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Training Manual  
(TRAMAN)

# Electronics Technician Supervisor

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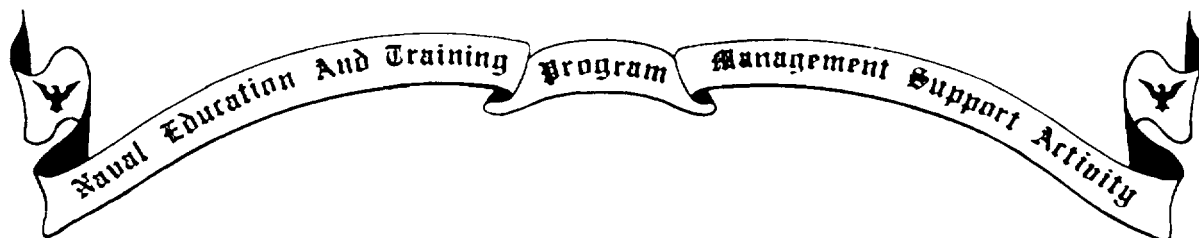


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Although the words "he," "him," and "his" are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading this text.

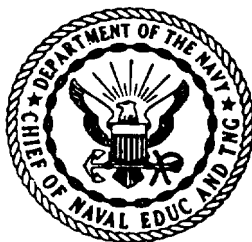
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# ELECTRONICS TECHNICIAN SUPERVISOR

NAVEDTRA 12410



*1992 Edition Prepared by  
ETC Steven D. Anderson and  
ETC Allen F. Carney*





# PREFACE

This training manual (TRAMAN) and its associated nonresident training courses (NRTC) were prepared especially for enlisted personnel of both the regular Navy and Naval Reserve who are studying for advancement in the Electronics Technician (ET) rating. This TRAMAN is based on and provides subject matter that relates directly to the occupational standards for advancement to the rates of ET1 and ETC, as stated in the Navy Enlisted Manpower and Personnel Classifications and Occupational Standards, NAVPERS 18068-E.

As you prepare for advancement, use this TRAMAN and its associated NRTCs to review your practical experiences and to identify areas that you need to strengthen. Keep in mind that the TRAMAN is not the sole source of advancement information. It provides a general overview of necessary professional knowledge and identifies other references that you should review as part of your preparation.

This training manual and its separate nonresident training courses were prepared by the Naval Education and Training Program Management Support Activity, Pensacola, Florida, for the Chief of Naval Education and Training.

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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 as 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

## INTRODUCTION

This training manual is designed to help you understand your work in the electronics division. It will also help you meet the requirements for advancement to Electronics Technician (ET) first class and chief. This manual is not the only publication you need to use as you prepare for advancement. You also need to read other publications to be well prepared for the advancement-in-rate examination. This manual provides background information on subjects, but you must study the indicated references to learn each topic in depth.

In this manual we use the terms "ET supervisor" and "electronics supervisor" interchangeably. Although you will be a supervisor in the ET rating, you may also have to supervise personnel from other ratings. The ratings you deal with daily will depend on your command's organizational make-up.

The manual is organized as follows:

This chapter explains how the electronics supervisor has evolved. The section entitled "Sources of Information" identifies publications you should study to advance and to help your subordinates with their careers.

Chapter 2, "Organization and Administration," is divided into two sections. The organization section discusses the electronics organization. The administration section describes the duties and responsibilities of electronics supervisors.

Chapter 3, "Supervision and Training," is divided into two sections. The supervision section describes supervision practices that effective electronics division managers follow. The training section describes the training organization and training procedures in an electronics division.

Chapter 4, "Combat Systems," describes combat system organization. It also describes the naval tactical data system/weapon direction system (NTDS/WDS) and combat system testing.

Chapter 5, "Casualty Control and Reporting," is divided into two sections. The casualty control section describes the electronics casualty control (ECC) organization and its functions. The casualty reporting

section describes casualty report (CASREP) procedures.

Chapter 6, "Quality Assurance," explains the concepts of quality assurance and describes the primary QA programs and shipboard organization and procedures.

Chapter 7, "Test Equipment," describes the programs set up to control test equipment, and your role in managing and maintaining test equipment.

Chapter 8, "Maintenance/COSAL," explains (1) your role in managing the maintenance of electronic equipment, (2) the problems and control of electromagnetic interference (EMI), and (3) your relationship with the supply system.

## RESPONSIBILITIES

By becoming an electronics supervisor, you will have taken a big step in your career. Previous advancement brought increased rewards. Along with those rewards came increased responsibilities. The responsibilities of an electronics supervisor are even greater. Your work as a supervisor will be important to the successful management of the Electronics Division. For general information on the advancement system and on the increased responsibilities of a supervisor, review *Military Requirements for Petty Officer First Class*, NAVEDTRA 12046.

By this time in your career, you are valuable as a technical specialist. You are also valuable as a supervisor, leader, and trainer of others. You can, therefore, make far-reaching and long-lasting contributions to the Navy. The extent of your contribution to the Navy depends on your willingness and ability to accept increased responsibility for military matters and for the professional requirements of the Electronics Technician. It also depends on your skill in getting other people to work for you.

You will find that your responsibilities for military leadership are much the same as those of petty officers in other ratings. Every petty officer is a military person as well as a technical specialist.

Your responsibilities for technical leadership are directly related to the nature of your work. Operating and maintaining the ship's electronic equipment is a vital job. It's a teamwork job requiring a special kind of leadership ability. This leadership ability can only be developed by personnel who have a high degree of technical competence and a deep sense of personal responsibility.

At this point, let's consider some of the broader aspects of your increased responsibilities for military and technical leadership.

### **RESPONSIBILITIES WITHIN THE ELECTRONICS DIVISION CHAIN**

You will be expected to translate the general orders given by officers into detailed, practical, on-the-job language that even relatively inexperienced personnel can understand and follow. In dealing with your juniors, you must see that they perform their work properly. You must also be able to explain to officers what your juniors may need or problems they may experience.

### **RESPONSIBILITIES FOR TRAINING**

Training is essential. Even if you are blessed with a highly skilled and well-trained electronics force, you will still find training necessary. For example, some of your best workers may be transferred and replaced by inexperienced or poorly trained personnel. Often, a job may call for skills your assigned personnel do not have, especially if your division must maintain new equipment. These and similar problems require you to be a training specialist who can conduct both formal and informal training programs. You must train individuals and groups to work safely, neatly, accurately, and with a spirit of cooperation.

### **RESPONSIBILITIES TO SUBORDINATES**

Any discussion of responsibilities must include the responsibility you as a supervisor have toward your subordinates. You are responsible for developing their professional and general military skills. You must also help them to become mature, competent technicians who are prepared to assume supervisory responsibilities. You must teach them and encourage them to use their skills and knowledge to make decisions. You must then support those decisions when they are correct and fair. However, you must also advise or counsel your subordinates when their decisions may cause harm to themselves, others, or their equipment. Use the "learn by mistakes" theory to teach your

subordinates. But be constantly aware of what is happening to be sure the lessons taught are worth the consequences, should problems develop.

You as a supervisor have an overriding responsibility to take care of your people before caring for yourself. This responsibility requires steadfast devotion to your subordinates. Gaining the loyalty of subordinates requires unselfish actions on the part of seniors.

**TAKE CARE OF YOUR PEOPLE AND THEY WILL TAKE CARE OF YOU!**

### **RESPONSIBILITIES TOWARD OTHER RATINGS**

As you advance to ET1 and then to ETC, you will find that your plans and decisions can affect many people. Some of these people may not be in your division or even in the operations department. It becomes more and more important, therefore, for you to understand the duties and responsibilities of personnel in other ratings. Every petty officer in the Navy is a technical specialist in a particular field. Learn as much as you can about the work of other ratings. Plan your own work to fit in with the overall mission of the organization.

### **EFFECTIVE COMMUNICATION**

The basic requirements for effective communication are knowledge of your own language, knowledge of standard naval terminology, and precise use of technical terms. Knowledge of your own language includes using correct language when you speak and write. Remember, the basic purpose of all communication is understanding. To lead, supervise, and train others, you must be able to speak and write so they understand exactly what you mean.

Standard naval terminology consists of words that express ideas usually understood or procedures used only by those in the Navy. When a situation calls for the use of standard Navy terminology, use it.

Use technical terms with precision. A command of the technical language of the Electronics Technician will help you receive and pass along information accurately. It will also help you exchange ideas with other technicians. If you don't understand the precise meaning of the terms used in your rating, you may not be able to understand the content of technical publications. Although the correct use of technical terms is always important, it is particularly important when you are

dealing with lower rated personnel. If you are sloppy in your use of technical terms, you will likely confuse them. This may cause them to do work in an improper or unsafe manner.

