel at any U. S., British, or Canadian port, the commanding officer is required to advise appropriate naval authority by message (provided that transmission by radio is authorized) of his logistic requirements. Ships in company furnish this information to the senior officer present who coordinates the data and submits it as a single message. In time of war, when transmission by radio is not authorized, logistic requirements normally will be transmitted when within visual communication distance of the port.

Classification

The security classification of the message depends on its content, but normally should not be lower than Confidential in time of war.

Basic Information Included in Message

The logistics requirement report is a message which you, as communication officer, will encounter as frequently as movement reports. It is of great importance. The first task of a ship upon arrival in port is to prepare, as rapidly as possible, to be ready for sea again. Food, fuel, voyage repairs, berthing assistance, and a variety of other requirements are requested by this message. Invariably an answer will be received, prior to arrival, giving the action taken on each requested item, availability of ship's stores, fueling time and location, customs clearance procedures, and other pertinent information. If steaming in company with other vessels, there may be a requirement in the operation order that your logistic report information be sent to the senior officer present at some time prior to the 48-hour deadline. Be sure to check this.

Since this is a routine recurring report, some foolproof method of ensuring compliance should be set up in each ship. The following method is suggested, but any effective method is acceptable.

Study of the appropriate section of NWIP 10-1 reveals that each item included in the report is listed by letter headings. For instance, ALFA is estimated zone time of arrival at destination, FOXTROT is petroleum products desired (in each case stating applicable units), NOVEMBER is currency requirements, and UNIFORM is name, rank, and signal number of commanding officer and other pertinent information

LOGREQ DRAFTING FORM
USS MADDOX (DD 731)

ITEM DESIGNATOR	MEANING	RESPONSIBLE OFFICER	TEXT
ALFA	Estimated zone time of arrival at destination.	Navigator	
BRAVO	Berthing assistance	Executive Officer	
CHARLIE	Passengers for disembarkation.	First Lieutenant	
DELTA	Freight, mail, and stores for off-loading.	Supply/Communication	
ECHO	Voyage repairs, ship's maintenance needed.	Engineer/Operations/ Gunnery	
FOXTROT	Petroleum products desired (include units).	Engineer	
LIMA	Estimated time of departure (if known).	Navigator	
MIKE	Potable water required. (State units).	Engineer	
NOVEMBER	Currency requirements (local or MPC).	Supply	
ZULU	Miscellaneous items not covered in any of the preceding items.	Department heads	

Initials:

XO/ Navigator _____

Gun Off. _____

Oper Off. _____

Eng Off. _____

Supply Off. _____

Figure 12-4.

about the crew. The usual report text is as follows:

LOGREQ X ALFA . . . BRAVO . . . etc. Only those letters which are pertinent to the specific situation are used.

Prepare a mimeographed LOGREQ drafting form for use aboard ship. It might include the following headings: Item designator, Meaning, Responsible officer, and Text.

Immediately prior to the required submission time, you may have your messenger carry the LOGREQ drafting form to the various department heads. Each of them will include the information required in the text column and initial at the end of the form. When completed and returned, you then prepare the final message and have it smooth-typed for release by the Captain. The rough drafting form should be delivered to the Captain with the smooth message so he can determine that each officer has indicated his department's requirements, and he will either release the message or send for the appropriate officer for further amplifying information. Use of such a form prevents the overlooking of important data and ensures the correct meaning of each item is available to the drafting officers.

CHAPTER 13

THE DIRECTIVE

The method a commander uses to inform his subordinates of his plan is the directive. A directive is any communication, oral or written, that initiates or governs action, conduct, or procedure. Commonly, it denotes the written instrument by which the plan of a commander is promulgated. It may be transmitted by any communication system. Regardless of the means of promulgation, it invariably follows a standard format mutually understood by the commander and his subordinates.

The directive usually consists of a letter-type basic plan and detailed procedures in the form of enclosures, called annexes. In many cases the plan could be written in a simple narrative form, but studying it would be more difficult and rapid reference during the execution phase of the operation would be practically impossible. As a result, the basic plan is kept short and concise, and contains only those details necessary for a clear over-all picture of the operation. The annexes themselves may be brief or protracted, and in many cases have appendixes and tabs to elaborate on the many details to be considered in a large and complicated tactical problem. Among the subjects which may properly be discussed in annexes are Battle Plans, Search, Communications, Intelligence, Logistics, Air Defense, and Antisubmarine Warfare. This is not an all-inclusive list, however.

Amplifying information which is not appropriate for inclusion in the annex may be prepared as an appendix to the annex. In the same way appendixes may be amplified by preparation of tabs to the appendix. Each is given a name descriptive of its contents. Appendixes are listed at the end of the annex to which they belong, and tabs are listed at the end of their governing appendix.

Types of Directives

Different types of directives are commonly used by the Navy. Each is designed for a specific purpose, and most are to be prepared in accordance with a standard approved form set forth in NWP 11, *Naval Operational Planning*. There is good reason for the use of standard forms. The directive is a starting point for the process of making a decision. Common understanding between the individual services and, in larger aspect, between the different allied nations is basic to successful combat. The approved format is designed to reduce to a minimum the areas of possible misunderstanding. Ideally, all subordinates, regardless of service or nationality, will interpret the common instructions the same way.

Warning Order

The warning order may be issued to alert subordinate commands to impending operations. No standard format is prescribed. It is a preliminary notice of an order or action which is to follow. Subordinates are expected to use the time thus gained to make preliminary plans. Intelligence and logistical studies might be started. In appearance it is similar to the letter of instruction.

Letter of Instruction

The letter of instruction usually is a directive to major commanders of participating forces, and is issued for planning. Other interested commands may receive information copies. It states the concept, mission, command relationships, areas of responsibilities and operations, and special instructions regarding communications, forces, and reports. General policy guidance of an operational nature may be promulgated by this directive. There is no prescribed format for the letter.

Campaign Plan

After the senior commanders determine the long-range strategic goals of the national or

area forces, a campaign plan usually is issued. It sets forth a series of related operations designed to achieve a common objective, normally within an estimated period of time. This plan must be prepared in accordance with a prescribed form.

Outline Plan

When a decision has been made to carry out a specific operation, time usually is so short that concurrent planning by the various responsible senior commanders is necessary. In order to facilitate such planning by commanders who may be widely dispersed geographically, an outline plan is issued. In a standard form, the mission, strategic concept, basic undertakings, and scope of the projected operations, among other things, may be set forth. As the detailed plans develop, close coordination between the various commanders is mandatory.

Operation Plan

An operation plan is a directive used to carry out operations extending over a large geographical area and usually covering a considerable period of time. Ordinarily it is based upon, and therefore restricted by, various appropriate assumptions. It is prepared well in advance of the impending operation, and includes information as to when it will become effective. This information may be included in the plan, or it may state merely that it will become effective when signaled by appropriate authority. The OPLAN is the instrument upon which subordinate commanders base directives to their commands covering the specific tasks assigned.

Operation Order

This directive, prepared in a prescribed form similar in most respects to that of the operation plan, is issued by a commander to his subordinates in order to effect coordinated execution of a specific operation. It directs the carrying out of the operation. No assumptions are included and, unless otherwise stated, the OPORD is effective from the time and date signed.

Rarely in peacetime, and only infrequently in wartime, will the shipboard communicator be called on to use an operation plan. On the other hand, almost all coordinated operations experienced in the daily life of a sailor are carried out as the result of OPORDS. To illustrate the difference, when the Marianas were recaptured by the Fifth Fleet in 1944, the Fleet Commander issued an OPLAN to all the participating forces. He spelled out the various tasks assigned in a general way and in his various annexes defined his concept of the way the various groups would be expected to operate in support of the landings. The directive, for example, to Commander Fast Carrier Task Force was general in nature, giving wide latitude to that commander as to the detailed way in which he would carry out his mission. The Fifth Fleet Commander's directive was an operation plan because it (a) included operations covering a considerable area and period of time, (b) was based upon certain assumptions spelled out in the plan, and (c) was prepared well in advance of the operation.

Based upon the higher directive, Commander Fast Carrier Task Force issued an operation order to his command, as did each of the other subordinate task force commanders. Here was spelled out the details of how that particular force was to conduct its operations. The schedule of airstrikes was promulgated and maneuvering instructions issued. Communication instructions peculiar to that force were delineated. Upon receipt of this OPORD, the next subordinate echelon of commanders studied and (where necessary) issued supporting OPORDS to their commands. One such might have been the screen commander who issued screening instructions, elaborated on the antisubmarine warfare instructions in the higher directives, and assigned specific screen stations to ships, where feasible.

The subordinate commander's directives were operation orders because they were issued for the purpose of effecting the coordinated execution of specific operations, in each case the mission assigned to the task force by the fleet commander.

The occasion may arise when speed is of such importance that an OPORD would be prepared in message form and disseminated by rapid communications. This may be the result of unexpected wartime developments; or, in peacetime, to supplement the standing OPORD

of an organized force. For instance, a hunter-killer training force may be completely organized, consisting of a CVS and a squadron of destroyers. The force commander undoubtedly will have a standing OPORD covering the many ramifications of this type of operation, and merely issue an amplifying order in message form to effect a particular operation of limited duration and scope. This is desirable in that it allows all personnel to become familiar with the commander's general desires over a period of time, and reduces the administrative workload of the staff in preparing new orders. A standing OPORD naturally is not feasible for carrying out such a specialized operation as the capture of a particular enemy stronghold.

THE OPORDER

Let's examine in detail an OPORD issued by a comparatively junior command, to see what is in it and how we use it.

Heading

Figure 13-1 is a sample heading of an abbreviated operation order. Most of the possible items have been included. Directly beneath the centered classification, a statement might have been added regarding changes to verbal orders. Since none had been issued, no statement was necessary. At the right below the classification, the issuing headquarters title is shown. Omitted from our illustration is the copy number. This would be required on each copy of the directive if joint or combined operations were involved, or for plans and orders involving only U.S. Navy forces if the document were classified higher than Confidential. Each copy would bear a different number, and a record of disposition must be maintained. The issuing headquarters title is preceded by titles of higher echelons considered necessary to ensure proper identification. The name of the flagship, or headquarters if on shore, must be included as shown. The geographical location of the issuing commander is listed or, if at sea, the latitude and longitude. The date-time group of the signature, including zone description, follows. Unless stated to the contrary in paragraph 3x of the order, the DTG is the effective time of the order. The message reference number is the originator's serial number for identification. This will be used for in-the-clear message acknowledgement of the order. (See acknowledgment instructions after paragraph 5.) The message reference number should contain no indication that it is associated with a plan or order.

CONFIDENTIAL

Fourth Fleet
TG 47.5 and ComDesRon 20
BARRY (DD 933), Flagship
Newport, Rhode Island
DTG 311200R, October 1959
Message Ref: 0059/59

Operation Order
ComDesRon 20
No. 52-59

Time Zone: Use time zone plus 5 (ROMEO) for operations.

Figure 13-1.—Operation order heading.

To the left you will notice the underlined words Operation Order. This is sufficient when, as in our example, only one service is involved. If more than one service is participating, such descriptive words as Joint Navy/Army Operation Order might be used. Immediately below this is the short administrative title of the originator and the serial number of the directive. Each commander serializes his directives consecutively throughout the calendar year.

If applicable, the pertinent references are listed next; for example: REFERENCES: NWP 20, NWIP 16-1. Since none were necessary for our example, none are shown. The time zone to be used in the operation is then included as shown in figure 13-1.

Body

The body of the directive consists of the task organization, five numbered paragraphs, and the acknowledgment instructions. The task organization and the first two paragraphs are illustrated in figure 13-2.

The task organization is now listed, each paragraph lettered consecutively beginning with

the small letter a. Each subdivision of the commander's entire force which is to be assigned a task is listed separately with its designated task name (Attack Carrier Group, Surface Action Group, etc.), followed, as illustrated, by either the short administrative title (ComCarDiv 3) or the name of the officer in command of the force, group, unit, or element.

Since an individual ship often is assigned several different tasks to perform during various phases of an operation, it is common for a ship to be listed under several subheadings of the task organization. Considerable thought should be given to these task names so that they adequately and positively describe the basic function the unit will perform.

Paragraph 1 is the SITUATION. Here the commander sets forth only so much of the general situation as will enable all his subordinates to understand the background for the planned operation. A history of preceding events is not desired. The information should be brief and to the point. In addition, paragraph 1 will always contain three lettered subparagraphs (a, b, and c). Subparagraph a relates to enemy forces. In a wartime situation, this will reflect the best intelligence estimate of what the enemy has available. If it is so extensive as not to be effective in this location, a separate annex may be written, and in the subparagraph a statement such as "See Annex ____" included. If none (as in peacetime), this is stated; this section cannot be left blank. Subparagraph b concerns friendly forces. This refers only to friendly forces which are not listed in the task organization. Information on friendly forces should be brief and restricted to that required for proper coordination of operations. Subparagraph c is for listing attachments and detachments. Here any forces which will join or be detached from the force as the operation progresses will be included. If a "Schedule of Events" annex contains this information, reference to the annex is sufficient. If none, this is so stated. (Let it be said again that none of the three subparagraphs may be omitted or left blank.)

Paragraph 2 is the MISSION which may either have been assigned by higher authority or deduced from his instructions. In effect, paragraph 2 contains the most important information in the directive, and often is the first item to be read by a subordinate upon receipt of the document. It consists of the task to be accomplished and purpose for accomplishing it, separated by the phrase "in order to." By reading the mission paragraph, each subordinate should be able to see what is to be done and why it is being done. No other place in the operation order gives such a brief and concise statement of the intent of the operation.

Paragraph 3 is the EXECUTION paragraph. (See fig. 13-3.) Opening with "This force will,"

Task Organization:

a. 47.5.3	Heavy Unit	Capt E.C.R.
	ALLAGASH (AO 97)	1 AO
b. 47.5.4	Screen Unit	Capt R.M.P.
	DesRon 20 less FISKE (DDR 842)	6 DD
c. 47.5.5	Air Defense, Coordination Unit	Cdr W.C.M.
	FISKE (DDR 842)	1 DDR

1. SITUATION. ComDesLant Notice 03360 of 16 September 1959 scheduled an opposed ASW/AA coordination sortie on 4 November with ComDesRon 20 as OCE and OTC. This OPORD covers the conduct of the sortie.

a. Enemy Forces: None

b. Friendly Forces

c. Attachments and Detachments: None

2. MISSION. On 4 November 1959 conduct a combined opposed ASW/AA coordinated sortie exercise from Narragansett Bay in order to train assigned units in antisubmarine warfare and AA coordination.

Figure 13-2.—The OPORD — The task organization and paragraphs 1 and 2.

3. EXECUTION. This force will conduct a combined opposed ASW/AA coordination sortie exercise from Narragansett Bay on 4 November 1959.

a. Heavy Unit–Sortie in accordance with Annexes ALFA and DELTA.

b. Screen Unit–Sortie in accordance with Annexes ALFA and DELTA, and protect heavy unit from submarine and air attack.

c. Air Defense Coordination Unit–Coordinate air defense of the sortie group in accordance with Annex GOLF.

x. Coordinating Instructions.

(1) This operation order is effective for planning on receipt and for operations commencing 4 November 1959.

(2) Search and rescue in accordance with CINCLANTFLT OPORD 1-58, NWP 37, NWIP 23-6, and Annex HOTEL. Submarine Search and Rescue Plan in accordance with COMSUBLANT OPLAN 27-58 (SUBMISS-SUBSUNK) and Annex HOTEL.

Figure 13-3.–The OPORD – paragraph 3.

it sets forth in concise terms exactly what the over-all organization will accomplish.

In succeeding subparagraphs, beginning with letter a, tasks assigned to the elements of the organization are prescribed in detail. Letters b, c, and so forth, are used to identify each additional subparagraph describing the tasks assigned each unit of the force. An additional subparagraph, "Coordinating Instructions," identified by letter x, follows. Here are listed items of information to more than one task subdivision, and instructions relating to security, cooperation, duration of events, and the like. If the directive is to become effective at some time or date other than the date-time group in the heading, it is so stated in x.

The wording of paragraph 3 is particularly important. This is not the place for hedging. All tasks should be assigned in terms of accomplishment. Such words as "destroy" and "capture" are ideal. Clear, concise statements should be used. If the commander does not sound convinced of the success of the operation, why should his subordinates? Where possible, the language used should allow subordinates some latitude in exercising individual initiative.

The subject of paragraph 4 is ADMINISTRATION AND LOGISTICS. Necessary arrangements and procedures for accomplishing the mission are set forth in this paragraph. As in the other paragraphs of the basic plan, it is permissible to refer to a logistics annex if one is appended or, as often is the case in comparatively small local training operations, simply to existing instructions.

Paragraph 5 is the COMMAND AND SIGNAL area. "Signal," used herein, means communications. Here all special features of command are set forth, including designation of the officer second in command; locations of the commander and his second in command are designated; division of responsibility among the various commanders is clarified; and the communication plan is described or, as usually is the case, the communication annex is referred to. A complete annex and one or more appendixes are necessary—even for routine operations down to the division level of destroyer operations—because the problem of communications is so enormous and vital.

Ending

The ending of the directive consists of the signature, lists of annexes, distribution, authentication, and security classification.

The signature of the commander is required to make the directive effective. It appears below the acknowledgment instructions, to the right of center page, over his rank and command title. For OPORDS and OPLANS concerning United States Navy units only, the operational and administrative titles are added, as shown in the illustration. The commander signs the

4. ADMINISTRATION and LOGISTICS. Administration and Logistics in accordance with existing instructions.

5. COMMAND and SIGNAL.

a. Communications in accordance with Annex CHARLIE.

b. Use zone time plus 5 (ROMEO).

c. Commander Destroyer Squadron 20 in USS BARRY (DD 933) is OCE and OTC.

d. Commander Destroyer Squadron TEN in USS FORREST SHERMAN second in command.

Acknowledgment Instructions:

Units listed in Task Organization acknowledge receipt of this directive by message using message reference number.

Figure 13-4.—The OPORD — paragraphs 4 and 5.

original directive and each annex, appendix, and tab of it. Distributed copies may be authenticated by his flag secretary, but usual practice is for the commander to sign the stencil prior to reproduction.

Immediately below and to the left of the signature are listed the appended ANNEXES, each designated by capital letters. Although not required, it is good practice to refer to each annex in the body of the directive. Each appendix and tab to the various annexes are included in the list also (see fig. 13-6). Actual content of the annexes, of most concern to the communication officer, will be discussed in greater detail later in this chapter.

After the list of annexes the distribution list is inserted. Two practices are commonly used: For comparatively short distribution lists, each addressee is listed as part of the basic plan; for longer lists (this usually is the case in all but the simplest directives), the distribution list may be a separate annex. It is appropriate to include collective units in the list, but much administrative mailing time can be saved by listing each individual unit separately. The number of copies each addressee is to receive should be indicated; and if some are to receive all but certain portions, the deleted part should be so indicated. Figure 13-7 is a considerably abbreviated distribution list prepared in annex form to illustrate the various points. Administrative titles should be used vice tactical titles which could serve to compromise the directive as well as cause mailing delays. Preparation of the distribution list is important and requires considerable thought and effort. If all commands that need to know do not receive copies, the whole operation can be reduced in effectiveness, or be damaged irreparably.

If the commander signs only the original of the directive, individual copies are authenticated, usually by the flag secretary, at the lower left, immediately after the distribution list.

R.M.P.
Captain, U. S. Navy
Commander Task Group 47.5 and
Commander Destroyer Squadron TWENTY

Figure 13-5.—The OPORD — signature.

Annexes

The basic directive has been discussed in its entirety, and one annex—the distribution list—illustrated as it would be prepared if included separately rather than at the end of the directive itself. As already stated, this is usual for large operations. For the communication officer, the most important portion of the OPLAN is the communication annex, in addition to paragraph 5 of the basic directive.

An annex is for the purpose of giving information on any subject too extensive to be included in the basic operation order. The heading

CONFIDENTIAL

Fourth Fleet
TG 47.5 and ComDesRon 20
BARRY (DD 933), Flagship
Newport, Rhode Island
DTG 311200R, October 1959
Message Ref: 0059/59

Operation Order
ComDesRon 20 No. 52-59

ANNEX ZULU

Distribution List	Distribution
CNO	10
CINCLANTFLT	10
COMAIRLANT	2
COMSUBLANT	2
COMDESLANT	2
PRES NAVWARCOL	2
COMONE	1
COMNAVBASE NPT	2
COMDESFLOT TWO	2
COMDESRON 8	3 (less Appendix I to Annex ECHO)
COMDESDIV 202	1 (less Appendix I to Annex ECHO)
USS BARRY	3 (less Appendix I to Annex ECHO)
USS MILLER	3
USS HAILEY	3
USS ROOKS	3
USS McNAIR	3
USS DECATUR	3
USS FISKE	5 (less Appendix I to Annex ECHO)
USS ALLAGASH	3
VU-2	5

R.M.P.
Captain, U. S. Navy
Commander Task Group 47.5 and
Commander Destroyer Squadron TWENTY

Authenticated:

H.P.R.
LT, U. S. Navy
Staff Secretary

Figure 13-7.—Distribution list as an annex.

CONFIDENTIAL

Fourth Fleet
TG 47.5 and ComDesRon 20
BARRY (DD 933), Flagship
Newport, Rhode Island
DTG 311200R, October 1959
Message Ref: 0059/59

Operation Order
ComDesRon 20 No. 52-59

ANNEX CHARLIE

Communications

200. General

1. Communications in accordance with NWP 16, and appropriate Joint, Allied and Navy Department Publications. NWP 16 and NWIP 16-1 are effective throughout as applicable to the existing situation unless modified or amplified by this Annex. The numbering of paragraphs herein follows the numbering of related matter in NWIP 16-1. The interpretation as to the applicability of a specific article is a function of the command concerned.

413. Radio Checks

1. Radio checks will be conducted at 020800R, 031500R, and 040700R on circuits 1, 2, 3, 4, 5, 6, and 9 in accordance with Appendix I to this Annex.

450. Call Signs and Address Groups

1. The call signs for CTG 47.5 and TG 47.5 are effective for use commencing 040600R.

460. Frequency Plan

1. Radio frequency plan is contained in Appendix I to this Annex.

2. Aircraft frequencies and AN/ARC-27 channelization are contained in Appendix II.

812. Distress

1. Distress guards are assigned in Appendix I to this Annex.

R.M.P.
Captain, U. S. Navy
Commander Task Group 47.5 and
Commander Destroyer Squadron TWENTY

Authenticated:

H.P.R.
LT, U. S. Navy
Staff Secretary

Figure 13-8.—Communication annex.

communication duties of participating units. Broad study of many plans will serve you well in your future duties as communication officer.

The Communication Annex, usually designated Annex C by general practice although not by doctrine, was described in the preceding section. Let us now look at several appendixes, and see how the information therein contained is used. Figure 13-9 is a condensed Appendix I (in this case the Frequency Plan) to the Communication Annex of the OPORD we have been studying.

Assume that we are to be assigned as a screening vessel. The various columns in figure 13-9 define the circuits, their use, designation, frequency, whether voice or CW emission, and which subdivisions of the task organization are required to guard or listen on each. (The meaning of letters X, N, and L is given at the bottom of the appendix.) The "Remarks" column is for amplifying data. Detailed study of this appendix by the communication officer in conjunction with the operations officer, CIC officer, and ASW officer is necessary. After they decide on the logical employment of available equipment, a detailed plan is submitted to the commanding officer for approval. Only a limited amount of equipment in each frequency range is installed in each participating ship.

At this point, nothing will substitute for hard digging and thorough understanding of the commander's intentions and desires. Any conflicts must be clarified before submarine contact is made—indeed, before sailing. It will be too late, when in contact with the "enemy," to train communication personnel to shift frequencies or patch RPU's to different equipments. That will not be the time to study the operation order. Be foresighted!

Appendix II to our plan lists the aircraft frequencies, and Appendix III the various call signs, both international and voice. As communications officer, you must ensure that the various stations have appropriate excerpts posted conspicuously for ready reference. These annexes are shown in the abbreviated copy of the operation order at the end of this chapter.

One final point on effective communications: Annex C includes a reference to conducting radio checks. They are designed to locate trouble before the operation begins. Make ample preparations and be ready to check in on the various nets when called. Do not wait until time for the radio checks to begin to set up proper frequencies. Ideally, all units should check out perfectly the first time around. A smart ship is always ready on time.

Schedule of Events

The operation we have been studying was designed to terminate 7 1/2 hours after the first ship got under way. Many operations you will participate in will last for days and occasionally weeks. In such event, an additional annex might be included covering the conduct of training exercises. Possibly the training exercises will be included in a special annex called the "Schedule of Events." Proficiency can be attained only by constant practice.

The Schedule of Events will designate the participating units and also the OCE (officer conducting the exercise). If your ship is assigned to participate, ensure that all necessary preparations are made in advance. If your ship is OCE, prior study and research will be necessary to ensure a smooth-running exercise. It might be a night yardarm blinker drill, requiring that drill messages be prepared. When an exercise calls for the use of "strikers," use them. Do not attempt to use your best men merely to look good. The object is training, not a promotion examination or ORI (operational readiness inspection). In another instance, a shore bombardment communication exercise might be scheduled on a quiet night of steady steaming. This will essentially involve CIC and gunnery "on watch" personnel using voice radiotelephone procedures. Liaison with the gunnery officer and CIC officer on the part of the communication officer is a must to guarantee that proper frequencies are set up on time. Do not forget your own training: Use strikers to set up and rated men to check the results, but remember the strikers will take longer, so start preparing earlier.

Fourth Fleet
TG 47.5 and ComDesRon 20
BARRY (DD 933), Flagship
Newport, Rhode Island
DTG 311200R, October 1959
Message Ref: 0059/59

Operation Order
ComDesRon 20 No. 52-59

APPENDIX I TO ANNEX CHARLIE

FREQUENCY PLAN

Circuit	Use	Desig.	Freq.	Emission	CTG	Screen	Main body	AD	Picket	Eagle	Remarks
1	TGM & W(P)	C3.5A	318.6	V	N	X	X	X	X	X	Pickets, Eagle may secure when in station.
2	ASW COMM (AIR SAFETY) TGM & S (S) SHIP/SUB(P)	C3.7B	24.10	V	N	X	X	X	X	X	
3	CINET SHIP/SUB(S)	C3.5F	345.8	V	X	X	X	N	X	X	
4	SAU TAC PRI (P) (A)	C3.15d C3.20L	283.4 389.8	V		X					See Appendix IV.
5	AAGDN COORD	C3.22(a)	299.4	V	X	X	X	N			
6	TG Common	C3.5C	442	CW	N	L	L	L	L	L	Alt Air Safety Net, if required.
7	SAUTACSEC (P) (A)	C3.9F C3.6N	357.0 352.2	V							See Appendix IV.
8	SAU SI (P) (A)	C3.14A C3.14D	148.68 134.46	V							See Appendix IV.

X – Guard
N – Net Control
L – Listen

R.M.P.
Captain, U. S. Navy
Commander Task Group 47.5 and
Commander Destroyer Squadron TWENTY

Authenticated:

H.P.R.
LT, U. S. Navy
Staff Secretary

Figure 13-9.–Appendix 1 – Frequency Plan.

CHAPTER 14

MAINTENANCE AND OVERHAUL

CATEGORIES OF MAINTENANCE

Maintenance is the function of retaining material in, or restoring it to, a serviceable condition. It includes servicing, repairing, modifying, modernizing, overhauling, rebuilding, testing, reclaiming, inspecting, determining condition, and providing support items. There are several main categories of maintenance. They are—

1. Operational maintenance, which consists normally of inspecting, cleaning, servicing, preserving, lubricating, and adjusting, as required; and may also include minor parts replacement not requiring high technical skill or internal alignment.

2. Technical maintenance, normally limited to replacing unserviceable parts, subassemblies, or assemblies, and the alignment, testing, and internal adjustment of equipment. This work requires skill and detailed knowledge of equipment.

3. Tender/yard maintenance, which requires a major overhaul or complete rebuilding of parts, subassemblies, or assemblies beyond the capabilities of the ship's force.

4. Preventive maintenance, which is the systematic accomplishment of items deemed necessary to reduce or eliminate failures and prolong the useful life of the equipment. Such items are specifically defined and outlined by the technical manual furnished with each equipment. In general, skill and detailed knowledge of the equipment are required to accomplish this work, although many items listed in the technical manual may well fall in the category of operational maintenance.

THE MAINTENANCE PROGRAM

Because of the nature of the equipment and the long periods required in training personnel to properly repair electronic equipment, a system of maintenance and repair peculiar only to electronic equipment, is used in the Navy. Gunner's Mates shoot the guns and repair them, Machinist's Mates operate and repair the ship's machinery. Electrician's Mates operate and repair electrical equipment; but, while Radiomen, Radarmen, and Sonarmen operate their respective equipments, most repairs are made by Electronics Technicians. The process is further complicated by the channels of command. You, as communication officer, are responsible for the proper operation and operational maintenance of communication equipment. But when the gear breaks down, the electronics material officer takes over, and it is his men who perform the repairs.

There are both advantages and disadvantages to this system. The main advantage is the comparative ease in training personnel. The most striking disadvantage, as far as you will note as communication officer, is the divided responsibility. To illustrate, if it should happen that the sonar equipment, a radar, and several of your communication equipments all were simultaneously in need of repair, shortages of qualified technicians might force the electronics material officer to defer repair of your equipment until completion of either the radar, sonar, or both. This situation would require you to improvise in assigning equipment, and could prove a severe handicap.

It should be immediately obvious that close liaison with the EMO is necessary. Although his main function is to get your equipment repaired, as well as that of the CIC officer and others, remember that cooperation works two ways. The more you train your men to perform the routine tasks of maintenance, and the more your men actually perform those tasks, to the

end that breakdowns become less frequent, the easier it will be for the technicians to restore your equipment to proper operation when major casualties occur.

TRANSMITTERS AND RECEIVERS

Radio remains irreplaceable as the primary means of military communication. Through the years great effort has been expended to reduce the load carried by radio. In spite of this effort, it is probable that the load will increase rather than decrease.

In simplest terms, radio is the equipment used to send usable information through the atmosphere from a source (transmitter) to a destination (receiver) where it is interpreted and used. This information may be sent and received in many forms. Voice transmissions are particularly useful for tactical purposes, although somewhat limited in range and security. Continuous wave (CW) is commonly used, employing the Morse code. By proper selection of power and frequency, range difficulties are easily eliminated; and, by encryption, security is maintained.

Transmitters and receivers are comparatively sensitive and delicate machines, and as such are subject to the abuses of every man-used instrument. The conditions of shock, temperature control, and climatic variations to which they are subjected aboard naval ships are severe. You would not drive your automobile without making oil changes, so you should not operate your radio equipment without periodic checks and inspections.

Cleaning

A clean machine runs better than a dirty one. This is particularly true of electronic equipment. Dust and salt particles are your worst enemies. All transmitters and receivers must be dusted with a soft brush daily and cleaned with a vacuum cleaner weekly. Do not use a blower. Accumulation of dust prevents proper cooling, causing rapid breakdown of sensitive tube elements, and salt can corrode contacts and severely damage equipment.

Troubleshooting

Here we are concerned with what you, as communication officer, can do, or, rather, what you should ensure that your operators do, other than the technician's task of restoring defective equipment. All transmitters and receivers should be turned on daily. This will ensure, first, that equipment is working properly and, second, it will prevent damage due to accumulations of moisture. Check the operating controls daily, noting binding, excessive play, and loose knobs. Spare fuses usually are secured on clips inside access doors for instant use. Make sure they are there. Loose cable couplings and bonding straps, burned-out pilot lights, and broken meter glasses should be repaired or replaced immediately.

All sliding mechanical contacts should be lubricated lightly with nonfluid mineral oil or petrolatum. Since lint and dust accumulate easily on these contacts, they should be cleaned frequently.

The manufacturer's instruction book invariably contains procedures for checking receiver sensitivity. Such tests should be made quarterly and the results recorded. This check is useless, however, unless it serves to warn you of impending equipment failure. Notify the EMO to have any faulty condition corrected before real trouble develops.

THE ELECTRON TUBE

The most common cause of communication equipment casualties is electron tube failure. A tube may also be operating considerably below standard, and in some cases this substandard performance may not be apparent even in a tube test. The average tube tester applies a 60-cycle sine wave to a tube, whereas in actual performance the tube is expected to handle extremely wide frequency ranges.

A few critical circuits are tuned to the characteristics of the particular tube installed. Replacement with another tube of the same design may in fact detune the circuit, resulting in poor equipment performance.

Some tubes will perform satisfactorily in an equipment but not check "good" in the tester. Conversely, some tubes which test "satisfactory" may, in fact, not perform well in actual

use. This is not to imply that the shipboard tube tester is not to be used. It is a valuable piece of test equipment when used properly. Be skeptical of its indications, however.

Many tubes in common use aboard ship cannot be tested in the ordinary tube tester, notably high-powered transmitter and modulator tubes, Klystron oscillators, and magnetrons. For these reasons the following tube testing policy is suggested:

1. Never test tubes as a matter of routine. The results obtained will not justify the work and time involved. Test tubes only when the equipment shows signs of improper operation, and be skeptical of the results unless the tube is shown to be completely bad.
2. In testing tubes, be sure that each tube is replaced in its original socket to avoid detuning critical circuits. To put a tube of one type into a socket designated for another type is to court disaster. This is quite easy to do because so many different tubes use the standard "octal" socket.

ANTENNAS

Maximum communication efficiency is dependent on properly maintained antenna systems. Due to their location, high in the ship, they are subject to the corrosion of salt spray and stack gases. Vibration and wind may cause damage such as broken strands and broken couplings and brackets. These are not easily located by visual inspection. Sloppy painting also contributes to antenna troubles. Paint on insulators can carry a great deal of the radio energy to ground, reducing the effective signal.

When one considers the many enemies of antenna systems, their reliability and effectiveness are remarkable. A reasonable amount of preventive maintenance is sufficient to ensure satisfactory and consistent performance.

Whenever the opportunity presents itself, antennas should be lowered and inspected. Deterioration at clamps and lead-ins is a common fault. Nicks and kinks should be avoided because they tend to weaken the wire. All soot and salt spray should be removed. A nonferrous wire brush is effective for this. Insulators should be wiped clean. Make sure there is no paint on the insulators. Do not use a wire brush on insulators; such a brush can cause damage. Cleaning without resorting to wire brushes is always desirable.

Whip antennas, which may collect moisture in their hollow centers, should be inspected and cleaned as opportunity permits.

Dipole antennas generally have a small insulator near the base of one dipole. Paint, salt, and soot can reduce antenna efficiency considerably by shorting the signals around the insulators. Ensure that your men are instructed to leave the insulators clean and unpainted.

Safety Precautions

It is often said that every safety precaution is written in someone's blood. This is as true with respect to antenna systems as any other field.

No one should be allowed to go aloft to work on antennas without first obtaining permission from the CWO and the OOD. Upon completion of the work, both of these officers should again be notified.

When a man is going aloft, he should use only properly grounded ladders. All antennas in the vicinity should be secured. A small spark, which of itself may be insufficient to cause harm, may result in death by causing a man to relax his grip involuntarily and plunge to the deck below. Ensure that every man working aloft wears a safety belt.

Prior to a man's going aloft, the switches of the various transmitters should be tagged "open." Failure to tag switches properly may result in injury if another man throws the switch.

While in port, the potential danger to personnel working aloft, due to transmissions from antennas of ships alongside, must be considered. A mutually acceptable period is agreed upon before work is performed.

MOTORS AND GENERATORS

Motors and generators are capable of extended operation without mishap and with very little care. They are often neglected, however, and casualties, which could easily have been prevented, occur.

Motors and generators should be protected from moisture, dirt, and friction. Carbon dust collects near the commutator as the result of the wearing of the carbon brushes. Use a vacuum cleaner to remove dirt and carbon dust. Do not use a blower, because foreign matter might be forced into the windings and bearings. Ensure that loose gear is not stowed near motors and generators, preventing proper ventilation. Overheating is a major cause of casualties.

Bearings

The greatest single source of motor and generator failures is bearing casualties. Lack of proper lubrication and excessive lubrication contribute to these breakdowns. Always check the manufacturer's instruction books to determine the proper grade of lubricant and method of application.

There are two types of ball bearings in general use, the grease-lubricated bearing and the permanently lubricated sealed bearing. Grease-lubricated bearings require periodic lubrication with grease, while the sealed bearings are permanently lubricated by the manufacturer, and sealed, and require no additional lubrication throughout their service life.

Where sealed bearings are installed in an equipment, they should be replaced, when necessary, only with bearings of the same type. If not already provided, nameplates reading DO NOT LUBRICATE should be attached to the bearing housing.

Some Navy equipment is oil-lubricated, and others have approved lubrication charts furnished; these should be followed exactly. Great harm can be done to bearings by forcing an excessive quantity of grease into the bearing housing. In those cases where grease lubrication is required, the following procedure should be used:

1. Grease cups should be installed only when actually lubricating the bearings. At all other times the grease cup should be removed and stowed with the equipment repair parts, and pipe plugs should be installed in the lubricating holes of the bearing housing. Check all your motors and generators now; if this has not been done, probably the bearings have been sadly neglected.
2. Select the proper grease. The manufacturer's instruction book and chapter 60 of *Bureau of Ships Technical Manual* should be consulted for this purpose. Grease, stock Nos. W9150-235-5544 and W9150-235-5564, is prescribed for bearings at the running temperatures of less than 134°F.
3. Run the machine to warm up the bearings.
4. Wipe all dirt away from the filling hole and drain hole.
5. Using a clean wire, or screwdriver, clear the filling and drain holes of all hardened grease.
6. Fill a clean grease cup with the proper grease.
7. Screw the grease cup into the filling hole and further screw the cup top down, forcing new grease into the bearing. KEEP THE MACHINE RUNNING CONTINUOUSLY.
8. Continue to refill the grease cup and force new grease into the bearing housing until clean grease begins to come out of the drain hole.
9. At this point, do not add any more grease, but leave the machine running until no more grease drains from the housing. This usually takes about one-half hour. THIS STEP IS VERY IMPORTANT.
10. Replace the grease cup with a pipe plug and insert the drain hole plug.

The above is essentially the way to lubricate a horizontally mounted motor or generator. Vertically mounted motors present special problems as do motors not equipped with grease-filling attachments. Probably more work has been made by improper lubrication of bearings than in any other routine maintenance procedure aboard ship. Make sure your men grease the bearings at approximately 6-month intervals and by all means read the appropriate sections of chapter 60 of *BUSHIPS Technical Manual.* It is a good book. Make it your friend.

Brushes and Holders

Check the brushes and holders often. The brushes, sticks of carbon, should move freely in their holders. Sufficient spring tension should exist to ensure firm contact with the commutator. The area of the commutator where the brushes bear should be a chocolate-brown color.

Remove carbon dust which tends to prevent free movement of the brushes in their holders. If the commutator is scored, it may be repaired easily and quickly by a tender or, in case of small generators, by ship's force personnel using a commutator stone. Small copper particles adhering to the brushes are the usual cause of scoring of the commutator.

Insulation resistance readings should be made of the windings and the results recorded on the appropriate history card for the machine. The manufacturer's instruction book will tell you where to take the readings most easily. Measurements of insulation resistance between each winding and ground should be made first, followed by the readings between windings. A megger is used to make the tests, and the results are recorded on Form NAVSHIPS 531, the Resistance Test Record.

INSPECTIONS AND MAINTENANCE SCHEDULING

A clean machine is an efficient machine. Don't let anyone talk you out of it—and they will try. You must inspect your equipment thoroughly at frequent intervals. Routine inspections conducted by your commanding officer and department head cannot substitute for personal inspections made by you.

Your inspections should not be limited to cleanliness and preservation factors. Check the various logs and checkoff sheets. It often happens that, immediately prior to an administrative inspection, the logs and records are brought up to date with no more effort than the time it takes to initial the various entries. You may fool an inspecting officer, but you will not fool the transmitters and receivers. If the routine maintenance has not been performed, the equipment will break down regardless of the log entries. The instant you acquiesce in the falsification of logs, you have forfeited your position of leadership.

POMSEE

POMSEE is the short title for Performance, Operational, and Maintenance Standards for Electronic Equipment. This program is a simple and systematic approach to maintenance scheduling utilizing Performance Standards Sheets and Maintenance Standards Books.

Performance Standards Sheets provide the operational performance data and basic technical measurements indicative of the minimum acceptable level of performance for electronic equipment. You should have on board a binder titled Binder for Electronic Equipment Performance Standard Sheets (NAVSHIPS 93000). All the various performance sheets for your equipment are placed in the same binder.

Maintenance Standards Books provide standard methods for determining measurements affecting the performance of a specific equipment, space to record the various measurements, and a preventive maintenance schedule for the equipment. The books are divided into two parts: Part I—Test Procedures and Maintenance References, and Part II—Preventive Maintenance Checkoff.

The books and sheets are distributed based on the Electronic Equipment Inventory, NAVSHIPS 4110, prepared periodically by ship. Each book contains necessary spaces to allow the various daily, weekly, monthly, and other less-frequent checks to be recorded for a period of 2 years. Be sure that you come to an understanding with the electronics material officer regarding responsibility for each check.

Mobile Electronics Technical Unit

At various U. S. naval bases throughout the world, a small group of civilian electronic engineers and Navy Electronics Technicians is maintained to assist in training shipboard repair personnel. These groups are called Mobile Electronics Technical Units and are designated by number. They are commonly known as METU 6 or METU 3 (pronounced ME TOO).

The primary mission of the METU, as we saw in chapter 11, is training. On many occasions a ship will experience electronic casualties which the assigned technicians are unable to repair. In many cases this is due more to the inexperience of the men than to the complexity of the derangement. Here the METU enters the picture. Upon request of the ship, the METU will assign a civilian engineer to assist ship's force in training and repair. The engineers do not do the work nor will they attempt to effect repairs in the absence of shipboard personnel. Rather, they help the ship's force to analyze the difficulty and direct the repair force in the light of their greater experience. When the

casualty has been eliminated, the ship's personnel will have learned the proper technique of troubleshooting and should be able to handle the situation without assistance in the event of another similar difficulty. METU assistance can be requested in the LOGREQ as outlined in chapter 12.