Just as you ensure accuracy and clarity in communicating with your juniors, you must also remember to communicate effectively with your superiors. You must be aware of what technical knowledge, if any, your superiors have. Many times you will be called upon to work for junior officers with no prior experience in the electronics or combat systems field. You are responsible for keeping them aware of all matters concerning the systems and personnel under your control.

## PROFESSIONAL UPDATES

Practically everything in the Navy—policies, procedures, equipment, systems, publications—is always in various stages of development and revision. As an electronics supervisor you must stay informed of all changes and new developments that might affect your work.

Some changes will be called directly to your attention. Others you will have to look for. Try to develop a special alertness for new information, especially technical information on electronics and associated equipment and systems. New types of equipment and systems are constantly being designed and tested. Existing types of equipment are modified. If you follow the history of electronics since the end of World War II, you will find that several important changes have occurred. Designers of new electronic equipment have designed several functions into a single piece of equipment as a self-contained system. This approach replaces combining several pieces of single-function equipment into a system. The size of electronic equipment has decreased as electron tubes have given way to transistors. Smaller and more reliable electronic components such as capacitors, resistors, transformers, and coils have been developed. Microcircuits are common. In addition, computers have become more prominent in the systems you now work with. The Electronics Technicians of today must perform maintenance on a wider variety of equipment than ever before. As a supervisor, you must be aware of all changes that are happening in the electronics field.

## STANDARDS

How do standards apply to you as an electronics supervisor? Let's start with a definition. We can define

a standard as something set up by either custom or authority to measure quality, quantity, performance, or service. As a supervisor you must be sure that the standards set by the Navy, your ship and division, and you are met. Four standards that you will deal with on a continuing basis are as follows:

- Naval Standards
- Occupational Standards
- Personnel Qualification Standards
- Equipment Standards

Use these standards to develop a training program for your division that will encompass all aspects of your subordinates' rating.

## NAVAL AND OCCUPATIONAL STANDARDS

The *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards*, NAVPERS 18068, (commonly called the Occupational Standards Manual) lists the minimum skills requirements for each rate within each rating. You are probably familiar with much of the following information. However, we will review it to help you work with your lower rated personnel.

### Naval Standards

Section I of the Occupational Standards Manual lists the naval standards for each paygrade. These are the skills and knowledge essential to the overall effectiveness of the enlisted personnel in the performance of their duties. Naval standards encompass:

- Military requirements
- Essential virtues of professionalism
- Pride of service in support of the oath of enlistment
- Maintenance of good order and discipline

Basic skills and knowledges concerning the well-being of Navy personnel

Naval standards are the basis on which the military requirements training manuals and military/leadership examinations are developed. An example of an E-6 naval standard is

**NAVSTD 944601**– Write enlisted performance evaluations.

Note that a naval standard is a task statement that is not rating specific. All E-5 personnel in the Navy should be able to perform this task before taking the military/leadership test for E-6.

In addition to being used to develop the military/leadership exams, naval standards are used for curriculum development at basic training commands and apprentice training facilities.

### Occupational Standards

The Occupational Standards Manual also lists the Navy occupational standards for each rating. We should mention again that the standards listed in the Occupational Standards Manual are only the minimum requirements for enlisted occupational skills. The content of this training manual (*ET Supervisor Volume 1-Administration*) is based on the occupational standards for ET1 and ETC. The Occupational Standards Manual is kept current by numbered changes. However, these changes are issued more frequently than most training manuals can be revised. Therefore, the training manuals cannot always reflect the latest occupational standards. Since the advancement examinations are also based on the Navy occupational standards, you should always check the latest changes to be sure your personnel know the current requirements for advancement in the rating. An example of an occupational standard for Electronics Technician First Class is

**OCCSTD 4436-** Troubleshoot electronic systems and subsystems.

Note the difference between the naval standard given in the previous section and the occupational standard shown here. The occupational standard is rating specific and cannot be performed by all Navy personnel going up for Petty Officer First Class.

Occupational standards are used in the development of training manuals and rating advancement exams. They are also used in the development of class A and class C school curricula, formal shipboard training, OJT, and general rating training for divisions.

### Personnel Qualification Standards

The Personnel Qualification Standards (PQS) program is a qualification system used to certify that officer and enlisted personnel can perform certain duties. A PQS is a list of minimum knowledge and skills necessary to qualify for a specific watch station, maintain specific equipment, or perform as a team

member within a unit. The PQS program is not designed as a training program, but provides many training goals. Therefore, you should use PQS as a key element to make your training program well structured and dynamic. A complete listing of available PQS manuals is published in the *Personnel Qualification Standards Catalog*, NAVEDTRA 43100.

An example of a knowledge/skill that is part of the PQS for Electronics Casualty Control (ECC) Repair 8 is

**PQSSTD 101.2-** Discuss the purpose and use for antenna cutout switches.

In this example the person must show a knowledge of how something operates. Not all PQS skills are knowledge statements. Some require physical demonstrations by the person wanting to be qualified.

Depending on your command, you may be responsible for all or part of the following duties within the division PQS program:

- Supervise Divisional PQS.
- Supervise Qualification Petty Officers.
- Recommend to the Department Head the assignment of Division Qualification Petty Officers.

Recommend to the Department Head the entry level of newly assigned personnel.

- Recommend to the Department Head any required tailoring that a division may need.
- Recommend final qualification to the Department Head.

Be sure that Page Four Service Record documentation of PQS is accomplished.

Assign requirements and PQS goals to individual trainees according to departmental guidance.

- On a weekly schedule, check the progress of division personnel toward PQS goals as shown on the Progress Records.
- Brief the Department Head monthly on the status of division personnel and adjust goals accordingly.
- Integrate PQS status with routine administration of special requests, early liberty approvals, etc.
- Be sure that enlisted evaluations reflect PQS qualification accomplishments.

- Be sure that a reference library is maintained.

## Equipment Standards

Not all standards pertain to the development of your personnel. Equipment standards fall into this category. Equipment standards, or operational parameters, are standards that are set for individual equipments to be sure they operate at maximum performance. These standards may be determined by the equipment's manufacturer, the Navy's planned maintenance system (PMS), or other authority.

An equipment standard for a radar maybe stated as:

Transmitter Frequency:  $9375 \pm 30\text{MHz}$

This standard gives the operational parameters within which this specific radar transmitter should operate. If the transmitter were to begin operating outside the prescribed standards you would need to perform corrective maintenance.

In chapter 3 of this training manual, we will discuss how you should use standards in your division training program.

## STUDYING YOUR TECHNICAL MATERIALS

As a supervisor, you have three major responsibilities concerning technical materials. First, be sure they are available. Your shop cannot operate properly or professionally without having the necessary technical materials. Second, keep your technical materials up to date. Out-of-date technical materials, in addition to causing inconveniences, may result in harm to equipment or personnel. Third, require your subordinates to use their technical materials, both on the job and to prepare for advancement.

Observing your responsibilities toward technical materials will not just make you a better professional. It will also demonstrate to your subordinates proper professional and supervisory attitudes.

In chapter 2 of this manual, we will discuss more on the care and use of technical materials.

## SOURCES OF INFORMATION

You and your subordinates should know which references to consult for detailed, authoritative, up-to-date information on all subjects related to both the naval requirements and the Electronics Technician occupational standards. Most of the publications

discussed here are subject to change or revision from time to time-some at regular intervals, others as the need arises. When using any publication that is kept current by changes, be sure you have a copy in which all official changes have been entered. Official publications and directives carry abbreviations and numbers that identify the source and subject matter of each document. For instance, the identification number for this training manual is NAVEDTRA 12410. The term *NAVEDTRA* means it is published by the Chief of Naval Education and Training.

Some of the NAVEDTRA and NAVPERS publications described here are essential to personnel learning to perform the duties of their rating or seeking advancement. The others, although not essential, are very helpful.

The following **publications** and **nonresident training courses** are usually required for advancement:

Training manuals (TRAMANs). Most training manuals have two purposes. First, they are written to help personnel perform the duties of their rating. Second, they may be used to help personnel study for advancement. Some courses are general in nature and are intended for use by more than one rating. Others, such as this TRAMAN, are specific to a particular rating. The courses and publications appropriate to ETs are as follows.