RECORDS AND REPORTS

Properly maintained equipment records are invaluable. These records more than likely will be maintained by the EMO, but you will be wise to familiarize yourself with their content. The basic source regarding their use is the *BUSHIPS Technical Manual,* chapters 6 and 7.

Electronic Equipment History Cards

History cards are prepared for each piece of electronic equipment on Form NAVSHIPS 536. They are maintained in specially designed ring binders. Every casualty is annotated, together with the work necessary to effect repairs, the parts replaced, and the pertinent circuit symbol number and stock number. The complete set of cards for a particular equipment remains with it throughout its normal service life.

Immediately behind the history card for the basic equipment, additional history cards should be prepared for each associated component such as starter, motor-generator, modulator, receiver, etc.

Resistance Test Card

Form NAVSHIPS 531 (Resistance Test Card) should be prepared for every equipment or unit for which resistance readings are required. These include motors, generators, antennas (long wire, whip, and dipole), etc. The card is inserted in the binder directly behind the history card of the unit to which the readings apply.

Record of Field Changes

A Record of Field Changes (NAVSHIPS 537) is maintained for each complete equipment and is filed immediately behind the first, or index, history card. All authorized field changes are listed to show the number, title, and authority; the remainder of the card is filled out when the work is completed. All field changes should be listed numerically, and in the event one is not applicable to a particular equipment, that fact should be noted on the card. Minor alterations authorized by various directives, but not designated specifically as a field change, should also be included on the card.

Repair Record

The blue Repair Record Card (NAVSHIPS 529) is prepared whenever a repair becomes necessary. These cards are placed in the binder adjacent to the applicable history card. The wording used in describing the difficulties and the work required to effect repair should be the same as that required when submitting tender and shipyard work requests. Such general terms as "overhaul" are rarely sufficient. The cards are physically designed with a small tab which makes them readily visible and facilitates preparation of work lists when an availability is assigned. The repair record card is removed to a "completed work" file when the work has been performed and the appropriate entry made on the electronic equipment history card.

Alteration Record Card

The Alteration Record Card (NAVSHIPS 530) is similar in many respects to the repair record except that it is pink. It is prepared, filed, and handled the same as the blue card.

Current Ships Maintenance Project

The CSMP consists of the Record of Field Changes (NAVSHIPS 537), Repair Record Cards (NAVSHIPS 529), and Alteration Record Cards (NAVSHIPS 530) combined. When properly maintained, a record of all authorized alterations and required repairs is available when needed. It is axiomatic that a ship with a poor CSMP is not an efficient ship. A considerable amount of work is required to properly set up and maintain a CSMP, but the results are well worth the effort.

Electronic Failure Report

All failures and deficiencies observed in electronic equipment must be reported to the Bureau of Ships on the Defense Department Electronic Failure Report (DD Form 787). These reports are used to provide the basis for alterations, new designs, and maintenance of proper stock levels of repair parts. The card should be filled out by the technician or operator effecting the repairs and mailed to the Bureau. Because of the nature of the report, it is easily overlooked. You, as communication officer, should work out a system with the EMO to ensure its accomplishment, and properly indoctrinate your personnel in the need for the card. In the long run the submission of failure reports may be as important as actually effecting the repairs.

Request for Survey

From time to time you will be faced with the need to replace a piece of equipment which no longer is serviceable. A telegraphic typewriter, for instance, may have been in use for some 10 years and repaired by a number of tenders and shipyards during that period. It may have reached the stage where it is beyond economical and effective repair. In such event you should prepare a request for survey, using S and A Form 154 (Survey Request, Report and Expenditure).

Your ship's supply officer will be able to help you prepare the survey request. A few points are important enough to mention here. The descriptive data should be detailed. Serial numbers and model numbers should be included. The condition, cause, responsibility, and recommendation should be specific. Tell why the typewriter is not serviceable and state the actual responsibility. This may be the result of an individual's negligence but, in most cases, no person can be held responsible. Certainly, in the case of a typewriter wearing out due to long use, no one can be held at fault. Certain stereotyped phrases are commonly used in preparing surveys but do not use them unless they actually apply.

OVERHAUL

Ships are assigned overhaul availabilities at naval shipyards in accordance with a regular cycle. Generally the major overhaul is scheduled for a 3-month period, once every 2 years. The period assigned may vary somewhat, depending on the type of ship and whether any extensive alterations are planned. Ships are notified of the assigned period by means of the type commander's annual employment schedule promulgated to all ships under his command.

Preparatory to Overhaul

Each type commander issues a directive covering the subject of preparation for overhaul and submission of navy yard work requests. These directives generally call for the submission of the work requests and covering letter to arrive at the navy yard no later than 2 months prior to the beginning of the availability. A successful overhaul requires a considerable amount of preparation by ship's personnel. Considering the time required to allow the division, squadron, and type commanders to intelligently study and endorse the document, and the time necessary to cut stencils and mimeograph them, the actual compilation probably should start about 4 months before the scheduled commencement date.

If you and the EMO have been keeping your CSMP current, you should have very little effort compiling your work request; if not, you will have many hours of labor. By keeping up your CSMP on a daily basis, you spread the preparatory work for a major overhaul over many 5- and 10-minute periods instead of compressing it into a solid 2 weeks of work with the attendant probability of overlooking some items. Either way, the task must be performed, so it behooves you to do it the easy way.

In describing the work you want accomplished on a particular equipment, use specific terms. If you have knowledge of certain parts which need replacing, enumerate them, giving stock numbers and blueprint numbers as applicable. This will give the yard planners time to order the parts and have them on hand prior to your arrival.

Each work request should list the names of the ship's inspectors. Normally the cognizant officers and petty officers should be designated. The ship's inspectors are the individuals who are qualified to discuss the details of the specific job with yard workmen and pass on the completeness of the repairs.

In company with your department head, arrange the work requests in order of priority for the area of your responsibility. Later your department head will help integrate all the repair items of the entire ship into one ship's priority list. This is an extremely important task. Shortly after arrival at the yard you will be informed of the cutoff job. This means, in effect, that no jobs lower on the list will be performed due either to time or monetary shortages. Much time and effort are wasted if the ship has to completely revise the priority list as soon as the cutoff job is announced.

Authorized alterations are handled in a different manner from repairs. Those alterations designated to be accomplished with funds normally appropriated for repairs are included in the ship's priority list. The remainder are listed separately. The Bureau of Ships, by letter, will designate which of the latter will be accomplished during a particular overhaul. The former, if approved by the type commander, will be completed within the limitation of funds and time.

Included with the basic work lists submitted to the yard should be a schedule of ship's force work planned. Insofar as possible the work should be scheduled for those weeks during which you expect your men to perform it. The schedule is particularly important to the yard planners. It allows them to ensure that the yard workmen and ship's company do not plan mutually conflicting tasks for the same time.

During Overhaul

The first order of business after the ship makes fast at the navy yard is the "arrival conference." The shipyard commander and his department heads sit down with the ship's Captain and his officers and discuss the plans for conducting the overhaul. Generally a representative of the type commander is also present. The work requests are covered in detail. You may be called upon to amplify some of your work requests.

The supplementary work requests should be submitted shortly after arrival at the yard. These requests cover jobs necessary to correct difficulties which developed after the initial work lists were submitted. In addition, as the result of decisions made at the conference, the ship will probably be asked to prepare a revised ship's priority list.

Progress Analysis

Due to the arduous operating schedules while with the fleet, you will find that the yard periods affords one of the rare opportunities when it is possible to grant extensive leave to your men. At the same time the many different jobs in progress will require constant checking by competent petty officers. The actual ship's communication workload will probably be assumed by the naval base communication station. No matter what the combination of factors, your job is going to be complicated by personnel shortages.

Check all the work periodically. Ensure that equipment designated as "ship to shop" is delivered to the appropriate shops expeditiously and properly tagged. When tests are to be performed, try to witness them yourself. If this is not possible, send your most competent petty officer.

New Equipment

New installations present training problems. Your men need to be taught to operate new equipment. Various schools are available and you must ensure that quotas are obtained and men assigned. Once the ship is back at sea it will be too late to send men to schools.

As the result of removal of obsolete equipment and installation of new gear, the ship's electronic repair parts allowance will be changed. The new allowance list is computed, under the direction of the Bureau of Ships, based on the ship electronic installation record and copies forwarded to the ship. Although the repair parts are stowed in the custody of the ship's supply officer, you will probably have to assign some of your men to assist in removing deleted parts and integrating new parts. At best it is a long, tedious job. Assign competent men and endeavor to leave the same men with the job until it is complete. If done properly, you will reap the benefits months later when casualties occur during fleet operations. The correct parts will be available when you need them.

Completion of Overhaul

The last few weeks of an overhaul are extremely important to the success of future operations. All equipment must be checked out and the adaptability of the installation tested. All the possible combinations of transmitters, receivers, and remote phone and speaker units should be tried. All personnel must be made familiar with the characteristics of the new equipment.

You will not be able to test out the equipment unless the yard personnel finish their work on time. Once the ship is out of the yard, you have to be ready to operate. Work closely with the leading men, ship's superintendent, and various shop supervisors. Cooperate in any way you can to help them finish up their work. If you suspect some jobs will not be finished on time, report the facts to the operations officer and Captain so they can apply pressure in the right places.

The records must be brought up to date. Invariably, within a few weeks of completion of an overhaul, the ship will report to the fleet training command for a period of refresher training. The arrival administrative inspection given by that command is arduous and extensive. Only long hours spent with the administrative records will enable you to pass the inspection.

All yard work must be entered in the equipment history cards. Repair and alteration cards should be signed and placed in the proper file. The training records both of the division as a whole and its individual men must be up to date and complete.

Safety precautions and operating instructions often disappear or become mutilated during an overhaul period. Replace them. Check to see that all the instruction books, as well as the POMSEE books, are on board. The emergency destruction bill should be posted in all of your spaces. Bring your watch, quarter, and station bill up to date.

There will be times near the end of the yard period when you will wonder if the ship will ever be clean. Dirt and dust will be under, over, and inside equipment and lockers. Just when all hands are trying to get their last good liberties ashore, you will be faced with the hard task of ordering extra hours to prepare for sea. Practically every space will need to be secured. You may delegate the tasks, but you would be ill-advised to delegate the inspections. The responsibility is yours. Assume it.

Operational Maintenance

Operational maintenance, as the name implies, is the responsibility of the operators. In other words, for communication equipment, it is ultimately your responsibility. Its purpose is to: (1) make operators more aware of the equipment's state of readiness, (2) reduce the delays which would occur if the making of simple adjustments depends on an ET, and (3) release technicians for more complicated work.

The nature of operational maintenance is such that an extensive technical background is not necessary to perform the various checks. It would be to your advantage to be able to carry out the operational maintenance procedures personally. Certainly your leading Radioman should be capable of doing it. The actual tasks should be assigned to your Radioman and strikers. Each man may be assigned specific equipments. Arrange with the EMO to have a technician instruct your operators in the proper technique. Above all, check to see that the work is being done. Certainly the completion of the checks scheduled for a particular day should be a prerequisite to the responsible man rating liberty. Leadership demands checking on results.

Consumable Supplies

Phenomenal quantities of message blanks, teletypewriter paper, tape rolls, and other consumable supplies are used in the course of a major fleet operation. Many of these items are difficult to obtain at advanced bases. Prior to deployment for overseas tour, you should have enough consumable supplies on board to last the complete cruise.

There is no hard-and-fast rule for determining stock levels. A statistical study of the number of messages handled during a previous cruise can give a good indication of what to expect. In the event of war, communication traffic can be expected to increase considerably. Order to capacity and reorder as necessary to prevent the stock level from getting too low.

CHAPTER 15

CONVOY COMMUNICATIONS

GENERAL

The convoy, as a means of improving safety of travel at sea, came into its own in World War I. Although now generally accepted, convoys were once the subject of bitter but sincere arguments by professional seamen, many of whom felt that concentrating the targets in one area merely made it easier for the enemy. Statistics prove the worth of the convoy system of ocean transit and, in the event of future wars, resort to their use again, although probably modified somewhat due to atomic warfare capabilities, seems inevitable.

When many ships steam in company the communication problems become more difficult. This have been discussed in some detail inprevious chapters of this text. In a convoy the problem is even more extreme due to the fact that merchant as well as naval vessels are involved. One must remember that the naval officer spends most of his years at sea steaming in company with other vessels, while the merchant marine officer, during peacetime, is steaming independently almost constantly.

Communications are further complicated by the language problem. Convoys are usually made up of vessels of many nations, traveling in company for mutual safety but manned by people who think and speak in different tongues. To be able to solve the problems involved, one must first understand the many basic characteristics of convoys. Let us therefore start by discussing the peacetime merchant ship communication systems.

PEACETIME MERCHANT SHIP COMMUNICATIONS

The naval communication network is vast, complicated, and expensive. No privately owned shipping company could afford to support such a network and still show a profit. Yet, the necessity for rapid communication with its owners by any vessel at sea is apparent. In the same way that corporations and individuals ashore obtain access to rapid communication facilities by subscribing to local telephone companies or using telegrams, so the merchant shipping companies contract with radio service companies. There are a considerable number of such companies, but the vast majority of U.S. flag vessels subscribe to one of four: RCA Communications, Inc. (RCA), a subsidiary of Radio Corporation of America; Mackay Radio and Telegraph Company (MRT); Globe Wireless; and Tropical Radio Telegraph Company (TRT), owned by the United Fruit Company.

All of these companies have shore stations located throughout the areas of the world which they serve. They have contracts with other such companies in foreign lands which enable a merchant ship to remain in communication with its company office. As a ship steams about the oceans, it will always have available, depending on location and atmospheric conditions, a shore-based communication facility to which its messages may be sent.

Once a message has been received ashore it is retransmitted through the radios or land wires of the radio service company and its affiliates until it reaches its ultimate destination. Messages to the ship are handled in much the same way.

Merchant Ship Communication Procedure

Communication procedure as practiced by merchant fleets is comparatively similar regardless of nationality. Although much like U.S. Navy procedure, it is less formal and, due to

language barriers, "Q" signals are used extensively. These are international in the sense that a signal has the same meaning after translation into any language. Appropriate Q signals may be found in the effective ACP 131. By their use, radio operators can talk among themselves without having the slightest knowledge of one another's language. The receipt method of radio communications is used. That is to say, both transmitting and receiving stations are required to use their transmitters, one to send the message and the other to acknowledge for it. Such a system is obviously reliable but, as we shall see, not safe in wartime.

Messages from shore are usually transmitted during scheduled periods which are published and available to merchantmen. A traffic list is first sent. It contains the call signs of vessels for which messages are held. For instance, WCC at Chatham would transmit on 500 KCS—

CQ CQ CQ DE WCC WCC WCC
QTC ANS 4Ø6 KDVI DKVU KKIJ
KKUV WKIJ WKMM QTC DE WCC
ANS 4Ø6 K

The ships listed would then answer in turn on 406 KCS and each would receive its traffic. Depending on the frequency band within which a station operates, an assigned calling and answering frequency exists for establishing initial contact. Particular attention must be given to prevent transmitting on 500 KCS during the silent periods. These are from 15 to 18 minutes and 45 to 48 minutes past the hour. Silent periods are reserved for distress messages. In the same way ships may contact other vessels and shift to different frequencies to work.

The Radio Officer

Each merchant vessel carries at least one radio officer. Large passenger liners carry many more. Where there is only one, he holds an officer's rank and prerogatives but does not have executive authority. Where more than one is aboard, the senior radio officer has executive authority over the junior radio officers only. The radio officer is responsible to the master and receives his orders from him or his designated subordinates such as the first mate and the watch officer.

In order to qualify for his position, a radio officer must have attended radio school and obtained a second class radiotelegraph license. Where radiotelephone equipment is installed, he must also hold a second class radiotelephone ticket. These licenses are issued by the Federal Communications Commission after successful completion of a comprehensive examination. During peacetime, the law requires the operator to display his licenses in the radio room.

No watches are stood in port during peacetime. In some ports harbor regulations require that antennas be disconnected or that some other means be used to prevent transmission. During wartime the standing of radio watches is governed by orders issued by the competent naval authorities.

Agreements between the shipping companies and the unions require a radio officer to stand watch no more than 8 hours a day. Where only one operator is aboard it is obvious that continuous watches cannot be maintained. The master may designate the hours of the watch but usually defers to the radio officer's greater knowledge, letting him set his own working periods. They will vary, depending somewhat on the location of the ship. The radio officer will adjust his routine to allow transmission of messages during that period of the day when atmospheric conditions are most favorable, and yet allow him to carry out his other routine duties such as taking radio bearings or time ticks.

THE CONVOY

Escort Force Commander

To understand the communication problem peculiar to working with convoys, it is necessary to understand their structure and organization. The convoy is under the over-all tactical command of the escort force commander. He is the senior naval officer of the escort or (if he is not the senior officer) the officer designated by competent authority to act as such. It is emphasized that this officer is not necessarily the senior naval officer on active duty sailing in the convoy, but only among those assigned to the escort force.

Officer in Tactical Command

The officer in tactical command (OTC), who is usually the escort force commander, is responsible for the safe and timely arrival of the convoy at its destination. This includes defense of the convoy, stationing of escorts, employment of aircraft escorts, ordering courses and evasive steering, ordering the convoy commodore to execute emergency turns, liaison with convoy commodore regarding safety of navigation, and establishment and control of an effective communication plan.

Convoy Commodore

The convoy commodore is a naval officer, or master of one of the merchant ships in the convoy. He is designated to command the convoy subject to the orders of the OTC. In this treatise the escort force commander is assumed to be OTC. The commodore is responsible for the internal arrangements of the convoy, tactical control subject to orders from the OTC, assignment of stations and station keeping, issuing instructions regarding safe navigation (usually in conjunction with the OTC), readiness of action, and conduct of action by the convoy. In the absence of an escort he is in complete command.

Masters of merchant ships are notoriously independent individuals who, at best, tolerate the restrictions imposed upon them by the rules of the convoy. They have spent most of their lives at sea steaming independently and are not usually expert at station keeping. Many masters take a critical view of the young naval officer (who may have been a child when the masters first went to sea) coming alongside and issuing terse and abrupt orders for them to "Stop making smoke" or "Douse those lights." Thus, the convoy commodore enters the scene.

During World War II commodores were usually retired Navy captains, recalled to active duty and assigned to permanent duty as commodores of convoys. Their age and years of experience as sailormen, together with the natural brotherhood of all who make the sea a profession, particularly suited them for command of a convoy. The convoy commodore passes many orders to the various masters from the escort force commander. As naval officers, they more readily accepted the logic of the escort force commander being in tactical command, although possibly junior in rank.

The convoy commodore may be assisted by a vice commodore and rear commodore, each of whom would assume the duties and responsibilities of the commodore in the event of his removal from the scene. If the convoy consists of more than one section, the vice commodore and rear commodore usually are ordered to command such sections.

Master

The masters, of course, are still in command of their ships, including the ship in which a commodore may by flying his pennant. A master is responsible for the navigation and handling of his own ship. Under the International Laws of Warfare certain rules of conduct are laid down. It is not the intent of this text to discuss them in detail; but to illustrate the responsibilities of the master, one example will be discussed.

A distinction is made between a merchant ship and a warship. The latter is designed to seek out the enemy and destroy him in the Nelsonian tradition. A merchant vessel may not attact aggressively. She may, however, defend herself. In the event of attack by enemy forces, the decision to resist rests with the master. His decision to resist carries with it the responsibility for the consequences of such action. By law the attacker may use any force deemed necessary to overcome the resistance, but no more. The master is not permitted to ignore the safety of the passengers or crew when escape has been prevented or resistance overcome.

To a degree, such laws may appear to reflect some past era of gentlemanly rules of warfare, rather than the unrestricted methods commonly experienced during World War II, and they do. Still, they are "the law," and are inserted here to give some understanding of the convoy problems.

MERCHANT SHIPPING CONTROL

In time of war or national emergency, economical control of merchant shipping assumes paramount importance. Indiscriminate sailing of merchant ships presents the enemy with an enormous number of ill-protected targets. The demands of military authority on the use of the available ships override their purely economic use.

It might well occur that a future war would develop with such rapidity that many U. S. merchant ships would be at sea. Such shipping requires protection and at the same time must be available to naval commanders for implementing evacuation and emergency plans.

Should it become necessary, the Chief of Naval Operations will broadcast, in the clear, using every available communication system, an emergency message directing masters of U. S. merchant ships to (1) proceed in accordance with instructions included in the message, or (2) proceed to the nearest U. S. or friendly port along their projected route, and (3) place in effect wartime procedures affecting the safety of their ships. At the various ports the master would then report to the appropriate shipping control authorities for further instructions.

Naval Control of Shipping

Worldwide direction of the naval control of shipping is exercised as the result of agreements between the allied governments. The operational control and protection of merchant shipping have been delegated to certain naval theater and area commanders. The subordinate of the theater commander who is specifically concerned with such problems is designated as an operational control authority (OCA).