These TRAMANs are specially prepared to present information based on the **naval standards**:

1. *Basic Military Requirements*, NAVEDTRA 12043
2. *Military Requirements for Petty Officer Third Class*, NAVEDTRA 12044
3. *Military Requirements for Petty Officer Second class*, NAVEDTRA 12045
4. *Military Requirements for Petty Officer First Class*, NAVEDTRA 12046
5. *Military Requirements for Chief Petty Officer*, NAVEDTRA 12047
6. *Military Requirements for Senior and Master Chief Petty Officer*, NAVEDTRA 12048

These TRAMANs, which present information based on the ET **occupational standards**, are **specific** to the ET rating:

*Electronics Technician 3 &2*, NAVEDTRA 10197.  
Most of the information given in the *ET Supervisor*

manual is based on the assumption that you are familiar with the contents of *Electronics Technician 3 & 2*.

*ET Supervisor*, NAVEDTRA 12410. This is the training manual you are studying now.

It provides information you will need as you perform the tasks stated in the occupational standards for ET1 and ETC.

The following **publications are recommended for basic information and for advancement**. Some of the training manuals your subordinates may need as they learn the requirements of their job and prepare for advancement are discussed briefly in the following paragraphs. For a complete listing of training manuals, consult the current *List of Training Manuals and Correspondence Courses*, NAVEDTRA 12061.

Navy Electricity and Electronics Training Series (NEETS), a NAVEDTRA series consisting of several different books. NEETS consists of officer-enlisted correspondence course assignment booklets and modules (texts) that present electrical and electronic subjects on a basic, introductory level. These modules and courses may be studied sequentially from the beginning or as individual units on specific subjects, such as radar or microelectronics.

Mathematics, volumes 1, 2-A, 2-B, and 3, NAVEDTRA 10069-D1, 10062, 10063, and 10073-A1, respectively. Volume 1 provides a review of basic arithmetic and elementary algebra; it includes fractions, decimals, percentages, exponents, radicals, and logarithms. It also contains exercises in factoring polynomials, linear equations, ratio, proportions, variation, complex numbers and quadratic equations. It presents brief introduction to plane figures, geometric construction, and trigonometry. Volume 2-A is general in nature. Its subjects include definitions, notations, and computations with logarithms; trigonometric ratios, analysis, applications, and aids to computations; trigonometric identities; and vectors and forces. Volume 2-B is also general in nature. Its subjects include straight lines, conic sections, tangents, normals, slopes; introduction to differential and integral calculus; combinations and permutations; and introduction to probability. Volume 3 provides knowledge in elements of digital computer mathematics—sequence and series, induction and binomial theorem, statistics, number systems, sets and subsets, Boolean algebra, matrices, and determinants.

*Tools and Their Uses*, NAVPERS 10085-B2. This training manual covers general uses and approved safety

procedures for Navy hand tools. It also includes safety precautions, operating practices, and care of common power tools; operating principles of measuring instruments and techniques of measurement; and types of fastening devices and procedures for using them. It discusses procedures for sharpening cutting tools; metal cutting operations and procedures; and techniques of miscellaneous tasks, such as flaring metal tubing, removing broken bolts, stripping insulated wire, soldering, and lubricating.

*Blueprint Reading and Sketching*, NAVEDTRA 10077-F1. This TRAMAN discusses uses and kinds of blueprints, language of blueprints, technical sketching, and gives extensive coverage to electrical and electronic prints. It includes chapters on piping, machine, sheet metal, structural, and architectural prints.

You are probably thoroughly familiar with the **Electronics Information Maintenance Books (EIMB)** series of reference publications. However, from time to time you should review the series, especially the General Information Handbooks. (Specifically, this is a series of books consisting of the *EIMB General, Installation Standards, Electronic Circuits, Test Methods and Practices, Reference Data, EMI Reduction, and General Maintenance books*.) As you review these books, pay special attention to appendices and other portions of the books you might have overlooked.

## **OCCUPATIONAL STANDARDS AND ADVANCEMENT STUDY BIBLIOGRAPHY**

Naval Education and Training Program Management Support Activity (NETPMSA), located at Pensacola, Florida, publishes a very useful set of pamphlets with information taken from the *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards*, NAVPERS 18068, and the *Bibliography for Advancement Study*, NAVEDTRA 10052. The pamphlets, issued yearly, are titled *Advancement Handbook for Petty Officers*. Each rating has its own pamphlet, which lists requirements specifically for that rating. Besides listing the occupational standards and the source materials related to those standards, the pamphlets also contain general information on advancement. Individuals studying for advancement should read and study all sources listed in the bibliography. Examination questions are based on all sources listed, whether they are required or only

recommended. The pamphlets are available through your ESO. Be sure your division personnel receive copies to use as they study for advancement.

As you prepare for advancement to ET1 or ETC, you may wish to study *Shipboard Electronics Material Officer*, NAVEDTRA 10478-B. This officer text/course is an excellent source of information you will need as a manager and an administrator in electronics. This course is not mandatory, but is highly recommended. (Do not procrastinate, order it now!)

## REFERENCES

- Military Requirements for Petty Officer First Class*, NAVEDTRA 10046-A, Naval Education and Training Program Management Support Activity, Pensacola, Fla., 1987.
- Military Requirements for Senior and Master Chief Petty Officer*, NAVEDTRA 10048-A, Naval Education and Training Program Management Support Activity, Pensacola, Fla., 1988.
- Personnel Qualification Standards (PQS) Manager's Guide*, NAVEDTRA 43100-1C, Naval Education and Training Support Center, San Diego, Cal., 1987.





## CHAPTER 2

# ORGANIZATION AND ADMINISTRATION

As an electronics supervisor, you will have duties and responsibilities that involve more than just repairing equipment. You will assume the additional duties of a work center administrator. We have designed this chapter to familiarize you with the standard electronics organization and basic administrative requirements. We will also present some methods for carrying out these new responsibilities.

You can find additional information on general organization and administration in *Military Requirements for Petty Officer Second Class*, NAVEDTRA 12045; *Military Requirements for Petty Officer First Class*, NAVEDTRA 12046; and *Military Requirements for Chief Petty Officer*, NAVEDTRA 12047. In addition to the above sources, we recommend that you also read *Shipboard Electronics Material Officer*, NAVEDTRA 10478-B.

### ORGANIZATION

To administer your division effectively and efficiently, you must have a sound division organization. A sound division organization has a clear organizational structure and definite policies and procedures. It also has whatever other controls are needed to make sure the division can complete its mission under all conditions.

The basic administrative and functional organization in ships is prescribed by OPNAVINST 3120.32, *Standard Organization and Regulations of the U.S. Navy (SORM)*. The SORM, a Chief of Naval Operations publication, prescribes the general pattern for a ship's organization. It eases the process of escalating from peacetime status to wartime status without major organizational changes. The standard requirements for organization aboard each ship type and class are defined by the type commander or higher authority. These requirements are intended to help commanding officers administer their units in the best possible manner. The electronics division organization is basically the same aboard all ships and shore commands. Variations in the organization within ships of the same type and class are usually caused by such factors as the number of experienced personnel, the differences in the ships' employment or material condition, and the methods that different division

officers or senior petty officers use to organize and run their divisions.

### ORGANIZATION BILL

Every level of command (ship, department, division, and so on) has an organization bill. The organization bill for a particular level describes the duties and responsibilities of personnel assigned to that level. It also prescribes policy and procedures peculiar to that level. The electronics organization bill is the means by which the primary electronics officer, the electronics material officer (EMO), delegates responsibility and authority to subordinates.

The following paragraphs identify positions usually listed in the electronics organization bill and primary responsibilities associated with those positions.

#### Personnel

The *electronics material officer (EMO)* is a commissioned officer or warrant officer who is responsible for the repair, upkeep, and preservation of all assigned electronic equipment and spaces. The EMO is detailed by the commanding officer to the operations department or to the combat systems officer.

The *assistant electronics material officer (AEMO)* (normally a warrant officer or limited duty officer (LDO) on large combat vessels) assists the EMO.

The *leading Electronics Technician* is the senior Electronics Technician assigned to the vessel.

*Group supervisors* are the leading communications, radar, data (DSs), interior communications (ICs), and weapons (FCs) personnel detailed by the EMO.

The proper assignment of available personnel for the upkeep of equipment (and for other necessary duties) is essential. It is particularly critical if the division is short of personnel or if the available technicians are inexperienced. The leading petty officer must always be aware of the qualifications of the onboard technician.

If the division is well staffed, inexperienced people may be assigned to work with more experienced crew members. In such cases, the leading petty officer should ensure that the inexperienced personnel actually receive

technical instruction, rather than merely act as toolbox carriers.

It is not possible to set up a "standard" electronics repair organization chart, but some type of chart (applicable to ETs) should be posted in the EMO office or in the workshop. Although the preparation of an electronics repair organization chart is primarily the responsibility of the EMO, the leading ET plays an important part.

The electronics organization chart should be organized into blocks according to the various types of equipment the division maintains. The names of the technicians assigned to the various groups of equipment can then be written under the appropriate blocks, with the top name being that of the supervisor in charge of that particular group. In the final breakdown of duties, a certain number of equipment units maybe assigned to one individual.

An advantage of such an arrangement is that the responsibility for the maintenance of certain equipment is placed on individual technicians.

In smaller vessels, of course, the equipment to be maintained and the electronics personnel available are reduced proportionately.

## **Responsibilities**

As an ET1 or ETC, you may be either the leading ET or an equipment technician, depending on the size of the command.

The leading ET assists the EMO and is responsible for directly supervising the preventive and corrective maintenance of all electronic equipment. The leading ET also ensures that all records and publications are up-to-date and available for reference, prepares required reports, and supervises the cleanliness and upkeep of the electronics spaces.

The radar, communications, and carrier-controlled approach and air navigation equipment technicians are responsible to their respective group supervisor and the leading ET for the preventive and corrective maintenance of all equipment for which they are responsible.

## **ELECTRONICS DIVISION ORGANIZATION MANUAL**

The electronics division organization manual is made up of the division's instructions and bills, general safety information, and the casualty control manual.

This manual sets forth the organization, procedures, and policies for the proper management of your maintenance efforts and resources. A properly established electronics division organization manual provides realistic guidance for all personnel within the division. As a senior ET, you will need to assist in updating and revising the organization manual when needed and should ensure that new personnel read it soon after they report on board. The organization manual reduces duplication of effort, prevents loss of information when personnel transfer, and establishes performance standards for you and the personnel of the electronics division.

To find additional information on running shipboard electronics repair organizations, you should review your Engineering Information Bulletins (EIBs) and Electronics Installation and Maintenance Books (EIMBs). You may also want to review various Department of the Navy, fleet, force, and type commander directives, instructions, and notices.

The Department of the Navy Directives Issuance System Consolidated Subject Index (NAVPUBINST 5215. 1) contains a list of notices and instructions. Some of these notices and instructions contain information that applies directly to the administration of an electronics repair organization. As a supervisor, you should be aware of this information and apply it as appropriate to your situation.

## **POLICY**

Many of the administrative policies affecting the electronics division are important enough to be put in written form. You should be prepared to implement these policies, along with additional instructions of your own.

## **ADMINISTRATION**

Your involvement in organizational and administrative actions is going to become more of a requirement, either directly or indirectly, as you advance to first class and chief. In this chapter, we will describe some of the duties and responsibilities associated with these actions. We will discuss areas such as general quarters and watches; supervision and assignment (administrative); reports and records; correspondence control; personnel manning; publications; and SCLSIS. We will also discuss your involvement in areas such as the 3-M Systems, inspections, maintenance periods, overhauls, alterations and modifications; safety; and the upkeep of your equipment and compartments.

## **GENERAL QUARTERS INSTRUCTIONS**

Electronics division personnel are each assigned a general quarters station by the division watch, quarter, and station bills. Assignments of personnel should be practical and functional, as determined by the EMO. As an ET1 or ETC, you will be in a position to make recommendations to the EMO, and your experience and attitude will contribute much to the success of overall electronics casualty control (ECC).

Specific instructions for general quarters should be outlined in the electronics division organization manual and in the electronics casualty control manual. Procedures and applications should be a major part of electronics training. Chapter 5 of this TRAMAN provides more information concerning ECC.

## **IN-PORT WATCHES**

The leading ET of each watch section is designated as the duty Electronics Technician and is directly responsible for the handling of all electronics casualties that may occur during periods outside normal working hours.

All technicians who are aboard, even though they may rate liberty, are considered to be on duty and may be called upon by the duty Electronics Technician at any time to assist in handling any electronics repair.

## **UNDERWAY WATCHES**

Underway, a watch list is made up by the leading ET, approved by the EMO, and posted in the electronics workshop or office. All watches are stood according to this watch list and watch standing instructions. The technician on watch maintains station in the electronics workshop, except when called upon to handle a casualty, to supervise preventive maintenance, or to make inspections and tests.

The only reading materials authorized for use during underway watches are technical publications, manuals, and instruction books pertaining to some phase of electronics.

For sea details, equipment technicians are assigned to main areas where electronics equipment is operated (for example, CIC, main communications, and the bridge). The electronics workshop or office should be manned by a senior ET, who will receive and coordinate trouble calls. Other specific special sea details required by your ship type should be manned accordingly.

## **SUPERVISION AND ASSIGNMENT**

Your duties and responsibilities above and beyond maintenance will involve making important supervisory and administrative decisions. These decisions concern personnel assignments, planning of workloads, and the prompt and proper completion of all paper work.

Supervision goes hand in hand with planning and the guiding of junior personnel. Proper supervision results in the proper employment of personnel. Today's ETs are well-trained technicians who have the right to expect their services to be used properly.

You must take the time to plan carefully and must supervise in a professional manner. Your efforts will result in the cooperation of junior personnel, thereby making your electronics division more effective.

## **REPORTS AND RECORDS**

As you advance in rate, you will find that submitting periodic reports and maintaining personnel and equipment records will become a daily responsibility. Train yourself to be both proficient and efficient. Doing these reports and records in a proper and timely manner will allow you more time to complete your other duties. In other words, if you let the paper work pile up, you will be pressured for time and will probably do the reports hurriedly. Keeping up with the paper work daily will decrease your stress level and will yield a better management product for the Navy.

## **REPORTS**

Even though the EMO is ultimately responsible for all division reports and records, the EMO will depend on your knowledge and performance for inputs to those reports and records. Some of the reports and records with which you should be familiar are described in the following paragraphs. These reports will be listed in your command's "Recurring Reports" instruction.

### **Trouble Reports**

Trouble reports are used by operators and technicians to indicate electronic equipment problems or failures. They are generally used in conjunction with the electronics office or workshop trouble call log. The EMO or senior technicians make electronics maintenance assignments based on the priorities of the existing trouble reports. A trouble report system with a trouble call log and a trouble call/report sequential numbering system will assist you in tracking trouble reports and will be useful as a tool in ensuring proper

3-M documentation. For consistency, you should maintain a central point for receiving trouble calls (such as the EMO office or workshop). Each time an equipment trouble is detected, a separate trouble report should be submitted. It should state such information as the equipment affected, nature of the trouble, time of failure, originator's name, and other information appropriate to your electronics organization. When the trouble has been corrected, the originator should sign the appropriate block of the trouble report (or the Accepted by block of the OPNAV 4790/2K maintenance action form).

### **Eight O'Clock Reports**

Eight o'clock reports are daily equipment status reports given to the commanding officer by the executive officer each evening at 8 o'clock (2000 hrs). At sea, the EMO usually will give the electronics division's eight o'clock report to the department head at least 1 hour prior to the eight o'clock reports. In port, the eight o'clock reports are given to the CDO by the duty departmental officers. As a senior technician, you must ensure that the information is current and accurate for your area of responsibility.

Traditionally, the eight o'clock reports are verbal reports of equipment status. However, because of the number of equipments on our ships today, a master sheet of equipments is usually made up in multiple-copy form. Applicable comments are made adjacent to the listed equipment on a daily basis. One copy of the equipment list is kept for the divisional file. The original is turned in for the eight o'clock reports. The following information is provided for each piece of equipment on the eight o'clock report:

- Whether the equipment is in an "up status" or "down status," with a statement of the nature of the problem
- Parts information (parts on board, parts not on board, and supply chit requisition number)
- Estimated time of repair for a "down" item
- Whether or not a Casualty Report (CASREP) will be necessary (If an equipment or system CASREP has already been made, the report includes the CASREP serial number for the applicable equipment or system.)

### **Casualty Reports (CASREPs)**

As an electronics supervisor, you will often be in a situation that requires you to draft a CASREP message. The purpose and basic types of CASREPs are given in

the following paragraph. Chapter 5 of this TRAMAN gives detailed information on the CASREP system.

The casualty report (CASREP) was designed to support the Chief of Naval Operations (CNO) and fleet commanders in the management of assigned forces. The effective use and support of Navy forces require an up-to-date, accurate operational status report for each unit. An important part of each operational status report is casualty information. The CASREP system contains four types of reports: INITIAL, UPDATE, CORRECT, and CANCEL. CASREPs are not a substitute for, but are in addition to and complement, 3-M data. The reference publication for CASREP information and procedures is NWP 10-1-10.