The OCA has many responsibilities, among which are:

1. Maintenance of a system of communications, intelligence, and plotting to ensure adequate dissemination of antisubmarine information.
2. Coordination of all convoy schedules for his area.
3. Coordination of shipping movements with OCA's of adjacent areas.
4. Ensuring that ships are sailed in accordance with instructions of the theater commander.
5. Diversion of shipping.
6. Designation of routes, breakoff positions, joiner positions, and rendezvous positions for convoys sailing from ports in their area.
7. Maintaining operational control over shipping control authorities at ports and bases within their area.
8. Reporting reductions in capacity of ports within their area to the theater commander.

NCSO

From the foregoing it can be seen that the OCA is an area authority concerned with problems of great scope. The merchant ship master and officers attached to escort vessels, however, will be most concerned with the naval control of shipping officer (NCSO). He is responsible for administering the in-port phase of shipping control. As such, he administers the Naval Control of Shipping Organization for the particular port to which he is assigned. The NCSORG staff is generally made up of personnel of the various allied nationalities, the NCSO himself being senior and normally of the nationality of the country in which the port is located. Under the supervision of his OCA, the NCSO discharges the following duties:

1. Organizing and routing ocean and coastal convoys leaving his port.
2. Routing merchant ships sailing independently.
3. When ordered, routing warships and task forces.
4. Instructing and briefing convoy commodores, their staffs, and masters of independents.
5. Convening convoy conferences.
6. Issuing charts and publications needed for convoys.
7. Reporting arrivals and departures.
8. Reporting overdue shipping.
9. Maintaining shipping plots and convoy records.
10. Preparing convoy communication plans in cooperation with the escort force commander and convoy commodore.

11. Instructing convoy communication personnel and ensuring that equipment is in good order.

By means of direct inspection and personal interviews the NCSO familiarizes himself with the various ships to be convoyed, and their destinations and cargoes. He then determines which ships should proceed in a particular convoy, assigns the flagship for the convoy commodore, and prepares the sailing orders.

Convoy Conference

It is extremely important to hold a convoy conference as late as practicable prior to sailing. Attending the conference should be the escort force commander and such members of his staff as he desires, escort vessel commanding officers and their operations and communication officers, commanding officers of supporting units or activities, the convoy commodore and his staff, and the merchant ship masters. In addition, the senior communication personnel of each ship and the naval communication liaison officers should attend.

The NCSO explains the command organization and responsibilities of the various commanders, the procedure for departure, instructions for keeping the various logs and records, and the convoy diagram showing the stationing of each ship. Communication procedures are discussed as are navigational problems. The NCSO is followed by the convoy commodore and the escort force commander, who elaborate on the convoy maneuvering instructions and ensure that all the masters are familiar with the tactical and communication publications. The advantages of convoys are discussed; and methods for transferring and replenishing at sea, and special action to take in the event of enemy attack are emphasized. Instructions in recognition and identification are given. The masters are encouraged to ask questions, and the meeting does not terminate until all personnel understand their duties and responsibilities.

Immediately after the convoy conference, a meeting of the communication officers with their radio and signal ratings is held. Here the many communication problems are discussed and detailed radiotelegraph, radiotelephone, and visual procedures are explained. Although this conference is not mandatory, it was found to improve considerably the conduct of communications. During World War II it was held after each convoy conference almost without exception. Naturally, no amount of briefing will substitute for study and understanding of such pertinent publications as ATP 1, ATP 2, ACP 148, and ACP 149.

MERCHANT SHIP BROADCAST

The broadcast from shore to merchant ships is known as MERCAST. This is an efficient system of transmitting messages to allied merchant ships in time of war. The appropriate ocean areas are divided into numbered primary broadcast areas, each covered by a high-powered shore radio station. These MERCAST area stations broadcast regular schedules simultaneously on one medium frequency and one or more high frequencies. This ensures that each ship in the area can copy the schedule on whichever frequency is most favorable, taking into account the atmospheric conditions and the time of day.

The transmission of traffic by MERCAST stations will commence precisely at the scheduled time and will continue within the scheduled limits until all traffic has been cleared. During the international silence periods the MERCAST schedule will cease so that ships may shift to 500 KCS. The MERCAST frequencies will continue with a taped call, enabling ships to regain the frequencies readily at the end of the silence period.

The initial part of each MERCAST transmission will include a traffic list, consisting of the radio call signs (transmitted twice) of ships to which it has messages addressed, and the date-time group of each message. A ship with one operator, for which no traffic is scheduled, is not required to copy the entire schedule and may immediately shift back to the regular 500 KCS listening watch. The remainder copy the schedule and thus receive all messages addressed to them. As with Navy fleet broadcasts, special schedules for one-operator ships are set up and messages for those ships are transmitted during the one-operator periods only. Flash and emergency precedence messages are transmitted on two consecutive periods; all others on one period. Under no circumstances will any ship break radio silence and transmit in connection with a MERCAST-received message unless specific instructions to do so are included in the text of the message.

In time of war there are certain general messages addressed to large groups or even all merchant vessels, and their inclusion in a MERCAST schedule will be indicated by a collective call sign in the traffic list. All ships must copy these messages and maintain a file of them.

Sailing orders received by each ship prior to sailing will include instructions on the precise date and time to shift from one area MERCAST broadcast to another. The time is usually such that no difficulty will be experienced in copying the appropriate broadcasts. In the event the routing authority drastically diverts a convoy, he will be responsible for including instructions amending the time of shift.

INTRA-CONVOY COMMUNICATIONS

The radio frequency common to all ships in a convoy is 500 KCS.

The voice radio frequency common to all ships in a convoy and between the convoy and the escort is determined prior to sailing and stipulated in the convoy communication plan.

Safety from enemy attack at sea demands radio silence by all ships of the convoy. Except in certain well-defined cases, transmission by radio is forbidden. Included in the exceptions are contact reports, distress messages, messages in accordance with a special order from some naval or military commands, and whenever in the opinion of the master (or the convoy commodore, if present), the necessity for breaking radio silence outweighs the risk of disclosing the ship's position. It should be borne in mind that the use of a radio transmitter endangers all other ships present. Enemy shore stations, ships, and aircraft equipped with DF receivers can take a bearing on even a very short message. We all know that two such simultaneous bearings will allow an accurate determination of the transmitting station's position to be obtained and, as a result, within hours a swarm of enemy submarines can be expected to approach the scene.

In order to maintain communication discipline, the ship in which the convoy commodore is sailing is usually designated as "transmitter ship" for the convoy. When a naval escort is present it is preferable for one of such ships to handle outgoing convoy traffic. If a ship in the convoy has a requirement to send a message, the text is transmitted to the convoy commodore preferably by visual means, or by voice radio. The commodore in turn, providing he concurs that the message is of sufficient importance, arranges for the escort force commander to send the message via naval channels. In the absence of an escort force commander, only the commodore has authority to break radio silence except in those instances cited previously.

If it becomes absolutely necessary to transmit a message, HF, VHF, or higher frequencies should be used, if possible. This will reduce the probability of detection. However, even high frequencies can be detected by proper equipment; therefore long transmissions should be avoided. Of course, transmission of contact reports and distress messages should always be initially made on 500 KCS to ensure receipt by ships in the vicinity. Maintenance of radio silence loses meaning when in actual contact with the enemy.

Radio Readiness

Two conditions of readiness are enforced in convoys. Condition "A" is the normal steaming condition maintained at all times while at sea unless otherwise ordered. Condition "B" is placed in effect only on orders of the convoy commodore when certain circumstances exist such as alarm, enemy attack, exceptionally heavy weather, and reduced visibility.

During each of these conditions, various ships have special duties and responsibilities assigned. In brief they are as follows:

CONDITION A

1. Convoy commodore:
   a. Guard 500 KCS continuously.
   b. Guard appropriate MERCAST schedule continuously.
   c. Guard prescribed convoy radiotelephone net continuously.
2. Vice commodore:
   a. Guard 500 KCS continuously.
   b. Guard appropriate MERCAST schedule continuously.
   c. Guard prescribed convoy radiotelephone net from 1 hour before sunset 1 hour after sunrise, or as directed by commodore.

3. Ships with three radio operators:
   a. Guard 500 KCS continuously, shifting as necessary to copy appropriate MERCAST. If equipment is available, guard 500 KCS while copying MERCAST.
   b. If equipment is available, guard prescribed convoy radiotelephone net from 1 hour before sunset to 1 hour after sunrise, or as directed by commodore.
4. Ships with two radio operators:
   a. Guard 500 KCS during two-operator watches, shifting as necessary to copy appropriate MERCAST. If equipment is available, guard 500 KCS while copying MERCAST.
   b. If equipment is available, guard prescribed convoy radiotelephone net from 1 hour before sunset to 1 hour after sunrise, or as directed by commodore.
5. Ships with one radio operator:
   a. Continuous guard of 500 KCS during the operator's watch period, shifting as necessary to copy MERCAST SCHEDULE.
   b. Listen continuously on convoy radiotelephone net on bridge if equipment is available.

CONDITION B

1. Convoy commodore:
   a. Continuous guard on 500 KCS.
   b. Guard appropriate MERCAST schedule.
   c. Continuous guard on radiotelephone net.
2. Vice commodore: Same as commodore on all nets.
3. All ships:
   a. A continuous guard on 500 KCS as personnel are available. If equipment or personnel prevent copying MERCAST or maintaining special guards in addition to guarding 500 KCS, then priority is given to the latter and the others discontinued. The convoy commodore's flagship is the MERCAST guardship for the convoy and will pass messages of interest visually.
   b. During fog or heavy weather the 500 KCS guard is maintained for the first 2 hours, followed by a listening watch during operator watch keeping periods only. MERCAST will not be copied unless 500 KCS can be guarded simultaneously.

Convoy Formation

We have illustrated earlier in this chapter the typical form for merchant ship communications by radio between one ship and either another ship or shore station. Within a convoy, special rules apply. To understand them, it is first necessary to have some knowledge of the way a convoy is formed when steaming in the open sea.

The normal arrangement consists of a series of columns of ships with the leading ships of each column abeam of each other. Columns are numbered consecutively from left to right as shown in figure 15-1.

Call Signs

Each ship, of course, is assigned an international call sign, known to all maritime nations. This call sign is used by a ship in time of war only when communicating with a neutral station, with ship's agents or owners on ship's business (if permitted), or when transmitting distress traffic.

In addition, each ship in a convoy has an internal convoy call sign and an external convoy call sign. The external call sign is assigned by the NCSO prior to sailing and is used only by authorities or commanders ashore or outside the convoy to address messages to a convoy, ships therein, or portions thereof. The internal call sign is formed according to certain prescribed rules based upon the position of the ship in the formation.

Each convoy is assigned a distinguishing 2-letter or figure/letter group, called the convoy distinguishing group, allocated prior to sailing. This distinguishing group, supplemented by certain suffixes listed in ACP 149, forms the complete internal convoy radio call sign of the ship, group, or commander. To illustrate, the suffix for the convoy commodore

COLUMN	1	2	3	4	5	ETC.
DISTINGUISHING SIGNALS OF COLUMN	01	02	03	04	05	ETC.
DISTINGUISHING SIGNALS OF SHIPS	11 12 13 14	21 22 23 24 25	31 32 33 34 35	41 42 43 44 45	51 52 53 54 55	ETC.

Figure 15-1.—A typical convoy formation.

is D1, the escort force commander is D8, and an individual ship is D plus the ship's position number. If our convoy had been assigned a distinguishing group of XY, it can be seen that the following are the internal radio call signs:

Convoy commodore . . . . . XY D1
Escort force commander . . . . . XY D8
Third ship in second column from left. . . . . XY D23

The letter D is invariably assigned to the main body of the convoy, and additional suffix letters such as E, H, I, K, O, Q, S, T, and X are reserved for allocation to joiner convoys or sections breaking off from the main body. Such allocation is made by the NCSO prior to sailing. The above rules are not all-inclusive nor does this chapter cover all eventualities. As a communication officer you should study thoroughly both ACP 148 and 149 in case you are assigned to convoy work.

A list of visual call signs which utilize numeral pennants and the ANS pennant is included in ACP 148. Thus, the visual call sign of the convoy commodore is pennant 1 ANS and of the escort force commander, pennant 8 ANS. Individual ship's visual calls are their station numbers. The visual call of the third ship in the second column whose internal radio call we found to be XY D23, would be merely 23. The collective call of each column would be the number of the column preceded by zero as illustrated in figure 15-1. Column 2 is Ø2; column 5, Ø5.

The visual call signs, including ANS, are transmitted by flashing light by substituting the prosign MM. By way of summary, let's illustrate a few of the various calls.

Ship or authority	Internal radio	Flag	F/L
Commodore . . .	XY D1	Pennant 1 ANS	1 MM
Escort force commander . .	XY D8	Pennant 8 ANS	8 MM
Third ship in second column from left	XY D23	Pennant 2 Pennant 3	23

Executive Method

The occasion often arises when the commodore finds it necessary to maneuver the whole formation with as little lost time as possible.

Such a situation might result from a report of a sighting of submarines over the horizon ahead of the convoy. At best, a convoy is a big, unwieldy weapon of war—and any maneuver takes time, so the decision to maneuver is not made precipitately. In addition, changing a convoy direction of movement is restricted to a maximum of 45° in any one step. These various considerations affect the decision to break radio silence to transmit a maneuvering signal. Once the decision has been made, however, invariably the executive method is used.

The executive method employs two procedure signs (prosigns) to accomplish simultaneous action by all units:

$\overline{IX}$ (meaning Execute to follow) and

$\overline{IX}$ followed by a 5-second dash (meaning Execute).

$\overline{IX}$ is a preparative or warning signal which indicates that the signal following will be a tactical maneuver. The procedure sign $\overline{IX}$ followed by a 5-second dash is the executive signal. The maneuver is executed at the end of the long dash. The text of each signal will be sent twice, separated by the prosign $\overline{IMI}$.

As a general rule, in order to save time, all ships of the convoy would not be required to receipt for the message prior to execution.

At least one ship, however, preferably in rotation, should receipt for each message. The idea of using ships in rotation is to ensure effective communications with all ships through a series of signals. If four ships, for example, were required to receipt for a maneuvering signal and another four for the execution message, followed by another group of ships for the next message, eventually all the merchant ships in the convoy would be checked out without the delay required for every ship to receipt for every message.

To illustrate the foregoing, the signal SIERRA TWO FIVE ZERO means to alter the course of the convoy by wheeling to 250° true. The convoy radio distinguishing call is XY, which may be omitted from the call if no ambiguity or confusion with another convoy will result.

EXAMPLE:

Commodore transmits:

XY D3 DE XY D1 $\overline{IX}$ $\overline{BT}$ SIERRA TWO FIVE ZERO $\overline{IMI}$ SIERRA TWO FIVE ZERO $\overline{BT}$ XY D11 K

D3 is the collective call of the convoy and D1 the call of the convoy commodore. The message requires a receipt from ship in station 11 only, since that ship was designated in the message and it was ended with K. If receipts from all ships had been desired, the message would have ended with K without any call signs preceding the K. If no receipt had been desired, the message would have ended in $\overline{AR}$, meaning end of transmission.

Ship D11 transmits:

DE XY D11 R $\overline{AR}$

Commodore transmits:

XY D3 $\overline{IX}$ (5-second dash) $\overline{AR}$

All ships would maneuver by wheeling as necessary to change the formation course to 250° true.

If in the initial maneuvering signal above, the commodore had not designated a specific ship to receipt but had ended with K, each ship would have answered in numerical order of convoy call signs. In such event, if one fails to answer in turn and 10 seconds pass, the next automatically transmits his receipt.

DE XY D11 R $\overline{AR}$
DE XY D12 R $\overline{AR}$
DE XY D13 $\overline{IMI}$ K
DE XY D14 R $\overline{AR}$

When all have receipted or asked for a repeat, the commodore takes the necessary action, either executing or repeating the message until all the ships are ready to carry out the ordered maneuver. If a ship misses part of a signal, she must ask for it to be repeated even though she might not have been designated to receipt in the message.

Canceling Messages

On occasion the commodore may decide that an executive method signal already sent out should be canceled, or that a whole series of unexecuted signals may be extraneous due to a change in the tactical situation and, thus, all should be canceled. If it is desired to cancel all signals outstanding, the commodore sends:

XY D3 DE XY D1 $\overline{BT}$ NEGAT
$\overline{IMI}$ NEGAT $\overline{BT}$ K

Notice that the text is sent twice separated by $\overline{IMI}$; and, since the message ends with K, all ships would answer in turn.

If a particular message among the unexecuted signals outstanding is to be canceled, leaving the remainder in force, the text of the message must be included with the NEGAT as follows:

XY D3 DE XY D1 $\overline{BT}$ NEGAT KILO ONE TWO $\overline{IMI}$ NEGAT KILO ONE TWO $\overline{BT}$ $\overline{AR}$

Of course, in the same way, if the commodore decides to execute only one of a group of outstanding signals, the text of that message must be included in the executive signal to prevent misunderstanding:

XY D3 DE XY D1 SIERRA TWO FIVE ZERO IX (5-second dash) AR

Repetition of Signals

Some convoys are so large and widely dispersed that the commodore may feel that a maneuvering signal using the executive method should be repeated by another ship some distance from his flagship. He may do this by designating the repeating ship and using the procedure sign G at the end, as follows:

Commodore transmits:

XY D3 DE XY D1 IX BT SIERRA TWO FIVE ZERO IMI SIERRA TWO FIVE ZERO BT XY D49 G K

Ship in station 49 transmits:

DE XY D49 XY D3 DE XY D1 IX BT SIERRA TWO FIVE ZERO IMI SIERRA TWO FIVE ZERO BT XY D49 G K

Commodore transmits:

DE XY D1 C AR

Commodore may then execute the signal:

XY D3 IX (5-second dash) AR

Flag Signaling

Flag signaling in a mercantile convoy is similar in most respects to that in common use throughout the United States naval service. There are differences in methods and, of course, the code of signals is taken from ACP 148, not from the *Allied Naval Signal Book* (ACP 175). The Encode and Decode section of ACP 148 should be familiar to communication personnel and others concerned with maneuvering ships engaged in convoy work. The signals there listed may be supplemented by those included in the *International Code of Signals*, Volume I. Some general rules to remember are:

1. All single-flag and single-pennant hoists are in ACP 148.
2. All 2-letter hoists not preceded by the CODE pennant are in ACP 148.
3. All 4-letter hoists beginning with letter A, 3-letter hoists, or 2-letter hoists, immediately preceded by the CODE pennant, are taken from the *International Code of Signals*, Volume I. The 2-letter signals taken from the *International Code* are used as a last resort.

The international code pennant and the answering pennant are the same flag, used as follows:

1. When hoisted above a signal, it is flown as the international code pennant and is referred to as "CODE."
2. When hoisted other than above a signal, it is known as the answering pennant and is referred to as "ANS."

There are five governing flags for use with ACP 148. They are:

"A" flag—Immediate execution.
"C" flag—Affirmative.
"N" flag—Negative.
"P" flag—Preparative.
"Y" flag—Interrogative.

The governing flags are hoisted above a signal or on a separate halyard to change the sense of a signal. Almost all of the signals in ACP 148 convey orders in a positive or affirmative sense, and by use of the governing flags such signals take on various shades of meaning. For instance, assume the signal "MO" means "Stream paravanes."

"A tackline MO" means "Stream paravanes at once." (In other words, as soon as understood, without waiting for the signal to be executed.)

"P tackline MO" means "Prepare to stream paravanes." The paravanes are made ready but not actually streamed until a direct order to stream is received.

"N tackline MO" means "Do not stream paravanes."

"Y tackline MO" by a senior means "Have you streamed?" By a junior it means "May I stream paravanes?"

"C" or "C tackline MO" are correct replies by a senior in answer to the request immediately above and signify "Affirmative" or "Approved, stream paravanes."

These examples illustrate the governing flags used in convoy operations. A word of caution: These meanings are not applicable to U. S. Fleet operations when the *Allied Naval Signal Book* is followed. They are used with ACP 148 only.

The remaining flag signaling procedures are essentially the same as in chapter 7 of this text. The differences are so minor that a

qualified Signalman can easily learn them by reference to chapter 11 of ACP 148, which is recommended if orders to join a convoy are received.

Flashing Light Signaling

The flashing light signaling procedure in a convoy is similar to the methods used in the U. S. Fleet today and covered in some detail in chapter 7. Generally, the procedure is slowed considerably to ensure understanding and prevent error in transmission.

As explained earlier, the prosign $\overline{MM}$ is used in calls to replace ANS.

To send a message by directional method, the transmitting ship will call the receiving ship by its visual call sign (station number).
EXAMPLE:

35 35 35 until answered by $\overline{TTTT}$ (long dash meaning I receive you). Usually it is obvious to the receiver who is sending the message, but if in doubt she may send her visual call which will be repeated by the receiver.

EXAMPLE:

Ship 23	Ship 35
35 35 35	$\overline{TTTT}$
DE 23	DE 23

If several ships are calling from the same general direction, so that there might be some doubt as to who is being answered, then the call of the ship answered is used before the T.