### **Getting Underway Reports**

On most ships, the electronics division will be responsible for turning in an equipment status report (similar to eight o'clock reports) before getting underway. This report may be due any time between 72 hours and 24 hours before getting underway, depending on the requirements set by your TYCOM and command. This report usually includes major equipment status, estimated time of repair (ETR), power out/MDS readings from radars, and power out/receiver sensitivity readings from communications equipment. The getting underway report is usually given on a locally generated report form (checklist type), specifically for getting underway; however, it may be made on the same form as the eight o'clock report. (The report will vary from command to command.)

### **Anticipated Not Operationally Ready-Supply (ANORS) Reports**

ANORS requisitions are used when a casualty is anticipated because of the lack of material. For example, suppose your air search radar's main output tube is expected to go bad within a short time and no spare tube is on board. The radar is still operational. However, since you anticipate that the tube will fail, you should submit an ANORS requisition. Afloat Supply Procedures, NAVSUP P-485, describes the use of the ANORS requisition.

### **Defective Material Reports**

Reporting of defective materials obtained through the supply system is covered in NAVSUP P-485. The Navy uses a report of discrepancy (ROD) or quality deficiency report (QDR) to report supply discrepancies. An ROD is used to report shipping or packaging

discrepancies caused by the shipper. Included in this category are shortages, unacceptable overshipments, unacceptable substitutes, material shipped in error, shipment of wrong items, and missing or improperly prepared supply documentation. Also included are shelf-life items that were too old at the time of issue or were issued with insufficient shelf-life remaining. A QDR reports defective material that is not suitable for its intended use because of a deficiency in design, material, or procurement. These deficiencies can include chemical, electrical, functional, or physical discrepancies that occurred because the contractor did not meet contractual or specification requirements. It may also include deficiencies that resulted because the contractual requirements (including the procurement document that describes the technical requirements of the material) were ambiguous, improper, incorrect, or omitted. The QDR is reported to the Fleet Material Support Office (FMSO); the ROD is reported directly to the Navy stock point that issued and shipped the material.

### **Survey Reports**

A survey is the procedure required by U.S. Navy regulations when naval property must be condemned due to damage, obsolescence, or deterioration; or acknowledged as nonexistent due to loss, theft, or total destruction. The survey is performed according to N4VSUP P-485.

### **Additional Reports**

There are many other reports not mentioned in this chapter; for example, the reports required by type commanders and other authorities.

To increase the effectiveness of recurring reports and to avoid duplication, the Navy instituted the Reports Control Program. This program is used in the various naval commands and offices, in the Marine Corps, in each continental naval area, and in selected major field activities. Direct responsibility for the program is vested in the Chief of Naval Operations (OP 09B83).

### **RECORDS**

Certain records are necessary to assist electronics personnel in keeping up-to-date information on equipment for which they are responsible.

As an electronics supervisor, you must ensure that all of your required records are maintained properly. To do this you should keep file copies of required reports.

In addition, you should maintain files on the following topics:

- Equipment
- System
- Safety
- Inspections
- Pre- or post-overhaul
- 3-M Systems
- Personnel

The above list is not a complete list, but should give you an idea of the type of records that you should maintain. Have the records filed neatly and in an orderly sequence. Purge them of any information that is not required or will not be needed for reference. For example, throw away 3-year-old information that is no longer applicable.

Regulations concerning the use of records and instructions are contained in the following references:

- *Naval Ships' Technical Manual*, chapters 090 and 400
- NAVSEA SE000-00-EIM-100 (formerly NAVSEA 0967-LP-000-0100), *Electronics Installation and Maintenance Book, General*
- OPNAVINST 4790.4, *Ships' Maintenance and Material Management (3-M) Manual*
- Type commanders' instructions on required records and command inspection guides

### **CORRESPONDENCE CONTROL**

A method of keeping track of correspondence and of routing information is important to any maintenance shop. Over a period of a week a large amount of correspondence enters and leaves the average work center. Some of this correspondence requires action, while some contains information for work center personnel. Ensuring that information is routed to the personnel of your work centers can be either a major chore or a simple everyday task. No simple procedures can help you simplify the job of keeping track of your correspondence:

1. Routing procedures
2. Correspondence tickler file

## ROUTING PROCEDURES

Each work center should have an organized procedure for routing correspondence to shop personnel. All correspondence that enters a work center should have a routing sheet such as the one shown in figure 2-1. This simple routing sheet allows you, the shop supervisor, to keep track of who has read the particular correspondence. Use the second column (to the right of the individual names) to what action each person must take. If the correspondence will be in effect for a long time (OPNAV instruction, EIB, and so on), file it in the shop for use as a reference. After the correspondence has completed its routing, keep the routing slip to provide you a list of shop personnel who have seen the correspondence.

## CORRESPONDENCE TICKLER FILE

A correspondence tickler file is system for keeping track of the action taken on all correspondence entering a work center. Figure 2-2 shows an example of a tickler

OE DIVISION OE 01 ROUTING SHEET				
TITLE: EIB-E15 (23 July 84)				
NAME	REQD	DATE IN	DATE OUT	INITIAL
ET1 BARMAN	R		8/12/84	FB
ET2 SWEET	I			
ET2 BALABUSHKA	A			
ET2 MURLBUTT	I			
ET2 JENNINGS	I			
ET3 MORGAN	I			
ET3 JONES	A			
ET3 JACKSON	I			
ET3 MYERS	I			
REQD legend: I - Information A - Action R - Retain Upon Completion, Return to <u>ET1 Barman</u> Destroy File OPS/OE Form No. XXXXXXXXX				

Figure 2-1.-Sample work center correspondence routing sheet.

file card for an action required by EIB-E15 (23 Jul 84). The format of this file card is general enough that you can use it to keep track of any action to be taken or any report to be generated in your work center. The file card is the heart of the correspondence tickler. The tickler is made up of three parts:

1. An active file
2. A suspense file
3. A completed action file

### Active File

The active file is made up of tab cards. There is a numbered tab card for each day of the month, plus a card with the name of the month. As correspondence comes into the shop and action is required, fill out a tickler file card and place it behind the month-date card corresponding to a date 2 or 3 days before the date you must complete the report or action. (Examples of actions needing a tickler card are installation of a field change, or a report on, or inventory of, test equipment.) Each day before quarters, you can check the active file to see if there are any pending reports or actions that must be completed in the next 2 or 3 days. This keeps deadlines from creeping upon you and helps you avoid the "panic mode" of operation.

### Suspense File

Put a tickler file card in the suspense file when you cannot complete an action or report because of one or more of the following reasons:

- Lack of material
- Lack of personnel
- Ship's operations
- Insufficient data
- Technical assistance required
- Other similar reasons

Your suspense file should contain tab cards with titles that indicate the reason each action was deferred. If, in the case of a field change, you require additional material or technical assistance and will not be able to complete the field change within 30 days, you must submit a deferral (OPNAV 4790/2K) via the maintenance data system (MDS). Note this on the tickler file card. When the problem that caused you to suspend the action or report is corrected and you have completed the

CORRESPONDENCE TITLE: <u>EIB-E15</u>	DATE RECEIVED: <u>Aug 08 84</u> mo da yr
ACTION REQUIRED: <input checked="" type="checkbox"/> YES NO	DATE BY WHICH ACTION REQUIRED: <u>ASAP</u>
REPORT REQUIRED: <input checked="" type="checkbox"/> YES NO	DATE BY WHICH REPORT REQUIRED: <u>Upon other Completion</u>
GROUP/INDIVIDUAL RESPONSIBLE FOR ACTION: <u>ETZ Balabushko, ET3 Jones</u>	
DESCRIPTION OF ACTION REQUIRED: <u>Field Change 4 - AN/URC-80(V)5</u> <u>Sideline Improvement Modification; Type I, Class C.</u> <u>Installation of this field change is to be accomplished</u> <u>concurrently with field change 3 - AN/URC-80(V)5.</u>	
DATE ACTION COMPLETED: <u>Aug 22, 84</u>	DATE REPORT COMPLETED: <u>Aug 23, 84</u>
4790/ 2K <input checked="" type="checkbox"/> CK JSN: <u>DE 112 07</u>	
SIGNED: <u>ETI Gary Basman</u>	
OPS/OE Form No. XXXXXXXXXX	

Figure 2-2.-Sample correspondence tickler file card.

action or report, place the tickler file card in the completed action file.