EXAMPLE:

23 has called 35. To answer, 35 makes:
23 $\overline{TTTT}$

Although the heading of a visual message may include practically all of the procedure signs found in radio messages, generally the abbreviated form is used. The receiving ship acknowledges receipt of each plain language word with a T on the light. All code groups are repeated back to the sender. If correct the sender makes C, if incorrect the group is repeated. In transmitting code signals, each letter is spelled out using the phonetic alphabet. A code signal (to be spelled out phonetically) is one taken from the signal book. A message which is encoded into 4- or 5-letter code groups is not sent by means of the phonetic alphabet.

Examples of Procedure

Ship 23 originates and transmits to 35. (Read left to right.)

Ship 23	Ship 35
35 35 35	$\overline{TTTT}$ (or 23 $\overline{TTTT}$)
DE 23 (may be omitted)	DE 23 (may be omitted)
$\overline{BT}$	$\overline{BT}$
RETURN	T
MY	T
DOCTOR	(Does not T. Did not receive word.)
DOCTOR	T
$\overline{BT}$	$\overline{BT}$
$\overline{AR}$	R

6 $\overline{MM}$ originates and transmits to a screen ship whose international call sign is NBGC.

6 $\overline{MM}$	NBGC
NBGC NBGC NBGC	$\overline{TTTT}$
$\overline{BT}$	$\overline{BT}$
KILO	T
ALFA	T
$\overline{BT}$	$\overline{BT}$
$\overline{AR}$	R

NOTE.—KILO ALFA, being a coded group, is spelled out phonetically.

Relaying Messages

Messages for a part of the convoy or column are passed to the leading ships of the columns concerned, who further pass them down their columns until all ships addressed have received the message. Each ship is responsible for the ships astern and, in addition, leading ships are responsible for the columns away from the originator. So that leading ships may know when the last ship in column addressed has received the message, the ship's call sign is passed up the column after R DE. The column leader then sends the collective call of the column after R DE to the originator by way of informing him that the whole column has received the message. The following example illustrates these principles. (Read left to right except when the arrows show to the contrary.)

All Around Procedure

The same message could have been sent to all ships by the all around procedure. This is done by the commodore transmitting the

1MM	Ship 41	Ship 31	Ship 32	Ship 33
41 41 41	TTTT			
∅3 DE 1MM	∅3 DE 1MM			
BT	BT			
UNIFORM	T			
HOTEL	T			
BT	BT			
AR	R			
	31 31 31	TTTTT		
	∅3 DE 1MM	∅3 DE 1MM		
	BT	BT		
	UNIFORM	T		
	HOTEL	T		
	BT	BT		
	AR	R		
		32 32 32	TTTT	
		∅3 DE 1MM	∅3 DE 1MM	
		BT	BT	
		UNIFORM	T	
		HOTEL	T	
		BT	BT	
		AR	R	
			33 33 33	TTTT
			∅3 DE 1MM	∅3 DE 1MM
			BT	BT
			UNIFORM	T
			HOTEL	T
			BT	BT
			AR	R
		TTTT	31 31 31	
		R DE 33	R DE 33	
		R	AR	
	TTTT	41 41 41		
	R DE ∅3	R DE ∅3		
	R	AR		
TTTT	BBB			
R DE ∅3	R DE ∅3			
R	AR			

NOTE.—The succession of B's is a special call sign used to address the commodore. Similarly, a succession of H's calls the vice commodore, and a succession of J's calls the escort force commander.

general call (AA AA etc.) on an all around visible light. No ship gives any indication it is reading the message. When the text has been sent, followed by the break prosign (BT), the procedure sign UD is transmitted by the general call and the text repeated a second time. The end of transmission prosign AR is made after the second sending of the text. The light repeating ships will receipt for the message by directional light. Any ship failing to copy correctly should obtain the message from their repeating ship.

EXAMPLE:

AA AA AA (etc.) (pause) BT UNIFORM HOTEL BT ∅857Z UD AA BT UNIFORM HOTEL BT ∅857Z AR

If the ship in station 73 is a designated light repeating ship, she would send by directional light to the flagship:

R DE 73 R DE 73

Sound Signaling

Convoys may be maneuvered, or messages transmitted, by sound signals, a system having no parallel in U. S. naval practice. There has long been a practice of such sound signaling between individual merchant vessels at sea. This procedure is outlined in the *International Code of Signals,* Volume I. However, as used in convoys, sound signals between individual ships will be rare.

The distance which sound will carry over water is limited. Therefore, a system of sound repeating ships has been developed. The leading ship of each column will repeat all signals except those addressed to an individual ship. In addition the convoy commodore may designate additional ships throughout the formation to perform this function. Only ships so designated will repeat sound signals.

General Signals

General signals always commence with the general call "AA AA AA" on the ship's whistle. On hearing this call, all ships should listen carefully for the signal which will follow. The signal itself will be transmitted twice.

EXAMPLE:

AA AA AA (pause) WN1 (pause) WN1

Repeating ships and column leaders will then repeat the message. Column leaders repeat, in order, outboard from the commodore's flagship beginning to port. The starboard column leaders start repeating when the signals to port can no longer be distinguished clearly. Designated repeating ships repeat from forward to aft.

Request for repetition can be made by sounding the procedure sign $\overline{UD}$. Although generally made by a repeating ship, this signal may be made by any ship missing a signal.

In the event a repeating ship hears one of its messages repeated erroneously, she makes the "Erase" sign. The transmitting ship then stops signaling and waits for the repeating ship to retransmit the incorrect group or word after which she continues the repetition.

In a similar fashion, messages directed to a particular column or section may be sent by regular flashing light visual call signs. This type of message would be repeated by all repeating ships having responsibility for the units called.

EXAMPLE:

Ø1 Ø1 Ø1 DE 1$\overline{MM}$ (pause) OW3 (pause) OW3

Alarm Signals

Each of the ten single digit alarm signals may be sent by sound signal. No call or ending sign is made with alarm signals. The appropriate number is sent in groups of three, each group repeated twice and followed by the call of the transmitting vessel.

EXAMPLE:

Alarm signal 5 means suspicious vessel in sight or detected.

555 (pause) 555 (pause) DE 81

Maneuvering

If the commodore decides an emergency turn together of 45° is required, he may execute this by whistle signals. He sounds a 15-second continuous blast which will be repeated by sound repeating ships. The 15-second blast is the preparative signal indicating an emergency turn of 45° will follow. The direction is signaled by the appropriate international turning signals, one short blast for starboard and two short blasts for port. Every ship in the convoy repeats the turning signals as she puts her rudder over. The turn is commenced as soon as the turning signal is heard.

Executive Signal

The whistle may be used to send signals by the executive method ($\overline{IX}$ followed by a 5-second blast) in the same way as a flashing light.

Pyrotechnics and Colored Lights

Use of Pyrotechnics

A rocket or roman candle may be visible as far as 20 miles. But, since the enemy has eyes also, it is obvious that use of pyrotechnics is limited to extreme emergency when, in all probability, the enemy already knows the location of the convoy.

There are five pyrotechnic signals authorized for use in convoys. Three of the signals are for maneuvering, and their use is left entirely to the discretion of the commodore.

A single red Very star indicates the executive signal for an emergency turn of 45° to port. This signal is employed in conjunction with the sound signals explained previously and with the colored light displays discussed in the following paragraphs. A green Very star would be used for a turn to starboard.

A series of red and green stars fired together is the signal to scatter and proceed at utmost speed. Such a maneuver might be ordered if enemy ships were encountered.

No fewer than two white rockets or roman candles are fired by a ship to signal that she has been torpedoed by a submarine or surface vessel, or that a submarine or torpedo boat is in the area. This signal should not be used to indicate attack or damage from aircraft torpedoes.

From an aircraft, a single white or yellow star indicates a submarine is held below.

Use of Colored Lights

A special list of colored light signals is included in ACP 148. It was developed basically to allow the commodore to maneuver the convoy rapidly at night. The same considerations of security should be applied as with pyrotechnics. If used, the lights should be exposed as brief a period as possible and their visibility limited to 2 miles. Only designated repeating ships repeat the signals. Signals are executed the instant the colored lights are switched off.

EXAMPLE:

Green over Green over Red	fixed lights	Emergency turn together 45° to starboard (to be carried out when the lights are switched off).

Radiotelephone

The radiotelephone system in convoys is, for all practical purposes, the same as that used throughout the Fleet and explained in chapter 6 of this text. Prior to sailing on convoy duties you should study the appropriate sections on radiotelephone in ACP 148.

NCLO

"On United States managed ships, other than United States convoy 'flagships,' when assigned on board, the United States naval communication liaison officer shall have cognizance of, and be responsible . . . for the efficient conduct of all communications, and for the supervision of the duties, watches and instruction of all communication personnel."

The above quotation from ACP 149 is a very brief summary of the duties of the NCLO. It is a short statement that covers a great number of tasks. It means, among other things, that he is responsible for—

1. Setting communication and radar watches.
2. Efficient performance of the personnel on watch.
3. Proper logkeeping.
4. Preserving radio silence.
5. Aiding the master in drafting messages which must go by Navy channels.
6. Supervising the delivery of incoming messages, and making sure they go to all the addressees.
7. Attending pre-sailing convoy and communication conferences.
8. Preventing unauthorized persons from entering the radio room.
9. Making nonapproved private broadcast receivers inoperative at sea.
10. Supervising the upkeep of visual signaling gear (but not the radio equipment, which the radio operator maintains).
11. Arranging for the emergency disposal of classified matter.
12. Assuring that identification signals are available on the bridge (if the ship is sailing independently).
13. Seeing that the radio room receives the information and publications necessary for its efficient operation.
14. Making certain that communication and radar personnel are familiar with the publications and are cognizant of changes; that they know the communication plan, distress procedure, the often-used call signs, the effective MERCAST numbered and lettered messages, and that they follow security measures.
15. Making certain that radar personnel make necessary reports as due.

In the execution of his duties, the NCLO should maintain a courteous respect for the customs of the merchant marine, and do everything he can to promote harmony between the Navy and maritime personnel. In supervising radio watches, the NCLO makes sure that there is no discrimination against either merchant radio officers or Navy Radiomen.

Certain merchant vessels have special radar equipment for use in navigation. The master of the vessel, in consultation with the NCLO, decides when the equipment should be used. The supervision and security of the radar equipment are the direct responsibility of the NCLO. Radarmen are a part of the naval communication liaison unit. Security arrangements must be made for the gear, and unauthorized persons are not permitted access to radar equipment either at sea or in port. Detailed instructions and information are promulgated to NCLO's and masters by the Chief of Naval Operations.

The NCLO and the Master

The NCLO is directly responsible to the master for the performance of his communication duties. The NCLO may be obliged to discharge certain other duties assigned by the Navy, but none of the collateral duties may be construed as giving the NCLO the right to disregard the ultimate authority of the master.

In accordance with the law, the master of a merchant ship commands the vessel, is charged with her safe navigation, and is responsible for everything connected with the operation of his ship, except for certain functions of the armed guard commander (as set forth in the OPNAV publication, *General Instructions for Commanding Officers of Naval Armed Guard on Merchant Ships*).

The Navy holds the master accountable for violation of merchant ship communication instructions.

The NCLO is required by the Navy to call the master's attention to any breach of wartime instructions for merchant ships or other official instructions concerning the security of the ship. If the master decides to disregard what is told him, the NCLO's responsibility in the matter is ended, unless the problem is of sufficient importance to warrant mention of it in the NCLO's communication report. In this event, suitable corrective action will be taken by the naval port control officer.

The master is required to make all communication instructions available to the NCLO. It is apparent that maximum efficiency can be achieved only by close cooperation between the two.

The NCLO and the Armed Guard Commander

The armed guard commander is in charge of the administrative organization and discipline of the naval personnel permanently assigned to the vessel. He is responsible to the escort force commander. The NCLO is subject to the military administration of the armed guard commander, but responsible to the master for the performance of his communication duties. The armed guard commander leaves the operational organization of communications to the NCLO.

The NCLO reports to the armed guard commander for endorsement of orders upon assignment to the ship.

Following are some regulations which clarify the relationship of the NCLO and the armed guard commander:

1. In all disciplinary matters affecting communication personnel, the NCLO is responsible to the armed guard commander, or naval commanding officer of armed guards and troops.
2. In port, the armed guard commander sets the security watches and the NCLO sets signal and radio watches that may be required. The security watches must not interfere with the signal and radio watches. Communication and radar personnel are not assigned gunnery duties while in port.
3. Unless a state of emergency exists at sea, communication personnel are assigned only to communication duties. In planning personnel requirements for gun stations, the armed guard commander will consult the NCLO. The NCLO makes provision for emergency communication stations on the bridge and in the radio room, and designates the remainder of the communication personnel as available for gun stations. It is well for all communication personnel to be trained for gunnery duty in case of emergency.

4. After consultation with the NCLO, the armed guard commander arranges the leave, shore leave, and liberty for communication and radar personnel. Cooperation and consideration of duties are essential to an equitable arrangement.
5. The NCLO is in charge of the advancement in rating of Quartermasters, Signalmen, Radiomen, and Radarmen. The armed guard officer handles the promotions of the gun crew.
6. The NCLO is expected to perform only the duties specified by official publications. He may also handle censorship if the duty is delegated to him by the armed guard commander.
7. The NCLO provides the armed guard commander with copies of incoming messages that concern the safety and defense of the ship.
8. The NCLO is responsible for procuring VHF radio equipment and for providing the armed guard commander with a list of other needed items before the ship reaches port. The armed guard commander is responsible for the requisition of BuShips signaling gear.

The NCLO and the Commodore's NCLO

The NCLO of a ship in convoy is also responsible to the commodore's NCLO. Should there be no NCLO attached to the commodore's staff, the NCLO of the flagship acts in that capacity.

XAK and XAP Teams

For certain invasion and support-invasion movements, specially trained communication teams, known as XAK and XAP teams, are assigned to some merchant ships. In communication matters, the NCLO is then subject to the authority of the officer in charge of the team.

Miscellaneous Information

The NCLO who serves also as armed guard commander will find himself busy enough. He will have to divide his labor in such a way that neither duty is neglected.

The NCLO often will find himself judge and jury, confessor, doctor, censor, advisor, keeper of the finances, and a hundred other things to his men. He should, of course, do all he can for them.

Naval personnel are quartered in their own spaces aboard ship. They are provided with their own mess and are fed from merchant ship stores provided by the merchant ship steward's department. The Navy is billed for their food. In short, all the Navy men have to do in the matter of chow is to eat it. The NCLO will be a member of the wardroom mess and will be provided with a cabin in the officers' country. Just as aboard Navy ships, he will be required to pay a monthly mess bill.

It is vital that the NCLO develop a cordial working relationship with the officers of the ship. Mutual understanding and cooperation will make everyone's job easier. The ship's officers will give the NCLO a helping hand when he needs it. They will be glad to have him aboard, and will look to him for advice on naval matters.

CHAPTER 16

COMMUNICATIONS ASHORE

INTRODUCTION

The primary function of naval communications is to provide and maintain reliable, secure, and rapid communications to meet the needs of the operating forces and the naval shore establishment. The elements of naval communications which carry out these responsibilities are (1) Director, Naval Communications, (2) the Naval Communication System, (3) communication departments of activities in the shore establishment, and (4) the communication organizations of the operating forces. The communication organizations of the operating forces were covered in the preceding chapters and will not be discussed here.

ELEMENTS OF NAVAL COMMUNICATIONS

The Director, Naval Communications

The Director, Naval Communications (DNC) whose complete title is Assistant CNO (Communications/DNC is the flag officer responsible for the over-all supervision and coordination of naval communications. DNC maintains technical control of naval communications and provides the necessary coordination and planning to ensure at all times efficient communication support for the naval establishment.

The Naval Communication System

The Naval Communication System is a fixed, integrated communication network which forms the worldwide framework of naval communications.

The Naval Communication System comprises the following types of activities:

(1) Naval Communication Station (NAVCOMMSTA)—which includes all communication facilities and ancillary equipment required to provide the essential fleet support and fixed communication services for a specific area.

(2) Naval Radio Station (NAVRADSTA)—generally a remote component of a NAVCOMMSTA which performs radio transmitting or radio receiving functions. To indicate the transmitting or receiving function, a type designation letter T or R is added in parenthesis.

(3) Naval Communication Unit (NAVCOMMU)—generally smaller in terms of personnel and facilities than a NAVCOMMSTA, which is assigned a limited or specialized functional mission.

Communication Departments in the Shore Establishment

The organization of the activities in the shore establishment generally provides for a communication department. The mission and functions of the communication department are in support of the mission of the parent activity and normally provide local or intra-activity communication services. The facilities and equipments used by these departments vary in amount and scope as may be necessary to meet the requirement of the activity concerned.

Normally the communication department of activities of the shore establishment provides for a small communication center, consisting of a message center and cryptocenter. However, where required, it may also provide for a tape relay station, wire and radio center, control center, radio transmitting and receiving facilities, and a visual signal station.

Generally, activities of the shore establishment are tributaries of the Naval Communication System. Where an activity performs functions for and is an operating part of the Naval Communication System, provision of the necessary facilities to perform those functions is made by the System.

NETWORKS AND CIRCUITS

Tape Relay Network

For point-to-point communications ashore, the Naval Communication System uses both radio and landline circuits. Certain channels of the radio trunk circuits, particularly overseas circuits, and practically all landline circuits are included in the naval teletypewriter and tape relay network. Stations comprising the network are designated as primary relay, major relay, minor relay, and tributary stations. Relay stations are integral parts of their respective communication centers.

Traffic is handled in the network by tape relay. Messages are received and routed in tape form to their destinations or next relay point by means of automatic and semiautomatic equipment. Tapes are routed by means of routing indicators. A routing indicator is a group of letters assigned to identify a station within a teletypewriter network. Figure 16-1 shows the routing indicators for the primary, major, minor, and some tributary stations of the U.S. Naval Teletypewriter network.

Letter Meanings

Routing indicators used in any worldwide tape relay network are combinations of four or more letters beginning with the letter R. Theater tape relay and manual teletypewriter networks (localized networks) employ routing indicators of four or more letters beginning with the letter U.

The letter R, then, the first letter of a routing indicator, identifies it as a world-wide tape relay network routing indicator, and distinguishes it from a call sign, address group, or theater routing indicator.

The second letter of the routing indicator identifies a communication system of a military service or a designated nation or facility. The assigned routing indicator does not necessarily identify the nationality or service of a particular station, since a second letter may be assigned to more than one nation, or a station may be served by or be a tributary to facilities of another nation or service. Second letters assigned to the military services of the United States are: B—Navy, U—Army, J—Air Force.

The geographical area in which a station is located or from which it is served is indicated by the third letter. The letters and the areas they represent are:

A—East Asia.
D—Great Britain and Ireland.
E—Eastern North America.
F—Europe.
H—Central Pacific.
K—Alaska and the Aleutians.
L—Caribbean and South America.
M—Malaya, East Indies, Philippines, and South Pacific.
Q—Middle East.
S—Western Asia.
T—Northwestern Africa.
V—Southern Africa.
W—Western North America.
Z—Australia and New Zealand.

Fourth and subsequent letters of the routing indicator designate relay or tributary stations as determined by assignment requirements. A four-letter routing indicator denotes a major relay station. A tape relay station is normally designated as a major tape relay station when two or more trunk circuits connected to it provide an alternative route for traffic, or when necessary to meet command requirements.

When the letter P appears in the fourth position it normally identifies a relay station of primary status. This facilitates the identification of tape relay stations having primary influence over traffic routing in designated geographical areas for a service network. When this is the case the station is listed as a primary relay station.

A routing indicator of five or more letters denotes a minor relay or tributary station. A tape relay station is designated as a minor relay station when it has tape relay responsibility, but does not provide an alternative tape relay route. A tributary station, on the other hand, does not relay traffic by the tape method. It is the terminus of a line from a relay station.