### Completed Action File

The completed action file contains all of the correspondence tickler file cards on which action has been completed. It serves as your record of actions you have taken or reports you have completed. Store routing slips in the completed action file by attaching them to their matching correspondence tickler file card. Annotate the serial number of a reporting letter or the JSN of a completed 4790/2K or CK on the bottom of the correspondence tickler file card for use as a future reference.

### PUBLICATIONS

You have probably had to research, read, or use various publications during your career as an ET. Your reliance on and use of publications will increase as you advance in rate because you will be more directly involved in planning, inspections, reports, and so on.

Today, there are more changes to procedures because of the ever-increasing sophistication of our fleet. In addition, many of our traditional

procedures are out-of-date in today's situations. As a result, we need to read current publications and keep them for use as reference material as we work with new technologies.

### REQUIRED PUBLICATIONS

Required publications are not listed in this chapter. However, you can find them listed in the TYCOM Administration and Material Inspection Lists; the *Electronics Installation and Maintenance Book (ELWB)*, *General* (NAVSEA SE000-00-EIM-100); and *EIMB, General Maintenance* (NAVSEA SE000-00-EIM-160).

The first step is to see what publications your division has and if they are useful, up-to-date, required, and so on. After you know what publications you lack, see if another division has them or place them on order as soon as possible.

Keep only the number of copies you really need, because storage space on a ship is scarce. In addition, if you have too many pubs, updating or making changes to them can be quite a problem. Maintain a master publication inventory (with locations of individual pubs noted). Also, for each subject publication in the electronics division, maintain a file card, such as the

one shown in figure 2-3 (OPNAV 5070/11). These record cards will help you efficiently maintain an up-to-date and complete inventory of publications.

## TECHNICAL LIBRARY

Whether you are on a small or large ship, some type of division technical library for technical pubs, reference pubs, training pubs, handbooks, and so on, should exist.

Besides the publications already mentioned, your tech library should have at least one up-to-date copy of each applicable equipment (and systems) technical manual.

Assign at least one petty officer to maintain the division's ready reference library (tech library). Assign a second person as a backup so that your tech library will stay current if the assigned tech library petty officer is absent.

## VALIDATION AND INVENTORY

Just as with other publications, you should have a master inventory of the tech library publications. The publication record and inventory card, OPNAV 5070/11 (fig. 2-3), will help the tech library petty officer keep track of publications (issued, on hand, and so on). When changes to publications arrive, you can consult the record cards for the location and quantity of publications requiring changes. In this way you can ensure that all your publications receive changes as they should.

As publications become unusable because of extensive wear and damage, order new publications (and changes) to replace them. Issue these replacements to work center personnel as necessary to avoid confusion; be sure the old publications are discarded after the new publications have been received. (Be sure to abide by security regulations as you discard publications.)

There are several methods used in setting up and maintaining a tech library. Publications NWP-0 and the *IMA Library Guide* (S8800-00-GIP-000) pertain to major technical libraries. However, applicable sections of the manuals may help you with your local situation.

Another problem of maintaining publications is keeping them updated. Of real help to you will be the *Navy Stock List of Publications and Forms*, NAVSUP 2002, and the Enhanced-Ships Technical Publications System (E-STEPS) products.

The NAVSUP 2002 is a master set of microfiche, issued quarterly, that lists most Navy publications and forms. Each edition supersedes and replaces the entire previous edition. The NAVSUP 2002 contains three major sections:

1. Forms
2. Publications
3. Naval technical directives

This microfiche set provides status information such as "canceled," "canceled-no superseding stock numbers," "canceled-incorporated in basic stock number," "replaced by," and effective dates.

*The Enhanced Ships Technical Publications System* (E-STEPS) is also a master set of microfiche. Several E-STEPS data products contain information concerning technical documentation supporting general documents; ships' selected records; ships' electronics; hull, mechanical and electrical (HM&E) and ordnance systems; and equipments under the cognizance of the Naval Sea Systems Command (NAVSEA) and the Space and Naval Warfare Systems Command (SPAWAR). *The Publication Applicability List* (PAL) is one of the products of E-STEPS. This microfiche set is used to determine the publication needs of the ship/shore station to which it applies. The PAL is an important key to identifying the technical manual you need. It applies to NAVSEA and SPAWAR technical manuals for systems and equipments reported to be installed on your ship. The PAL lists publications that apply to, but are not required for, your ship.

Another publication you will need for operating a technical library is the *Technical Manual Identification Numbering System (TMINS) Application Guide and Index*, M0000-00-IDX-000/TMINS. This publication is the sole reference handbook for all component commands involved with the composition, construction, interpretation, or assignment of technical manual or associated technical document identification numbers. This guide will help you understand how the TMINS numbers apply to the new publication numbering system.

A publication used to find current listings for instructions by Washington, D. C., headquarters organizations is the *Department of the Navy Directives Issuance System Consolidated Subject Index*, NAVPUBINST 5215.1. This index has a listing of instructions issued by Washington, D. C., headquarters organizations. It is a numerically indexed and divided





by subject to aid in identifying active naval instructions. The index is divided into four sections:

1. Alphabetical listing—lists instructions by subject content
2. Numerical listing—lists instructions first by sponsor, then in numerical sequence
3. Recently canceled and/or superseded instructions—lists all instructions recently canceled by the sponsor
4. Navy implementation of Department of Defense (DOD) issuances—provides a cross-reference listing to assist activities requesting DOD issuances

## **MAINTAINING TECHNICAL MANUALS**

Maintaining your technical manuals so they are up-to-date is as important as maintaining any other valuable tool. Your technical manuals must reflect the actual equipment configurations that you have at your command. An out-of-date manual or a manual that does not reflect any changes that may have been made to your equipment may prove to be useless when you try to isolate problems.

Changes or update information you receive to NAVSEA technical manuals will be in one of three forms: 1) Advance Change Notice (ACN), 2) Permanent Change, or 3) Revision. After receiving any change or update to a tech manual, you should first ensure that the Field Change, ORDALT, SHIPALT and so forth, is installed in your equipment. If you indicate a change in a manual that is not made in the equipment, the manual will be incorrect. Making an incorrect change to a technical manual is as bad as not making a change when one is required.

### **Advance Change Notice (ACN)**

An ACN is issued when there is an urgent need to add, correct, or expand information in a technical manual to prevent injury or death to personnel or damage to equipment. The ACN is issued by the responsible NAVSEA technical activity in response to a known need for immediate corrective action.

An ACN may be issued as a naval message, a letter, a NAVGRAM, or in an Engineering Information Bulletin (EIB).

When you receive an ACN, you should do the following:

1. Determine whether or not the ACN applies to your technical manual.

2. If it does apply, enter the changes into your technical manual.
3. Record the entry on the Record of Changes page.

### **Permanent Change**

Permanent changes are issued to add system or equipment configuration variations and new procedures and to change existing procedures. They are also used to highlight outstanding ACNs and to correct other reported deficiencies.

Most permanent changes to technical manuals are identified by a vertical line, known as a change bar, extending along the margin of the changed material. When changes to an entire part, chapter, or section are made, a change bar will not be present.

When you receive a Permanent Change, you should take the following steps:

1. Determine whether or not the change applies to the technical manual for your system/equipment configuration.
2. Check the Permanent Change Package against the Change Instruction Sheet and the List of Effective Pages to be sure you have a complete set of change pages.
3. Add replacement pages and new pages, and remove replaced pages according to the instructions that come with the change package.
4. Record the entry on the Record of Changes page.
5. Destroy the removed pages according to your local disposal instructions.
6. Insert the Change Instruction Sheet immediately following the title page.

### **Revision**

A revision is a second or later edition of a technical manual. A revision is issued whenever it is necessary to change the majority of pages in an existing manual. A revision may be required because of hardware modification, because of a deficiency that affects a large part of the manual, or because a change of system configuration results in one volume or part of a multivolume or multipart set being revised.

When you receive a technical manual revision, you should:

1. Verify that the revised manual applies to your ship, system, or equipment configuration.

2. Destroy any superseded edition according to your local disposal procedures.

As supervisor you should ensure that the personnel who manage the technical library, or function as technical manual coordinators for the work centers, should be knowledgeable, responsible, and willing to help others. It is a job for personnel who understand the value of tools, the need to safeguard them, and the need to place them in the hands of the users who need them. Such management will play a vital role in maintaining the operational readiness or your command.

In this chapter we were unable to give all the information you will need on the job. But we have tried to provide basic information and references to help you maintain a good reference technical library.