Theater teletypewriter routing indicators are identified by the letter U as the first letter. The second letter identifies the nation, military service, or international command (when special identification is specifically authorized) having primary interest in that particular theater

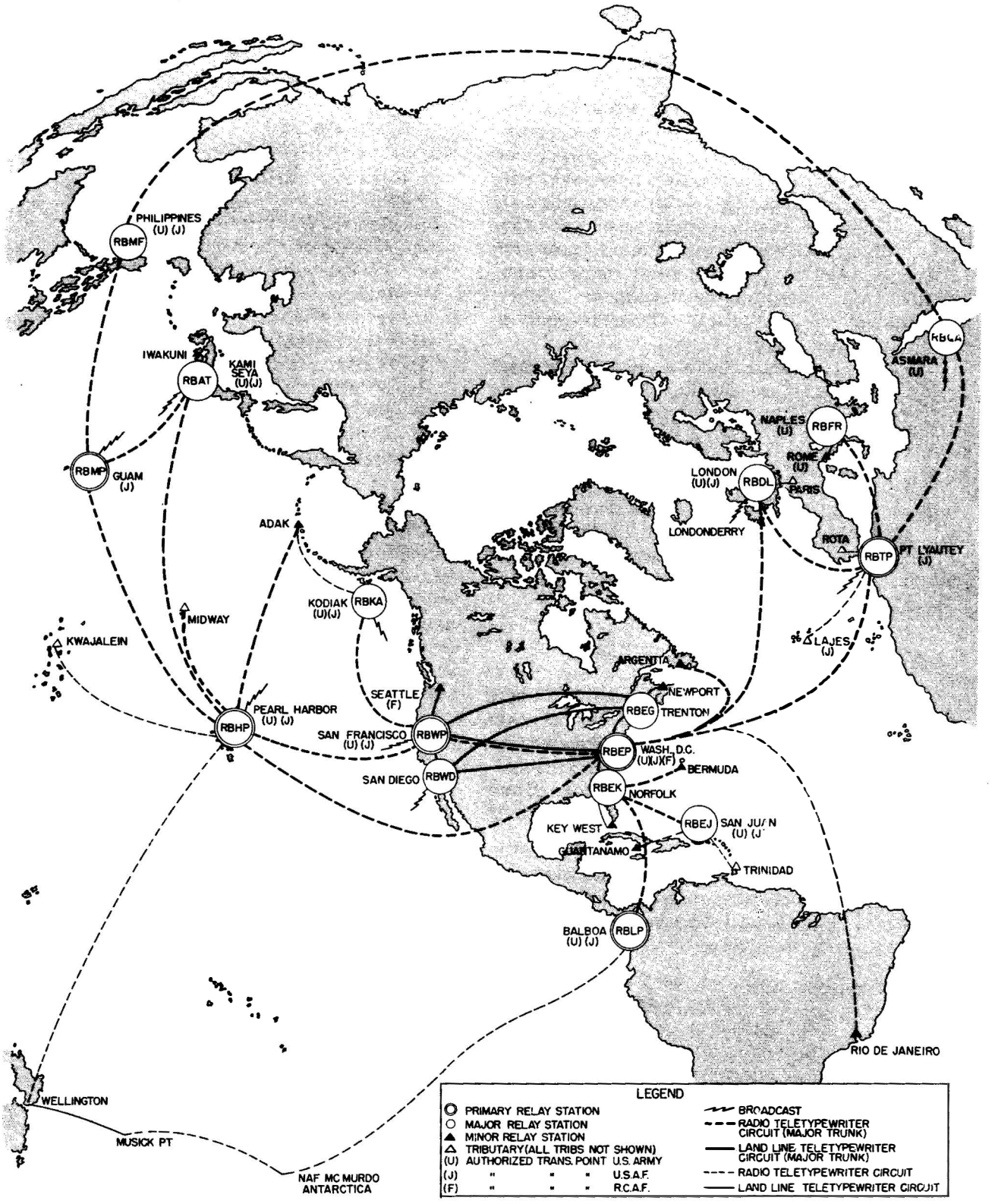


Figure 16-1.—Teletypewriter network and associated broadcasts.

network. The meanings of the subsequent letters are generally the same as for a worldwide routing indicator. Theater routing indicators are never used in the headings of messages transmitted over worldwide networks.

Suffix Letters

The letter C and all two-letter combinations CA through CZ are reserved for suffixes to routing indicators. There is a prescribed meaning for each authorized suffix. Suffixes are intended to aid the routing of tapes for processing purposes or localized action by the relay station or any of its supplementary sections or facilities. The use of these suffixes for intra-service messages is optional, but they are not used in joint or combined messages unless they appear in the routing columns of the encode sections of the combined worldwide routing indicator book. The meanings of authorized suffixes are:

C—Local delivery or refile in page form is required.
CF—Section which accomplishes delivery by broadcast methods.
CI —Section which coordinates routing information.
CN—Electronic conference facility or section.
CR—Cryptocenter.
CS —Section dealing with service messages.
CT—Section which accomplishes delivery of traffic by telephone.
CV—Section which uses tape relay methods for delivery of traffic to common carrier.
CX—Section which uses tape relay methods for delivery of traffic to activities served by commercial teletypewriter exchange systems, such as TWX.

Examples

Here are some routing indicators and their meanings.

The crytocenter of the primary tape relay station in the NAVCOMMSTA at San Francisco is RBWPCR. The meaning of each letter is:

R—Worldwide network.
B—United States Navy.
W—Western North America.
P—Primary station.
CR—Cryptocenter.

When a minor relay station is on a direct trunkline to a major relay station, it has a five-letter indicator. For example, Guantanamo Bay, Cuba, RBEJG, is a minor relay station on a direct circuit from a major relay station, San Juan, RBEJ.

A tributary station which is on a direct line from a major relay station may have as few as five or as many as seven letters in its routing indicator. When its traffic must go through one or more minor relay stations it will have a longer indicator, as is also the case when it is one of several stations on a line from the same major relay station. For example, Marine Corps Schools, Quantico, Naval Air Station, Patuxent River, Maryland and Supply Office, Naval Air Station, Patuxent River are tributaries on the same circuit from Washington, RBEP. Their routing indicators are RBEPYM, RBEPPA, and RBEPPS, respectively.

A tributary station of a minor relay station has at least six letters. For example, the Naval Air station at Guantanamo Bay, Cuba, RBEJGB, is a tributary of the minor relay station at Guantanamo Bay, RBEJG. The breakdown of RBEJGB is:

R—Worldwide network.
B—United States Navy.
E—Eastern North America.
J —Major relay station (San Juan).
G—Minor relay station (Guantanamo Bay).
B—Tributary station (NAS, Guantanamo Bay).

As you can see, the routing indicator system greatly simplifies and speeds the relay of traffic handled over teletypewriter facilities. Operating personnel at the originating station need to know only the first four letters of an indicator to place it on the proper circuit. For example, take a message to NAS, Guantanamo Bay, RBEJGB, originated at Washington, D.C. An operator in the relay station at Washington, seeing the letters RBEJ, knows that the message goes to San Juan. When received at San Juan, RBEJ, the operator knows from the fifth letter, G, that the message goes to Guantanamo Bay. At Guantanamo Bay, the operator knows that the sixth letter, B, means

NAS, Guantanamo Bay, and relays it to that tributary station.

Leased Teletypewriter Exchange Service

Commercial teletypewriter exchange service (TWX) is employed by the Naval Communication System for communication with activities for which there is insufficient traffic to justify a full time teletypewriter line.

TWX is a service supplied by the telephone company. The equipment used is owned, installed, and maintained by the company. Teletypewriter communications are available to any other TWX subscriber. Subscribers and their TWX numbers are listed in a TWX directory. Connections for TWX communication are made by the telephone company TWX operator in a manner similar to a long distance telephone call. The company is paid for the time used in actual communication with another station.

Traffic for naval activities served by TWX is normally routed to designated naval tape relay station, rather than transmitted directly to the addressee by TWX unless the TWX addressee is within a certain distance of the originator. This results in a considerable saving because the long haul portion of the traffic travels over Navy-leased lines. The only cost is for the short distance transmission between the nearest tape relay station and the addressee.

Relay of TWX messages to naval activities is facilitated by the assignment of routing indicators to facilities served by TWX. Activities equipped only with TWX facilities are designated by a routing indicator ending with the letters CX. The letters preceding CX in the indicator identify the relay station which transfers traffic routed via the tape relay network to and from the TWX-served activity. As a particular routing indicator ending in CX may apply to several TWX-served activities, messages (including service messages) to the TWX-served activities must bear a complete address. The CX at the end of the message routes the message to the TWX section of a COMMCEN, where the operator must read the address portion of the tape to determine the destination.

Facsimile

Facsimile (FAX) is the established system of telecommunication for the transmission of fixed images with a view to their reception in a permanent form. Facsimile transmission consists of sending pictorial-graphic intelligence by wire and/or radio, and is made via broadcasts to the fleet, from ships to shore and by point-to-point circuits. Facsimile transmissions have no inherent security as such, requiring ancillary security equipment to effect secure transmissions. Aside from purely naval FAX facilities, there is also a joint facility maintained by the Weather Bureau, Navy, and Air Force, called the National Facsimile Network.

Fixed Radio Circuits

The greater share of traffic between fixed stations is carried by the teletypewriter and tape relay network. Manual circuits are sometimes maintained but only where the volume of traffic does not justify the use of radioteletypewriter (RATT) facilities. Some of the manual nets could be shifted to RATT operation if a large increase in the volume of traffic makes it advisable.

In discussing circuits, it should be noted that the word has a different meaning when employed as a communication term than when used as an engineering term. When employed in the latter sense, it refers to a number of components connected electrically for the purpose of performing some desired function. As a communication term, a circuit is an electronic path between two or more points capable of providing one or more channels.

The types of fixed radio circuits are:

1. Half duplex (HDX)—a landline circuit capable of transmissions in both directions, but not simultaneously. The term simplex is synonomous with half duplex.
2. Full duplex (FDX)—a method by which transmissions on a circuit take place in both directions simultaneously. It may be either a radio or a landline circuit.
3. Multiplex (MUX)—a circuit capable of transmitting and receiving multiple teletypewriter messages simultaneously. Each message is placed on a separate channel and the channels are combined

by using time division on a single carrier frequency.

4. Single sideband (SSB)—a circuit capable of transmitting and receiving simultaneously six to 16 teletypewriter channels and one or more voice channels on either the upper or lower sideband frequency.

Radio Transmissions to the Fleet

There are three principal methods used for transmissions of naval messages to the fleet; broadcast, intercept, and receipt. When either of the first two methods is used, fleet units copy all transmissions but do not answer, thus avoiding the disclosure of their positions as is the case when the receipt method is used. The broadcast and intercept methods have one common disadvantage, in that there is no positive assurance that the message, as transmitted, has been received by the station called. This disadvantage is minimized by the use of transmitters of adequate power, careful choice of frequencies, good operating technique, monitoring of transmissions for accuracy, and the use of sequential serial numbers.

Broadcast

The broadcast method is the primary method of delivering traffic to the fleet. In this method, information transmitted is contained in sequentially numbered messages addressed to the ships concerned. The messages are copied by designated fleet units which then check the serial numbers to ensure that they have a complete file. Serial numbers of the messages are composed of the letter designating the broadcast station (see fig. 16-2) followed by the letters NR (meaning number), then a number, and appear as the first item of the procedure component of the message. The first message of the month is numbered 1, and succeeding messages are numbered sequentially until the end of the last day of the month, at which time a new series is begun. For example, WR NR 4986 means the four thousand nine hundred and eighty-sixth message broadcast by radioteletypewriter (R) from the NAVCOMMSTA, Washington (W). Units in the Atlantic would guard this broadcast. Similarly, units operating in the Mediterranean would guard the KR broadcast originating in Port Lyautey, and units in the Central Pacific, the HR broadcast from Pearl Harbor.

CW broadcasts follow regular schedules. No deviation is made in these schedules without prior notification to the fleet. Messages are placed on these schedules in order of precedence. If a message with a precedence of Operational Immediate or higher is given to the broadcast operator while a message of lower precedence is being broadcast, the lower precedence message is interrupted (unless only a short portion remains to be transmitted), and the high precedence message is sent out. On RATT circuits, which have continuous broadcasts, there is a device which may be keyed to ring bells on all receiving teletypewriters to call the attention of personnel to an incoming high precedence message. It is possible that a long, low precedence message which has been interrupted may not be completed until the next schedule. Messages are not usually repeated on subsequent schedules. All ships copy schedules and maintain a complete file of all broadcast messages, but of course only the addressee takes action on any message.

To ensure reception by all units of these very important broadcasts, the broadcast stations employs several transmitters simultaneously. Broadcasts normally employ one very low frequency or low frequency transmitter, and as many as five high frequencies. Most ships copying a broadcast tune to a low frequency and a high frequency, or to two high frequencies.

Broadcasts employ automatically keyed radiotelegraphy, radioteletypewriter, and radiofacsimile. In the first method, messages are perforated on tape, and fed into a machine which keys them at a speed no greater than 29 words per minute. Ships which have RATT equipment copy the RATT broadcasts, and do not copy the CW schedules. Facsimile broadcasts are usually limited to weather maps and similar material.

The broadcast stations, in addition to the fleet broadcasts, also transmit general broadcasts. The general broadcasts include hydrographic warnings, notices to mariners, merchant ship traffic (MERCAST), and weather reports. In some areas, general broadcasts also include press and time signals.

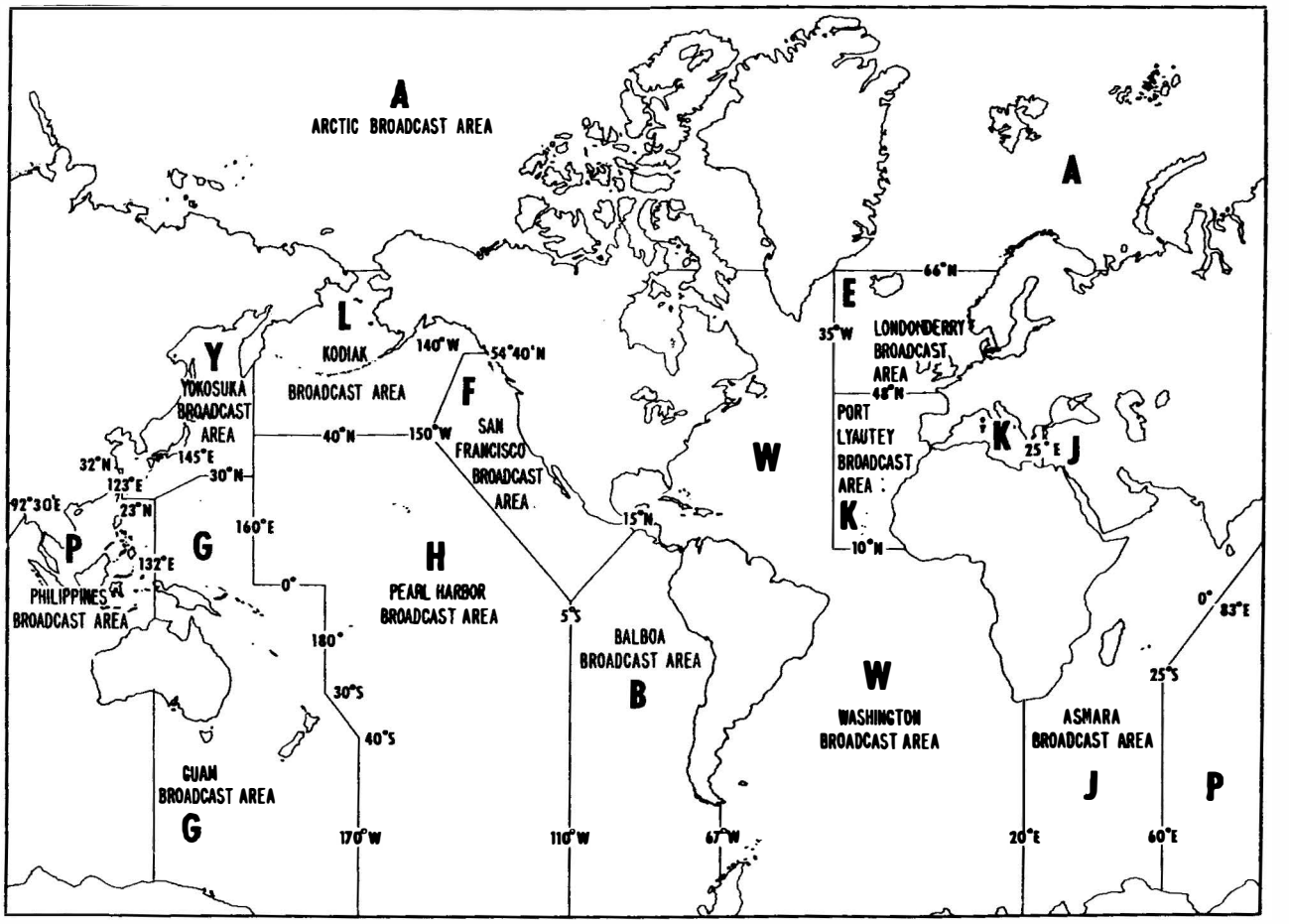


Figure 16-2.—Fleet broadcast areas.

Intercept

By the intercept method, the transmitting shore station sends to a second shore station. The latter obtains necessary repetitions to ensure correct reception, and repeats back. Messages thus transmitted are actually intended for third stations or ships, which are required to copy the transmissions but do not receipt for them or use their transmitters for any other purpose directly in connection with these transmissions. This method has an advantage over the broadcast method in that the necessary verifications can be pointed out and corrections obtained. In addition, the third party has two opportunities to copy the same transmission. Despite these advantages, however, the broadcast method is superior in that greater amounts of traffic can be handled in a given period. For this reason, the intercept method is not currently employed within the U.S. Navy.

Receipt

The receipt method is that method of delivery by which the receiving station indicates that it has received each transmission. This may be effected by the receiving station transmitting a receipt after each message or sequence of messages or by waiting and then making a periodic station serial or channel number comparison with the transmitting station.

The receipt method is the normal method of handling radiotelegraph point-to-point, ship-to-ship, ship-to-shore, and aircraft traffic. It may also be authorized by responsible commanders

for shore-to-ship communication in peacetime and, under exceptional circumstances, in wartime.

The receipt method is the most reliable method of handling traffic since no doubt exists as to the addressee's receipt of the message. Repetitions and corrections may be obtained as desired at the time of transmission.

A decided disadvantage in the use of the receipt method in wartime is that the location of both stations may be disclosed to the enemy through the use of direction-finding equipment. In addition, the identity of the station using this method may be disclosed because of the use of individual call signs.

Ship-To-Shore Radio

In addition to their responsibilities for operating fleet and general broadcasts, NAVCOMMSTAS serve as the principal agents in receiving radio traffic from the fleet. The primary means for delivery of this traffic from individual ships to shore stations is via the ship-shore radio circuits. Certain NAVCOMMSTAS maintain a continuous guard on the fleet ship-shore circuit. Stations which do not guard the primary ship-shore circuits may instead guard special area ship-shore circuits. At many communication stations, guard is also maintained on secondary ship-shore and harbor common circuits. These ship-shore frequencies are not to be used for point-to-point transmissions but rather, as contact frequencies, the station then shifting to the working frequency.

The Naval Security Group

Naval communications perform special functions in addition to the primary functions mentioned previously. Most of these functions are handled by components of the Naval Security Group (NAVSECGRU) located at NAVCOMMSTAS and NAVSECGRUACTS although some of the operations may be performed by special teams or detachments assigned to the fleet or to other activities of the Navy.

The direction, administration, and coordination of the operations of the NAVSECGRU are the direct responsibility of the Head, NAVSECGRU under the supervision of the Assistant Director, Naval Communications (DNC), for NAVSECGRU matters. Communication officers should be aware of the following functions performed by NAVSECGRU:

1. Safeguarding of U.S. Navy communications against foreign intelligence.
2. Administration of the Registered Publication Section (RPS) of DNC and of the registered publication issuing offices (RPIOS).
3. Supervision and administration of the naval portion of the Armed Forces Courier Service (ARFCOS), including manning and operation of specified ARFCOS courier transfer stations.
4. Supervision of the organization and administration of and training within the naval reserve NAVSECGRU program.

Security Group Department at a NAVCOMMSTA

The senior officer of the NAVSECGRU at a NAVCOMMSTA is the department head. The functions of the Communication Security Division, the Registered Publication Division, and the Courier Division are explained below.

Communication Security Division

The functions of the Communication Security Division at a NAVCOMMSTA are:

1. Monitoring circuits to determine evidence of improper circuit procedures, poor circuit discipline, off-frequency operation, and violation of rules for communication security.
2. Examination and analysis of message traffic (plain and encrypted) to determine errors.
3. Examination and analysis of all U.S. Naval message traffic to determine what cumulative intelligence is available to foreign intercept.
4. Issuance of communication improvement memorandums (CIMS) to the commands responsible for errors and malpractices in communications.
5. Liaison with communication officers of naval activities on all matters pertaining to communication security.
6. Making training visits to fleet and shore-based activities.

The communication improvement memorandums mentioned in subparagraph 4 are not to be construed as official letters which reflect upon the performance of any individual, and they should not be used as a basis for determining the winner of communication competition or for assigning penalties to personnel. An exception to this policy is made when flagrant violations of communication discipline are uncovered, such as use of obscenity, unauthorized conversations between radio operators, and serious violations involving physical or cryptographic compromises.

Communication personnel of naval activities should have liaison with communication security personnel and consult on all matters pertaining to communication security. Communication officers of staffs, ships, and stations are urged to utilize the technical knowledge and experience of communication security personnel.

Training visits made by communication security personnel are for the improvement and correction of communication procedures. They are not inspections or tests. A report of each training visit is made only to the commanding officer of the activity visited. Request for training visits should be sent directly to the nearest NAVCOMMSTA, NAVSECGRUDET, or NAVSECGRUACT. All commands should make arrangements for at least one communication security training visit a year, if practicable.

Registered Publication Division

The registered Publication Division in the Security Group Department is responsible for the operation of the Registered Publication Issuing Office (RPIO). RPIOs are responsible for supplying the RPS-publication needs of the Naval Establishment. District Libraries, which are under the cognizance of District Commandants in those Naval Districts where RPIOs are located, are also operated by RPIOs.