### **PERSONNEL MANNING**

Personnel manning will be a prime concern of the EMO; however, you will more than likely be quite involved with personnel manning within your division. A division must have the correct manning levels to function properly, filling the needs of equipment maintenance and other shipboard functions, such as general quarters watch stations. Manpower requirements are normally accounted for by the Navy manpower requirements system (NMRS).

This section of the chapter will give you a background in Navy manning and the personnel "tools" with which to work.

### **THE SHIP MANPOWER (MANNING) DOCUMENT (SMD)**

To effectively manage manpower and personnel, the Navy needs an accurate identification of ship manpower requirements. The main function of the ship manpower document (SMD) and preliminary ship manpower document (PSMD) programs is to document manpower requirements. This is done in terms of quantity and quality (such as skills, experience levels, and specialized training), required to perform mission requirements specified in the required operational capabilities (ROC) and projected operational environment (POE) statements.

An ROC statement lists all required operational capabilities (ROCs) for a class of ships, a type of aircraft squadron, or other unit as assigned by the CNO.

Example:

- |        |   |
|--------|---|
| ROC    | <ol style="list-style-type: none"><li>1. Engage submarines with antisubmarine armament.</li><li>2. Engage airborne threats using surface-to-air armament.</li></ol> |
| SUBROC | <ol style="list-style-type: none"><li>1. Attack with torpedoes.</li><li>2. Engage airborne threats using installed AA weapons.</li></ol>                            |

A POE statement is a listing of the most demanding conditions (wartime and peacetime) of operation for which a unit must be manned.

Example: At sea in wartime, capable of performing all offensive and defensive functions simultaneously while in Readiness Condition 1; capable of performing other functions that are not required to be accomplished simultaneously.

The SMD is developed in six phases: data collection, workload standards development or validation, generation of a preliminary statement of required billets, fleet review, publication of final billets, and implementation. The Navy manpower requirements system provides automated data processing support for each of these phases.

If a ship is modernized during its service life (equipment or systems updated or added), the SMD provides a means for determining manpower requirements for the modified systems or mission.

The NMRS can generate an SMD to identify billets needed to operate and maintain new weapons, equipments, and systems, far enough in advance of fleet introduction to provide trained personnel both when and where they are needed.

In addition, the shipboard managers—from the commanding officer down to the LPOs—can use the SMD as an effective source document. Since it has detailed watch station requirements, it can serve as the basis for the establishment of a battle organization and watch bill for specific conditions of readiness.

### **DESCRIPTION OF THE SMD**

We have discussed the importance of the SMD as an element of the Navy manpower management process. It presents the basic manpower requirements summary in seven sections as follows:

- |           |   |
|-----------|---|
| Section I | <u>Officer billet summary.</u> Consolidates officer requirements into a single section. |
|-----------|---|

Section II Manpower summary. Shows the number of officer, enlisted, and civilian manpower requirements at the deptmental level.

Section III Manpower requirements. Displays the ship manpower requirements by organizational component.

Section IV Battle bill. Shows watch station requirements for each condition of readiness prescribed in the required operational capacity (ROC) and projected operational environment (POE) statements.

Section V Functional workload. Provides a summary of all workloads, by category, that contributed to the billet requirements in each organizational component.

Section VI Divided into three parts as follows:

Part O I-Summary of officer manpower requirements. Provides a summary of

officer billets by designator and paygrade along with totals for both. (These are shipwide and not related to organizational components.)

Part 02-Summary of enlisted manpower requirements. Similar to Part 01, but more detailed. This section includes a summary for each rating group (for example, DS, ET, FC, OS, and RM) in alphabetical order, showing primary and secondary NECs and paygrades. At the end of the section, there is a summary for the entire activity summarized by paygrade only. As in Part 01, the totals and subtotals are shipwide and not related to the organizational structure. See figure 2-4.

Part 2A-Summary of enlisted manpower requirements by department.

SECTION VI (PART 02)													OPNAVINST 5321.435		
SUMMARY OF ENLISTED MANPOWER REQUIREMENTS.													29 JUN 1981		
FOR															
USS NEVERSAIL (DD 123)															
RATING	PRI NEC	SEC NEC	E-9 MCPO	E-8 SCPO	E-7 CPO	E-6 PO1	E-5 PO2	E-4 PO3	DISG STKR	1-3	1-2	1-1	TOTAL		
DK						1			1				2		
RATING TOTAL						1			1				2		
DS	1615	9535			1								1		
DS	1623							1					1		
DS	1672						3						3		
DS	1682					1		1					2		
RATING TOTAL					1	1	3	2					7		
EM					1		1	1					3		
EM	4626					1		1					2		
RATING TOTAL					1	1	1	2					5		
EN					1		1	4	2				8		
EN	4291					1		1					2		
EN	4398					1	1						2		
RATING TOTAL					1	2	2	5	2				12		
ET		9535		1									1		
ET	1426	1454						1					1		
ET	1431	1425						1					1		
ET	1436	1422							1				1		
ET	1438	1453							1				1		
ET	1453	1454								1			1		

Figure 2-4.-Sample page from ship manning document (Section VI [Part 02]).



The Navy must produce the maximum combat readiness with the dollar resources available. For this reason, and because of the high cost of manpower, each billet requirement must be stated at the minimum skill and experience levels necessary for satisfactory performance of billet functions.

Billet reviews are conducted periodically at the CNO level. In these reviews, decisions are made based upon the existing classification of each billet as indicated on Manpower Authorizations (OPNAV Form 1000/2, previously explained.) Improperly classified billets become the lowest priority billets in the category in which they are classified. Consequently, if the objective is to delete or redistribute billets, improperly classified billets are prime candidates for deletion or reprogramming.

The manpower requirements and manpower classifications within each Navy activity are specifically reviewed at the activity level annually to ensure the deletion of unnecessary billets or positions and the proper classification of each authorized billet or position. If changes are required, a Manpower Authorization Change Request (OPNAV 1000/4A) is submitted. If changes to the designator rating, grade, or number of billets and/or positions are requested, the requests must be justified in terms of changes in mission, function, and task, as contained in the required operational capability (ROC) or shore required operational capabilities (SHOROC) statement. If a billet is currently classified improperly, the misclassification must be explained.

Manpower Authorization Change Requests are normally submitted annually. More frequent requests must be justified on the basis of changes in mission or functions beyond the control of the activity.

Valid requirements for billet changes that will require the movement of personnel must be identified and requested as early as feasible to permit orderly personnel management. Normally, 5 to 9 months' time is required after final billet approval before new or changed billets can be filled with personnel. Manpower Authorization Change Requests that involve an activity reorganization are planned and submitted on the basis of the existing number of billets.

The Billets Authorized (BA) column on the MPA (refer to fig. 2-5, block 32) indicates the billets authorized by the CNO. The quantity assigned to each billet authorized on the MPA is normally the same as the corresponding billet in the SMD. SMD billet requirements, which are not included in the Billet

Authorized (BA) column on the MPA, are entered on the MPA as Mobilization Billets, the majority of which will be reflected in the Selected Reserve column (SR - block 39).

What does all of this mean to you? You as a supervisor, play a very important part in the process. You must continually work with your personnel specialist to ensure that billet and personnel requirements for your shop are accurately reflected in ship manning documents. By keeping your shop's manning requirements up to date, you will help to keep your ship's manning requirements up to date.

Check the MPA to ensure that all of the Navy enlisted classifications (NECs) listed in the MPA that pertain to your shop are current and correct. It is especially important to make sure that the NECs required to support new installations are requested and that old NECs no longer required are deleted. Have a Short Form Change Request to the MPA submitted when you find a discrepancy.

Whenever you work with the MPA, use OPNAVINST 1000.16, *Manual of Navy Total Force Manpower Policies and Procedures* as a reference. Article 903 contains all of the information and procedures necessary to initiate a Short Form Change Request (military only).

## **ENLISTED DISTRIBUTION AND VERIFICATION REPORT (EDVR)**

An EDVR is a statement of an activity's personnel account—how many assigned, what rates, what NECs, and so on. The Enlisted Personnel Management Center (EPMAC) publishes an up-to-date EDVR for every command monthly. You will see and use the EDVR often, more so than the MPA or SMD. As an ET1 or ETC, you will work closely with the EMO to determine NEC manning and personnel losses and gains, and to initiate any necessary changes to the EDVR.