RPIOs are located at points chosen to give maximum support to the Naval Establishment. They normally are components of NAVCOMMSTAS; however, they may also be independent detachments or mobile units. Registered Publication Mobile Issuing Offices (RPMIOs) serve under appropriate Service Force Commanders and operate at sea. Sometimes they are temporarily based ashore at a remote location when such location will best serve the Fleet.

Courier Division

The Courier Division of the Security Group Department at a NAVCOMMSTA is charged with the operation of a station of the Armed Forces Courier Service (ARFCOS). The Armed Forces Courier Service is responsible for the secure and expeditious delivery of authorized classified material to military addressees and certain civilian agencies throughout the world. It is designed to eliminate duplication of effort and expense through the use of strategically located courier transfer stations which supplant the previous system of separate courier services maintained by the individual armed forces.

With the establishment of the ARFCOS, the navy officer messenger mail (OMM) system was discontinued. Officer messenger mail centers formerly operated within RPIOS have been designated as courier transfer stations (CTS). Although OMM facilities still are frequently located within RPIOS and are operated by RPIO personnel, this is no longer an assigned mission of the Naval Communication System. The establishment and maintenance of facilities for handling officer messenger mail is the responsibility of sea frontier, area, fleet, force, type, and base commanders, and naval district commandants.

The Naval Communication System is charged with the operation of the Navy's proportionate share of the approximately 60 courier transfer stations located throughout the world. The operation of local intra-area intra-service courier systems is the option and responsibility of local commanders.

NAVCOMMUS

Although much of the work of the Naval Communication System is done by the NAVCOMMSTAS and independent facilities, important functions are performed by naval communication units (NAVCOMMUS).

A NAVCOMMU is under an officer-in-charge instead of a commanding officer. The assistant officer-in-charge who has the collateral duty as head of the administration department is the next in the military chain of command.

The two departments in a NAVCOMMU are the communication department and the administration department. The communication department of a NAVCOMMU includes the message

center, the cryptocenter, relay station, control room, classified relay station, visual signal station (if applicable), receiver station, and transmitter station. The functions of the communication department are the same at a NAVCOMMSTA and a NAVCOMMU.

COMMUNICATION DEPARTMENTS OF SHORE ACTIVITIES

The communication department facilities element of naval communications is composed of the communication departments of naval bases, stations, air stations and facilities, ammunition depots, supply depots, etc., but does not include any of the activities of the Naval Communication System. These departments primarily provide local (intra-area or intra-activity) communication support for the base, station, depot, etc., of which they are an organic component. They provide fleet support facilities, air operational support facilities, and such extra-local service as may be required. They disseminate information and convey reports, progress data, current status information, and similar intelligence to the command or activity.

In addition to providing local communication support, a communication department serves as a link with the worldwide network of the Naval Communication System. Teletypewriter tape relay is a function which may be performed by communication departments.

A communication department facility normally consists of a communication center, including wire and/or radio transmitting and receiving equipment, associated control equipment, cryptocenter, and such other equipment as local circumstances and requirements may dictate.

CHAPTER 17

THE NAVAL COMMUNICATION STATION

MISSION

The NAVCOMMSTA as a link in the Naval Communication System was discussed in the preceding chapter. It will be examined in greater detail here.

The mission of a NAVCOMMSTA is to manage, operate, and maintain those facilities, equipments, devices, and systems necessary to render requisite communications for the command, operational control, and administration of the Naval Establishment and to perform such functions as may be directed by the Chief of Naval Operations.

NAVCOMMSTAS are located in San Diego, California; Newport, Rhode Island; Norfolk, Virginia; San Juan, Puerto Rico; Adak, Alaska; Kodiak, Alaska; San Miguel, Philippines; Yokosuka, Japan; Londonderry, Northern Ireland; Asmara, Eritrea; Washington, D.C.; San Francisco, California; Honolulu, Hawaii; Finegagen, Guam; Balboa, C.Z.; and Port Lyautey, Kenitra, Morocco. The last six are designated primary communication centers. These centers are responsible for the maintenance of:

1. Fleet broadcasts for the delivery of traffic to all U.S. naval ships in each ocean area. These broadcasts consist of a high-power VLF or LF transmitter keyed simultaneously with high-power HF transmitters.
2. A fleet radioteletypewriter broadcast, similar to the fleet broadcast except that a VLF transmitter is not employed.
3. A general broadcast, also similar to the fleet broadcast except that a VLF transmitter is not employed. These broadcasts provide time signals, weather (RATT and CW), hydrographic warnings and notices, press (RATT and CW), and merchant ship broadcast schedules.
4. A fleet facsimile broadcast, similar to the fleet broadcast, but with no VLF transmitter.
5. A high-power, high-frequency ship-to-shore circuit, manually keyed.
6. A high-power, high-frequency duplex or multiplex radioteletypewriter ship-to-shore circuit available for use with fleet commanders.
7. Local MF, UHF manual, radioteletypewriter and voice ship-to-shore circuits as required.
8. Multichannel radio and landwire teletypewriter, voice and facsimile trunk circuits to major or minor communication centers throughout the world.
9. Radio or landwire teletypewriter circuits to tributary activities.
10. Other radio or landwire circuits as may be required to meet specific requirements.
11. Radio and landwire link control circuits and facilities which link the components within a communication center.

NAVCOMMSTAS also provide communications for naval district and river command commandants; commanders of naval bases, stations, and shipyards; and Marine Corps support establishment commanders. Other tasks assigned to certain NAVCOMMSTAS are the operation and maintenance of one or more of the following: security group facilities, communication facilities for the headquarters of a specific major command, primary and secondary air operational communication facilities, and communication facilities and services for the Army, Air Force, Coast Guard, Federal Aviation Agency or other Government agency as economically feasible.

ORGANIZATION

Figure 17-1 shows the standard organizational structure of a primary NAVCOMMSTA. Minor deviations from the basic organization are permitted to meet the local situation.

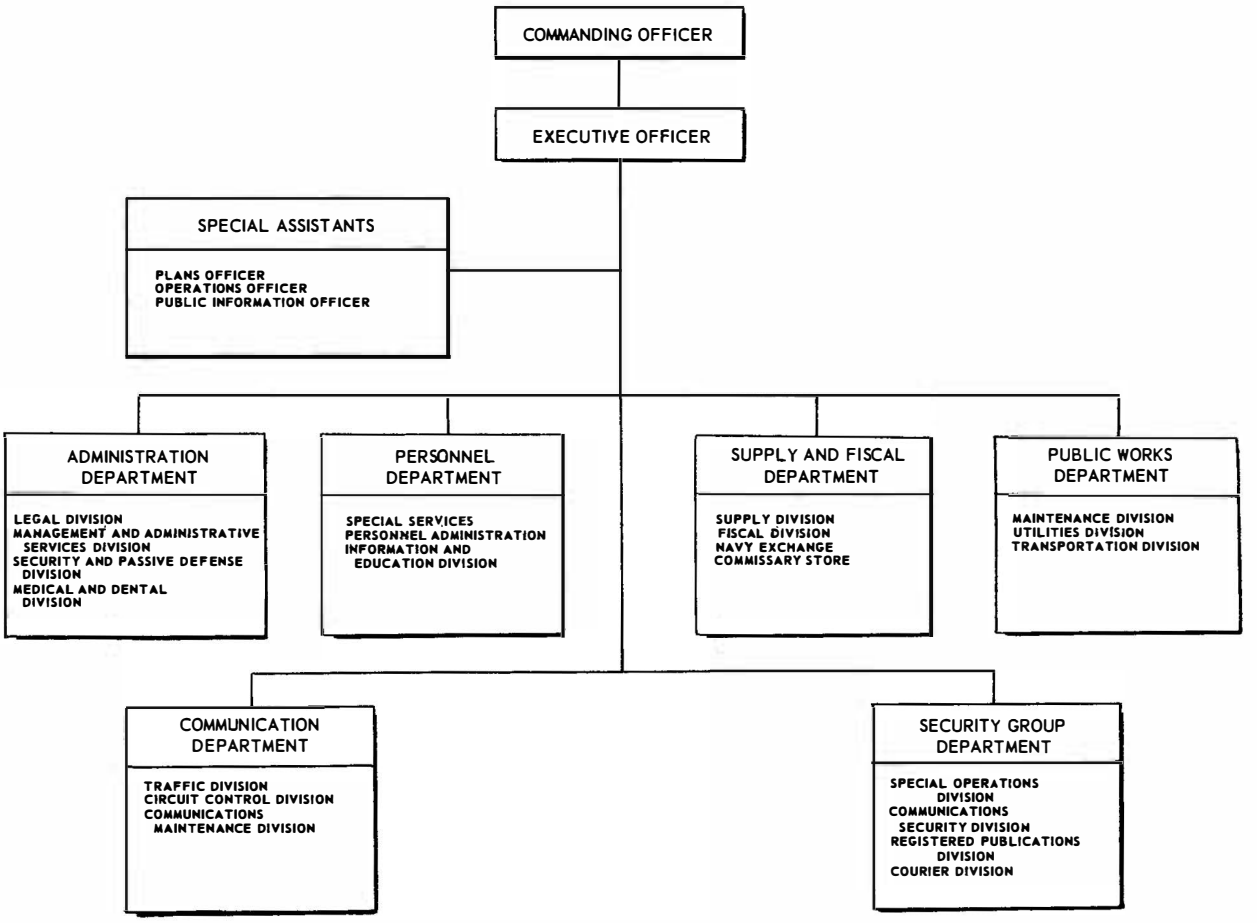


Figure 17-1.—Organization of a primary NAVCOMMSTA.

Departments or functions for which support is received from other activities may be omitted. An example might be where the NAVCOMMSTA is close enough to a naval station so that it may utilize the public works and supply departments of the naval station without difficulty or where the public works functions are performed by a Public Works Center. Otherwise it will need a public works and supply department of its own. Also, two or more departments are combined where one or all are not of sufficient size to warrant separate departments. At some stations the administration and personnel departments are combined for this reason.

The buildings and spaces of NAVCOMMSTAS vary so widely in location and arrangement that generalization is difficult. The components discussed in this chapter are usually present, but at some stations they are scattered over a large area. The transmitter and receiver radio stations, in particular, are often several miles from the remainder of the activity.

The commanding officer of a NAVCOMMSTA is usually of the rank of captain or commander. He is responsible for the station's successful fulfillment of its mission. To this end, he establishes policies and procedures for its operations, and initiates and enforces local directives for its upkeep and security.

The responsibility of the commanding officer includes functions which are of a management nature. Budget requirements must be determined, fiscal control exercised, and measures of performance developed and applied to ensure the most effective use of available manpower and funds. The efficient and economical operations of the station is a major responsibility of the commanding officer.

In addition to his station command, the commanding officer may be the staff communication officer for the commandant or force commander of the naval district or area within which the NAVCOMMSTA is located. As such, he is responsible to the commandant or force commander for the coordination of naval communications within the district or area.

As aboard ship, the commanding officer is assisted in the discharge of his responsibilities by an executive officer. The executive officer is the direct representative of the commanding officer. He coordinates the activities of the department heads in accordance with the general policies promulgated by the commanding officer. The executive officer organizes the activities of the station, plans the details and procedures of the training and discipline of personnel, and prepares and issues operating orders, notices, and directives as required. He also directs routine and emergency fire, battle, air raid, and other drills. When the commanding officer of the station is also the district or area communication officer, the executive officer may be the assistant communication officer of the district or area. In some cases a separate officer, usually with the rank of commander, is assigned this duty.

Special assistants to the commanding officer and the executive officer are the plans officer, operations officer, and the public information officer. These billets are not directly in the chain of command of a NAVCOMMSTA and are sometimes assigned as collateral duties. An example of this is where the communication officer is assigned collateral duty as operations officer.

The typical NAVCOMMSTA has a complement of several hundred officers, enlisted men, and civilians. These personnel are divided among the administration, personnel, communication, security group, supply and fiscal, medical, dental, and public works departments. These departments are headed by the administrative officer, personnel officer, communication officer, security group department head, supply officer, medical officer, dental officer, and public works officer respectively.

COMMUNICATION DEPARTMENT

Figure 17-2 shows the organization of the communication department at a NAVCOMMSTA. Again, deviations are usually made from this organization plan to meet the local situation. In addition, the terminology used to identify the components of the communication department at a NAVCOMMSTA may vary from station to station. Basically, the divisions of the communication department of a NAVCOMMSTA are the traffic, circuit control and communication maintenance divisions. The communication department may include a Receiver Division where the receiver station is at the same location.

The communication officer of a NAVCOMMSTA is usually of the rank of lieutenant commander. He has direct supervision over and responsibility for the general service personnel and functions of the communication department of the station. He serves as manager of the local communication program, and determines its budgetary requirements. In addition, he is responsible to the commanding officer for—

1. Formulating communication plans and directives.
2. Establishing an internal routing and filing system.
3. Providing for the physical security of messages, and for maintaining monitoring facilities.
4. Supervising the operation of the NAVCOMMSTA publications library through the command's appointed RPS custodian.
5. Supervising the training of communication personnel and cryptoboard members.
6. Operating and maintaining electronic and visual communication equipment.
7. Conducting inspections and inventories.
8. Maintaining records and forwarding abstracts and statements of the usage of naval communication funds.

Traffic Division

The traffic division of a NAVCOMMSTA is the section where the incoming and outgoing messages are processed. All messages coming into and going out of the NAVCOMMSTA must be prepared in some component of the traffic division. The components of the traffic division are the message center, the cryptocenter, the relay station, the wire and/or radio center, the classified relay station (if applicable), the visual signal station (if applicable), and the facsimile center.

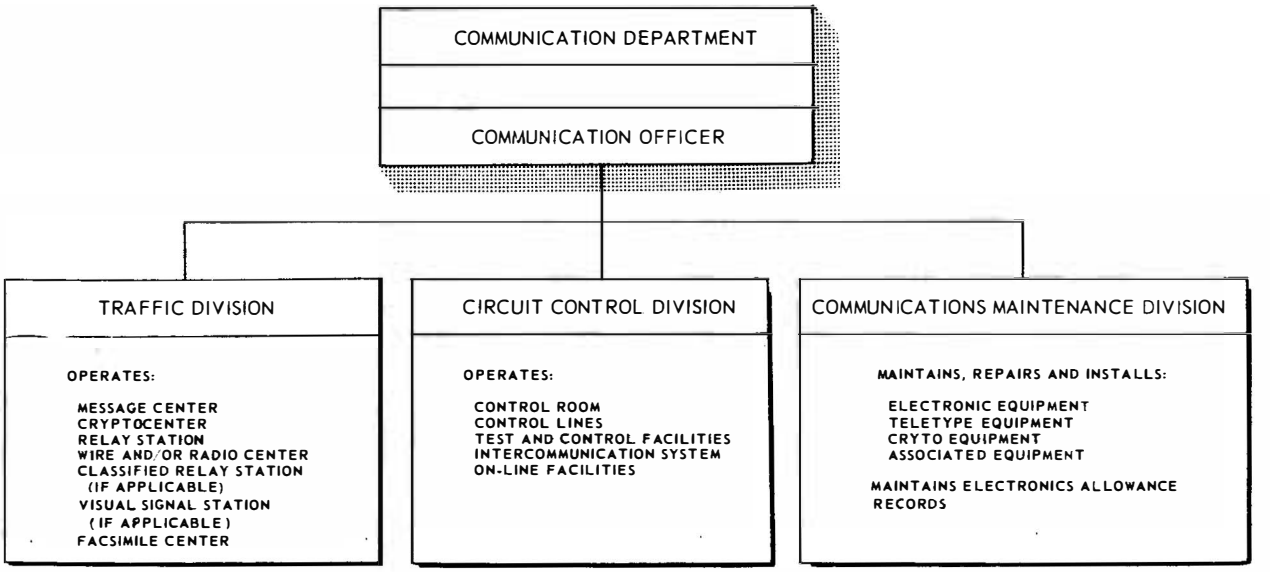


Figure 17-2.—Communication department organization of a NAVCOMMSTA.

Message Center

Messages received by messenger, mail, and pneumatic tube from local activities to the NAVCOMMSTA are accepted for transmission by the message center. When a message is received for transmission the time is stamped on the message and the name of the releasing officer is checked against the master file of the authorized releasing officers to ensure that transmission of the message is properly authorized. A date-time group is assigned to the message and a check is made to determine if all security requirements have been met. Routing indicators, call signs, and address groups are assigned to the message and the heading is prepared. If the message is classified it is sent to the cryptocenter for processing prior to transmission.

Messages which are received by electrical means for local delivery are also handled in the message center. The time of receipt is stamped on the incoming message. Next it is scanned for garbles. It is prepared for further relay over local radio and/or wire circuits when required. The call signs and address groups are decoded and duplicate copies of the message are made for internal distribution. The messages are then routed to the delivery desk where they are logged for delivery by messenger pickup, pneumatic tube, and telephone to the local activities served by the NAVCOMMSTA. The check copy is checked and filed.

It is the responsibility of the message center to maintain current message routing and information facilities to expedite the routing of messages to proper circuits for transmission. Close liaison should be maintained with the movement report center for ship locations. In addition, the message center should maintain the message files and a service section for obtaining and making prompt corrections to messages.

Wire and/or Radio Center

The wire and/or radio center operates those radio or landwire circuits which are off-net or not a part of the integrated tape relay network, such as:

1. Circuits to commercial companies.
2. Circuits to other Government agencies.
3. Fleet and general broadcast.
4. Certain ship-to-shore circuits.
5. Cables.

The wire and radio center is usually located close to the message center and at some NAVCOMMSTAS is considered part of the message center.

Cryptocenter

The cryptocenter is generally located adjacent to the message center. At small stations, the proximity of all components of the traffic division enables message traffic to and from the cryptocenter to be passed by hand. Large stations, however, require a more complex arrangement, due both to the greater volume of traffic and the physical separation of the various components. At large stations, the cryptocenter is a tributary station of the relay station.

The routing of decrypted traffic from the cryptocenter is facilitated by the maintenance of a card file arranged according to subject matter. Each card lists those activities interested in a particular subject, and the action activity can be readily determined from this listing. The other activities are put on the routing sheet as activities interested for information only. A message is routed only to those activities which require it for their proper functioning. The number of copies made of a message of any classification is limited to the number required by the activities to which it is routed.

Authorized messengers from the activities served by the cryptocenter pick up copies of messages routed to their activities at the classified delivery desk. Carrier authorization cards for these messengers are retained at this desk. After presenting suitable identification, a messenger signs for and receives the messages for his activity. The messenger's receipt for a Secret message must indicate the copies (or copy numbers) of the messages received. A separate receipt is required for each copy of a Top Secret or category B message. Top Secret messages are delivered to the Top Secret control officer (or center) of the activity. A continuous chain of receipts must be maintained for all individual pieces of Top Secret information. Responsibility for the accounting of Top Secret information rests with the Top Secret control officer. This officer is responsible for the control of all Top Secret material originated or received by the activity.

In the case of outgoing messages requiring encryption, the orginating office sends a single copy, signed by the releasing officer, to the cryptocenter. The originator's copy is time-stamped at the time of receipt, and is retained in the cryptocenter as evidence of authorization to transmit the message. After the message has been processed and encrypted, a copy is returned to the originating office, and other copies are routed as necessary to any local adees. Other than normal local distribution, if required, is indicated by the originator at the bottom of the last page of his message.

Relay Station

The function of a relay station is to forward messages in tape form by means of semiautomatic or automatic teletypewriter tape relay equipment. A recent addition to the relay system is the automatic relay center which has fully automatic equipment for routing messages in tape form. At the present time there are five automatic relay stations which link the naval activities in the United States. They are at Cheltenham, Maryland; Norfolk, Virginia; and Trenton, New Jersey for services to east coast and midwestern activities, and at San Diego and Stockton, California for activities in the western area. The new system handles almost 100 percent of the Navy's command and administrative messages in the continental United States. In the future, automatic relay equipment will be provided at overseas relay stations.

In the semiautomatic (or torn tape) system the incoming circuits of the naval teletypewriter and tape relay network terminate in typing reperforators which automatically perforate and print messages on tapes. Message tapes are removed by hand from the receiving consoles by an operator, who then checks the tape quickly for the legibility of the routing indicators and station serial numbers. He also scans the remainder of the tape for garbles and mutilation.

If the tape is found to be correct, the operator crosses off its number on his received numbers sheet for that circuit and enters his personal sign in the S-T (sign-time) column. Each operator and supervisor at a teletypewriter station is assigned a two-letter sign, usually his initials. No two persons at a single station are given the same sign, nor can the sign conflict with channel designators or prosigns.

When the tape is mutilated, garbled, without a channel number, missent or misrouted, or is in any other way unfit for relay, it is passed to the service desk.

Opening and closing notices (messages sent to commence or cease transmissions on a given channel), STOP and GO AHEAD (GA) notices (signals sent to suspend or recommence transmissions on a given channel), and other service and procedure messages are called to the supervisor's attention after checkoff. The receiving operator must furnish sufficient identifying data for each tape referred to the supervisor. Operators do not question the text portion of a tape containing nongroup cipher (scrambled) text.

During normal hours of operation, after the receiving operator has removed the tape from the console, checked it, and made the proper entries on his numbers sheet, he delivers it to a tape screening position immediately ahead of the tape factory. From this point, single address tapes are bypassed around the tape factory to a tape distribution position, where they are looped around pegs labeled for various destinations. A separate peg is provided for PRIORITY traffic. OPERATIONAL IMMEDIATE and higher precedence traffic are handled hand-to-hand.

A multiple address message, on the other hand, must go from the tape screening position to the routing line segregation position. The routing line segregator is equipped to reproduce as many single address tapes as necessary to effect the delivery of a multiple address message.

Figure 17-3 shows the page copy of a multiple address message originated at Guam (RBMPC). When the receiving operator in primary relay RBMP notes that it is a multiple address message, he transfers it to the routing line segregation operator, who determines what additional tapes are needed.

Following is an explanation of the heading of the message itself. The first (procedural or format) line that appears in the message is actually line 2 in the teletypewriter procedure. There is no line 1 in this message. Line 2 is the basic routing line, and consists of the precedence prosign (DEFERRED in this case) and the routing indicators of the stations that are to effect refile or delivery of the message.

In line 3, DE is the prosign which means "This transmission is from the station whose routing indicator follows." RBMPC 98 is the routing indicator and the station serial number of the station (NAVCOMMSTA, Guam) originating the message tape.

(line 2)	MM RBWPC RBHPC RBATC RBEPW
(line 3)	DE RBMPC 98
(line 4)	NPG T NALK
	NPM ZON3
	NDT T NESP
(line 5)	M 10/1400Z
(line 6)	FM NFDR
(line 7)	TO NALK
	NAPN
	NARL
	NELT
	NESP
	NORL
	NUSX
(line 8)	INFO MUSK
(line 10)	GR 75
(line 11)	BT
(line 12)	Text
(line 13)	BT
(line 15)	10/1430Z JAN RBMPC

Figure 17-3.—Multiple address message.

NPG T NALK, NPM ZON3, and NDT T NESP are transmission instructions (line 4). These transmission instructions ensure that the message is delivered to all addressees. NFDR (originator) has already delivered to NUSX, so no mention need be made in this line. NPG (RBWPC, San Francisco) is to transmit the message to NALK, NPM (RBHPC, Pearl Harbor) is to place the message on the NPM fleet broadcast. RBMPC has previously determined that the message can be delivered to NAPN, NARL, NELT, and NORL via the NPM broadcast, NDT (RBATC, Yokosuka) is to transmit to NESP. Since RBEPW, Washington is the guard for MUSK, neither transmission instructions nor delivery responsibility need be indicated.

The major relay station at each NAVCOMMSTA relays messages for its traffic division; thus, RBMP relays for RBMPC, RBAT for RBATC, RBEP for RBEPC, RBHP for RBHPC, and RBWP for RBWPC. Of the four stations to which the message must be transmitted for refile or delivery, Guam has direct circuits with only two, Japan and Pearl Harbor (fig. 16-1). Pearl Harbor, however, serves as a further relay for traffic from Guam to San Francisco and Washington. Therefore, only two tapes are needed to transmit this particular message from Guam.

The routing line segregation operator determines the need for, and makes, the required tapes. One will contain only RBATC in line 2, the second will contain RBWPC RBHPC RBEPW.

The tapes are then put into the tape holder at the transmitting position. The transmitting operator selects them in order of precedence. Tapes of the same precedence are selected in order of time of arrival or receipt. The tape grids are divided into three sections: red (PRIORITY), blue (ROUTINE), and gray (DEFERRED). After selecting the tape, the operator inspects the routing indicator to determine the proper transmitter in which to insert the message.

High-precedence traffic is transmitted at once, lower-precedence messages being removed from the transmitter if necessary. The time of delivery (TOD) is penciled on the front of FLASH and EMERGENCY tapes, which are recovered after transmission and passed to the supervisor's desk.

Supervisory duties may be performed by one man, as is the case at many smaller tape relay stations, or by several. Regardless of how many personnel are involved, the basic responsibilities are the same.

The relay station supervisor must work in close coordination with the watch officers at the radio stations. He is charged with the operation of all circuits and equipment, and with the movement of traffic through the relay station. He assigns personnel to the various sending and receiving positions. The relay supervisor keeps informed of all current operating instructions and changes to them. When an unusual event occurs, he notifies in turn the officer in charge, the radio station watch officer, and the section chief, making reports as necessary.

The relay station supervisor also maintains the relay station log, which records the opening and closing of circuits, and any pertinent information regarding the watch, such as defective circuits, equipment casualties, and abnormal delays to traffic.

Supervision of the transmitting operations of the relay station is the responsibility of the sending supervisor. He instructs operators in the proper methods of inserting tapes and operating transmitters.

The sending supervisor also ensures that number comparisons are sent at designated times, that STOP and GA messages are complied with, and that any retransmitted messages are not given new numbers. He watches for the faulty operation of sending, automatic numbering, and monitoring equipment. If such a casualty occurs, he immediately notifies the relay supervisor and sends for the maintenance man.

The sending supervisor assists the relay supervisor in the preparation of general message checkoff sheets, of page copies of messages, and of the traffic load study report. He also assists the relay supervisor in closing out channel numbers, and in the opening and closing of part-time and overflow circuits.

Service operations of the relay room are under the direction of the service and monitor supervisor. These operations include:

1. Locating missent, misrouted, or lost messages and transmitting them correctly.
2. Retransmitting messages which were not delivered to an addressee because of equipment failures.
3. Preparing new message tapes when existing tapes result in faulty transmission.
4. Clearing up garbled or overlined message tapes.
5. Investigating claims of delay or nondelivery of messages handled by the station.
6. Making and checking automatic numbering tapes.
7. Investigating and correcting failures of automatic numbering equipment.
8. Directing the recording and identification of monitor records.

As receiving supervisor, the relay station watch officer is responsible for the operation of the receiving positions. He checks the received message records for completeness of the required data (such as circuit designation and date), and inspects and endorses the records every half hour, encircling any open numbers. He reports the open numbers to the service desk.

He supervises the handling of STOP and GA messages, and sees that number comparisons are sent at the proper times. He also instructs personnel in the correct handling of tapes, the checking of channel numbers, the identification of TWX tapes and their routing, the special handling given messages of OPERATIONAL IMMEDIATE and higher precedences, and the general routing of messages.

Classified Relay Station

There has been established a high command (on-line crypto) teletypewriter tape relay network consisting of classified relay stations linked by channels and circuits of the Naval Communication System, utilizing on-line crypto equipment for handling high command classified and unclassified traffic between those high commands served by the network.

The methods, procedures, practices, techniques, and functions of the classified relay stations are similar to those of the tape relay station.

Visual Signal Station

The visual station is responsible for the visual branch of communications at the NAVCOMMSTA. This station is not present at all NAVCOMMSTAS, but only at those which are so located as to require a visual communication station. The visual station handles receipt, transmission, and relay of traffic to or from ships entering or leaving port or at anchorage. It parallels the shipboard signal division.

Facsimile Center

The facsimile center is the physical location where the functions of the facsimile branch are performed. The facsimile center of a NAVCOMMSTA has the functions of operating area facsimile broadcasts, working point-to-point facsimile circuits, and receiving ship-to-shore facsimile traffic. It may also maintain a drop on the national facsimile network, a joint facility of the Weather Bureau, Navy, and Air Force.

The equipment used by a facsimile center includes receiver-converters and facsimile transmitter-receivers (transceivers). In addition, the facsimile center has complete darkroom facilities. Photographic equipment and material are furnished by and under the cognizance of the Photographic Division of the Bureau of Naval Weapons.

The major facsimile operations are the fleet broadcasts, such as the broadcast from Washington (designator WP). These broadcasts are transmitted simultaneously on as many as three frequencies. They are composed mainly of weather charts, but also include photos, blueprints, drawings, charts, and other graphic material. At the present time, written messages are not transmitted on facsimile circuits, nor do they carry classified material.

Weather maps on the WP broadcast originate in Navy weather central. Transmissions from weather central are carried by wire or radio (CCL) to the radio transmitting station, where they are broadcast.

Each item of facsimile traffic carries an identification block in its lower left corner. The identification block contains the standard message heading format, modified as indicated below, and such other lines as necessary.

Element	Line No.	Explanation
WP NR 115 M 101515Z	3 & 5	Station or broadcast identifying letters, station serial number, precedence prosign, and DTG.
FM NSS	6	Prosign FM: originator's designation (address group, call sign, or plain language).
TO PKWN	7	Prosign TO: action addressee designation (address group, call sign, or plain language).
INFO NERK	8	Prosign INFO: information addressee designation (address group, call sign, or plain language).
XMT SPRX	9	Prosign XMT: exempted addressee designation (address group, call sign, or plain language).

This standard format is not used where material is introduced into the Naval Communication System which is not produced by a naval communication activity. The direct retransmission of material from the national facsimile network is an example. When such material has been included, the facsimile unit transmits a daily recapitulation sheet containing a list of the day's

transmissions. The list indicates the time of each transmission and the associated serial number.

Stations in the Naval Weather Service add headings to the weather maps which they originate. All other headings are prepared in the message center.

Incoming point-to-point and ship-to-shore facsimile is received at the NAVRADSTA(R), and carried by landline or radio (CCL) to the traffic division. Weather traffic goes directly to weather central, and a line monitor in the facsimile unit makes a copy. Material intended for activities served by the traffic division is sent by the facsimile unit to the incoming routing desk of the message center. Facsimile traffic is handled at the position in the same manner as other incoming traffic.

Circuit Control Division and Communication Maintenance Division

Personnel in the circuit control division are responsible for operating the equipment in the control center of the NAVCOMMSTA. Personnel in the communication maintenance division are responsible for maintaining, repairing, and installing the electronic, teletype, and crypto equipment for the entire NAVCOMMSTA and for keeping the electronic allowance records up to date.

The control center is a space which, in outward appearance and function is comparable to a large telephone exchange. It is the entry point for the landlines and the central control point for the intercommunication facilities of the NAVCOMMSTA. The main frame is the place in the control center where all the components of the communication center can be interconnected. (See fig. 17-4.)

The radio and landwire link facilities for remote control of the equipment at the naval radio stations (T) and (R) by the other components of the communication center are terminated in the control center. The personnel in the control center operate the equipment for testing all circuits or channels. Malfunctions are analyzed and remedial action is taken before returning the circuit or channel to its appropriate terminal or user.

Control center personnel operate the equipment for patching circuits or channels to alternate terminals or users, the telephone switchboard, and the associated facilities of the point-to-point telephone channels. They operate the intercommunication system between the control center and the naval radio stations (T) and (R) and other components of the communication center and terminal users. Close surveillance is maintained over conditions existing on all circuits and channels and emergency changes or adjustments to all circuits are directed by personnel in the control center.

Control center operators maintain and operate the terminal equipment of the multichannel radio circuits. They operate the frequency measuring equipment in coordination with distant stations and direct frequency shifts. In addition, the facilities required for on-line operation are maintained and operated in the control center.

Naval Radio Station (R)

Radio receiving stations are normally located some distance from both the traffic division and the transmitting station. They are placed in an area of minimum electronic interference.

Incoming traffic is handled either by copying and relaying to the traffic division, as is the case with ship-to-shore CW and RATT circuits, or by piping directly from the receiver to the traffic division as with high-speed, point-to-point radio circuits.

Remotely controlled radio receivers, operated at the Communication Center, are being installed in the modernization program as replacements for locally operated receivers.

The radio receiving stations of most NAVCOMMSTAS maintain a continuous guard on the primary ship-to-shore frequencies. Operators at the shore stations answer calls on the calling frequency, keying transmitters at the transmitting station by remote control.

The shore station also guards ship-to-shore RATT circuits during the required periods, or when requested. When a ship desires to transmit a message during a regular RATT period, it first puts on a call tape for 30 seconds, and then sends its message. At times other than the assigned RATT period, the ship calls the shore station on the primary ship-shore CW circuit, and the station designates a frequency to be used.

At the shore station, ship-shore RATT is received on a teletypewriter and reperforator. The page copy made by the teletypewriter is

kept for the station file, and the reperforator's tape is used to relay the message by direct wire to the traffic division. A typing reperforator is used to make a tape of CW ship-shore traffic from the receiving operator's copy, and this tape is relayed to the traffic division in the same manner as the RATT traffic.

Messages forwarded to the traffic division are relayed exactly as received, with the exception that they are preceded by a station serial number which is assigned by the receiving station. As each message is received in the traffic division, the number is checked off on a "received numbers sheet."

The radio receiving station at a NAVCOMMSTA receives point-to-point radio signals, and forwards them directly to the traffic division by either landline or a carrier control system. This procedure is also used for both point-to-point and ship-to-shore radiofacsimile traffic. The traffic division notifies the radio receiving station by a voice channel whenever frequencies are to be shifted on point-to-point circuits.

The radio receiving station at a NAVCOMMSTA has facilities for accomplishing special tasks such as those performed by the communications security division. For this reason the communications security division is usually located at or near the radio receiving station of the NAVCOMMSTA. The communication security division is not part of the communication department but is in the security group department of the NAVCOMMSTA.

Naval Radio Station (T)

The radio transmitting station is usually separated from the radio receiving station of the NAVCOMMSTA. The number of officers and men at radio transmitting stations varies from NAVCOMMSTA to NAVCOMMSTA but the personnel complement normally is not as large as that of the radio receiving station. Personnel at a radio transmitting station operate and maintain 60 or more transmitters for the NAVCOMMSTA. These transmitters vary in size from less than a 1-KW output up to 1000-KW output.

The circuits requiring transmission from the traffic division to the radio transmitting station go by either landline or microwave radio link. Instructions concerning transmitting frequencies are passed from the control center to the transmitting personnel via a direct teletypewriter line (order wire). A log listing the circuits, frequencies, transmitters in use, changes in any of these, outages, and any other pertinent data is maintained at the transmitting station. The traffic division is usually notified by telephone of an outage, its expected duration, the reason for it, and other necessary information. (An outage is that term which denotes a circuit which is unusable for any reason—atmospheric conditions, equipment failure, etc.)

There are a number of equipments designed for shore radio stations to handle high-power, low-frequency broadcasts, other high-power broadcasts, and point-to-point transmissions. Some of these are link receivers, single sideband transmitters, frequency shift keyers, and high-power, high-frequency transmitters for shore radiotelegraph communication. There is also a high-power transmitter of special design for low-frequency broadcasts.

The link receiver and its associated transmitter have a frequency range in the VHF or UHF band. It is used to receive signals originating in the traffic division of the radio receiving station and transmitted either there or at a special radio link station between the traffic division and the transmitting station. The signals employed may be multichannel telegraph signals using voice frequency tones, voice signals, or a combination of voice and telegraph signals. The audiofrequency range of the link channel is 300 to 12,000 cycles.

The single sideband transmitters are operated in the high frequency band, and are used for long distance point-to-point, multichannel, tone and voice communications. It is the transmitter used to transmit signals from the single sideband equipment in the traffic division. These transmitters provide for two transmission bands extending from 100 to 6000 cycles on the opposite sides of a reduced carrier frequency.

The frequency shift keyer unit shifts a constant amplitude carrier between two extreme fixed frequencies representing the marking and spacing conditions of the radioteletypewriter code, or, in the case of radiofacsimile, through a chosen variation of frequencies between two fixed frequency points. There is also a frequency shift keyer designed solely for use on facsimile circuits.

Also in use are special high-frequency, high-power transmitters for radiotelegraph

transmission for shore-to-ship and point-to-point communications. These transmitters have a power output on the order of 40 KW; they have an internal water-cooling unit, as well as motors and blowers, and weigh almost 40,000 pounds. Frequency shift keyers or single sideband transmitters may be used in conjunction with them.

Duties of Officers in the Communication Department

Traffic and Circuit Officer

The traffic and circuit officer plans, operates, and administers the radio and landline facilities at a major communication activity. He performs the following functions:

1. Supervises communication personnel such as routing clerks, radio and teletypewriter operators, relay station operators, maintenance technicians, and messengers.
2. Determines workloads, and effects personnel distribution to meet prevailing conditions.
3. Provides adequate facilities and circuits to meet communication requirements.
4. Interprets and applies communication procedures and regulations.
5. Conducts traffic studies and analyses to ensure efficient use of facilities and circuits.
6. Maintains current communication guard lists of forces afloat.
7. Investigates causes of delayed or lost messages, and takes appropriate corrective action.
8. Supervises preparation and submission of reports.
9. Controls security of assigned spaces and classified material contained therein.

Communication Watch Officers

While on watch, the CWO, under the communication officer, is responsible for all incoming and outgoing traffic. It is his duty to ensure that all messages transmitted or received are handled rapidly and accurately in accordance with existing regulations and orders. In performing this duty, the CWO controls communications as the direct representative of the communication officer for the period of his watch. In addition to the knowledge required of all officers performing communication duties, the CWO must have a particularly thorough knowledge of communication methods and procedures, including the internal handling of messages. The CWO is primarily responsible for the following:

1. Ensuring that messages are routed correctly and delivered promptly.
2. Ensuring that messages are prepared and transmitted in accordance with the prescribed procedures set forth in the current edition of DNC 5 *(U.S. Naval Communication Instructions)*.
3. Maintaining the necessary records of incoming and outgoing traffic.
4. Proper filing of incoming and outgoing messages.
5. Proper operation of the cryptocenter during his watch period.

The CWO must also maintain a CWO notebook, and ensure that it is not removed from the message center. Immediately upon receipt of special orders, instructions, and information, the CWO notes in the book all data that should be passed on to his relief. The oncoming CWO reads and initials all new entries before relieving the watch.

Cryptosecurity Officer

The cryptosecurity officer is responsible, under the commanding officer, for the accurate, secure, and efficient operation of the cryptocenter. To this end, he is charged with the following:

1. He must provide for and supervise the training of all crypto personnel, ensuring that each member of the cryptoboard is thoroughly familiar with the provisions of the current edition of ACP 122, with the operating instructions for each cryptosystem he will use, and with such other local service directives as maybe issued by competent authority.
2. He must ensure that all suspected violations of instructions or compromises of cryptosystems are promptly reported. This applies both to those suspected within his own cryptocenter, and those

noted in incoming traffic, whenever originated.

3. He will see that there is present in the cryptocenter at all times during its operation at least one person competent to select the proper cryptosystem for outgoing messages.
4. He will request drafters to make changes in messages, or their classification or precedence, when he believes that errors in these respects have been made.
5. He will be responsible for the detailed performance of duty by crypto personnel, the assignment of tasks to them, and the supervision thereof.
6. He will ensure that there is present in the cryptocenter at all times during his absence a person qualified and specifically designated to have responsibility for the performance of the duties listed above.
7. When higher authority declares a particular system compromised and directs a review of messages encrypted in that system, the cryptosecurity officer will bring to the attention of the commanding officer all such messages which were encrypted in his command. After review of these messages, the commanding officer will take such action as he deems necessary and feasible insofar as his own operations may be concerned, and report to the next higher headquarters any compromise of information involving major operations, strategic intelligence, or significant military planning.

Cryptoboard Members

Cryptoboards always include commissioned officers as members, but may in addition include warrant officers and competent and reliable enlisted personnel who possess communication or general administrative training, and who are of unquestionable loyalty.

Warrant officers and enlisted personnel employed on a cryptoboard must, however, be under the supervision of a commissioned officer who is a qualified cryptoboard member. The supervising officer will furnish the direction and guidance necessary to ensure the efficient and secure operation of the cryptocenter, and of the cryptoaids and materials used therein. He must be physically present or immediately available at all times when the cryptocenter is in operation.

Relay Station Officer

The relay station officer is directly responsible to the communication officer of the NAVCOMMSTA for the proper organization, administration, and supervision of the relay station. The relay station officer is usually a lieutenant. He has two principal assistants: the chief in charge of the relay station, and a civilian administrative assistant.

In addition to supervising operation of the tape relay circuits and relay station terminal facilities, the relay station officer administers a training program for relay station personnel, provides adequate control of message accountability, and works with other components of the NAVCOMMSTA and with communication officers of other activities to ensure satisfactory service and operation of the station.

Facsimile Officer

The facsimile officer plans and administers the operations of naval facsimile receiving and transmitting facilities. He performs the following functions:

1. Directs location, installation, and maintenance of fixed and mobile facsimile equipment.
2. Supervises the training of communication personnel in all phases of maintenance and operation of facsimile and related auxiliary equipment.

Electronic Repair Officer

The electronic repair officer is in charge of the maintenance of the electronic equipment at a NAVCOMMSTA. His primary responsibilities are—

1. Installation, maintenance, and repair of electronic equipment, crypto equipment, and teletypewriter equipment.
2. Maintenance of equipment spares.
3. Allowance and plant accounting (i.e., maintenance of records and filing of reports for all installed electronic equipment.

Signal Officer

The signal officer is in charge of the NAVCOMMSTA visual station. His duties are to—

1. Organize, coordinate, and supervise his personnel to ensure accurate, secure, and rapid handling of communications.
2. Record and report all discrepancies noted.

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