The purpose of the EDVR is to provide

- a rate or NEC summary of the current and future manning status of the activity,
- a common reference point in any discussion of manning status between the manning or detailing control authorities and the activity,
- a statement of account for verification by the activity, and
- a permanent historical record at the Bureau of Naval Personnel (BUPERS) of an activity's

personnel account for statistical uses and overall Navy manning.

The EDVR printout is divided into nine sections. Sections 1 through 3 contain information on members that has been extracted from the activity account and that requires special attention or action by the activity. Section 4 contains the total personnel account of the activity, including those members reflected in sections 1 through 3. Sections 5 through 8 contain only statistical and authorized billet information. Section 9 contains information about NEC management; it lists names and up to five NECs that the service member may hold.

The following list will provide you with a basic description of each section of the EDVR:

Section 1. Prospective Gains (PG). Lists all members who have currently been ordered to report to your activity within the next 7 months.

Section 2. Prospective Losses. Lists all members who should have been detached or are expected to be detached from the activity within the next 7 months. Career and noncareer EAOS (end of active obligated service) losses are also listed.

Section 3. Personnel On Board for Temporary Duty or Assigned in a Deserter Status.

Section 4. Total Personnel On Board and Rating NEC Summary. Lists all members in the activity's personnel account, regardless of their loss, gain, or duty status. When a member also appears in one of the three preceding sections, the section in which the member is listed is displayed in item AA of the EDVR. See figure 2-6.

Section 5. Personnel Status Summary. A numerical summary of the activity's personnel account showing authorized billets, the

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ALPH	K	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	
NAME	SOCIAL SECURITY NUMBER	ACRUAL RATE	ABSEN RATE	ENR IN PRCS	NEC	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	
SECTION 4																								SECTION 4	
KNOWS (MAR)	555-11-0011	ENR	ENR	1204	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	GM-AC
IRBYARD FRAN	555-11-0012	ENR	ENR	1000	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
FRZEL REZIT	555-11-0013	ENR	ENR	1000	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	GM-AC
SPS2065 (MAR)	555-11-0014	ENR	ENR		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
MURTAZAVI MA	555-11-0015	ENR	ENR	1760	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
FANCY WIL	555-11-0016	ENR	ENR		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
WITTON MURUS	555-11-0017	ENR	ENR		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
FASSMAN JOHN	555-11-0018	ENR	ENR		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
SOKULASKI II	555-11-0019	ENR	ENR		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
MURJAN (ENR)	555-11-0020	ENR	ENR	1000	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
CATTREHEAD W	555-11-0021	ENR	ENR		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
MURTYN BRIAN	555-11-0022	ENR	ENR	1000	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	GM-AC
CAHND ALVIN	555-11-0023	ENR	ENR	1000	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	GM-AC
WANGER RAJVI	111-11-0024	ETCS	ETCS		ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	ENR	SEC2
KNOWS ROBERT	111-11-0025	ET1	ET1	14201104	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	GM-AC
OSTER CALVIN	111-11-0026	ET2	ET2	14541420	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	SEC2
WELCH GARRET	111-11-0027	ET1	ET1	1516	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	ET1	SEC2
OWNE CURTIS	111-11-0028	ET2	ET2	14701420	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	SEC2
KARHYAN ROY	111-11-0029	ET2	ET2	14301470	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	SEC2
SHANE RONNE	111-11-0030	ET2	ET2	15041470	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	SEC1
WEST CHARLES	111-11-0031	ET2	ET2	14501430	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	ET2	SEC1
SECTION 4																									SECTION 4

Figure 2-6.-Example of EDVR format (Section 4).

Navy manning plan (NMP), and members on board the activity.

- Section 6. NEC Summary. A summary of an activity's authorized NEC billets and the members on board or expected on board who possess those NECs.
- Section 7. CNO Billets Authorized Revision Number XXXXX dated yr/mo/da. The information contained in this section is identical to the Summary of Organizational Billets appearing in the activity's Manpower Authorization (MPA) OPNAV Form 1000/2.
- Section 8. NEC Billet/Personnel Inventory. Lists NECs for which the activity has authorized billets and members who hold these billets.
- Section 9. NEC Management Section. Lists the names of the activity's personnel who hold NECs, and lists up to five NECs per individual.

As a supervisor, you should learn to read and use the EDVR. It will provide you valuable information to use in providing proper manning for your ship. The format and procedures for validating the EDVR are shown in NAVMILPERSCOMINST 1080.1.

### **MAINTENANCE MATERIAL MANAGEMENT (3-M) RESPONSIBILITIES**

By this point in your career, you should have an extensive knowledge of the 3-M Systems and should follow their requirements automatically. As an ET1 or ETC, you should know the full use of the 3-M Systems and must ensure that your personnel comply with the 3-M Systems requirements.

To review the mechanics of the 3-M Systems, we recommend that you read the "Ships 3-M Systems" chapter of the *Military Requirement for Petty Officer Third Class* once again. This particular chapter of the *Military Requirements for Petty Officer Third Class* provides an excellent description of the 3-M Systems; however, the official reference for the 3-M Systems is OPNAVINST 4790.4. You may also wish to read *Introduction to 3-M Systems*, NAVEDTRA 13092. This text gives a short, but very informative explanation of 3-M Systems and procedures.

### **SHIP CONFIGURATION AND LOGISTIC SUPPORT INFORMATION SYSTEM (SCLISIS)**

The structure of a ship, defined in terms of onboard systems and equipment, is referred to as the ship's configuration. The ability to define a ship's configuration accurately is critical in maintaining proper shipboard support. Navy managers responsible for the operation, maintenance, modification, and logistics support of both ships and equipment need to receive accurate configuration data in a timely manner. To ensure the availability of this data, many Navy managers in the past developed their own information systems for gathering and processing configuration data. While those systems satisfied specific requirements, each required maintenance and organizational support. The multiple systems also imposed redundant reporting responsibilities on the fleet. Managers who lacked the resources to develop their own configuration information system were forced to collect data from the several existing systems. This produced inconsistent results and interface problems because of different program languages or equipment incompatibilities. The need to provide all managers with a single, standard source of accurate ship configuration data and to reduce fleet reporting to a single requirement led to the development of the Ship Configuration and Logistics Support Information System (SCLISIS).

SCLISIS replaced the CNO-sponsored program, Ship Equipment Configuration Accounting System (SECAS), in 1989. SCLISIS applies to all ships of the active and reserve fleets, except for fleet ballistic missile submarines (SSBNS) and nuclear propulsion systems. It covers the life cycle of the ship, starting during its construction.

*Department of the Navy Configuration Management Policy*, SECNAVINST 4130.2, assigns to the Naval Sea Systems Command (NAVSEA) the responsibility for maintenance and control of ships configuration data, including related platforms, systems, and equipments. It also requires that a single activity be designated as the ship class control authority for configuration data input and changes to the Weapon Systems File/Ship Configuration and Logistic Support Information (WSF/SCLSI) Database. The WSF/SCLSI Database is maintained by the Ship's Parts Control Center (SPCC) in Mechanicsburg, Pennsylvania.

The term *weapon systems file* refers to the parts level, parts inventory portions, and related secondary ship component level configuration data files of the



Weapon Systems File (WSF). The SCLSI database, which was formerly the WSF Download database, is the master configuration file for all Navy ships.

### SCLSIS Data Input Path

Data is put into SCLSIS according to 3-M reporting procedures. The data flow is from the ship to the TYCOM and then to the Central Data Exchange (CDE) at the Naval Sea Logistics Center (NAVSEALOGCEN). The CDE consolidates the configuration and logistics data and routes it to the appropriate Configuration Data Manager (CDM). Figure 2-7 shows the SCLSIS data flow for an operational ship.

The CDM is the single activity responsible for the accuracy and maintenance of the configuration data for a ship class. All data entries into the WSF/SCLSI database are made directly by the CDM. The CDM conducts any research necessary on information submitted for inclusion in the database and then updates the SCLSI database.

As custodian of the SCLSI database, SPCC processes transactions as directed by the CDM, calculates allowance changes and extracts related supply support information. All SCLSI database updates, whether initiated by the ship or the CDM, cause an output from the SCLSI database to go to the ship. SPCC also passes back to the ship all supply support changes, including new and revised Allowance Parts Lists (APL), and National Item Identification Number (NIIN) changes. Response to Coordinated Shipboard Allowance List (COSAL) Feedback Reports are passed from the SPCC to the ship in the same process. In addition, the data base provides Shipboard Nontactical ADP Program (SNAP) databases and data to other fleet and shore activities who require authoritative configuration and logistics information.

### Scope of SCLSIS

The scope of SCLSIS includes all configuration-worthy items necessary for the operation,

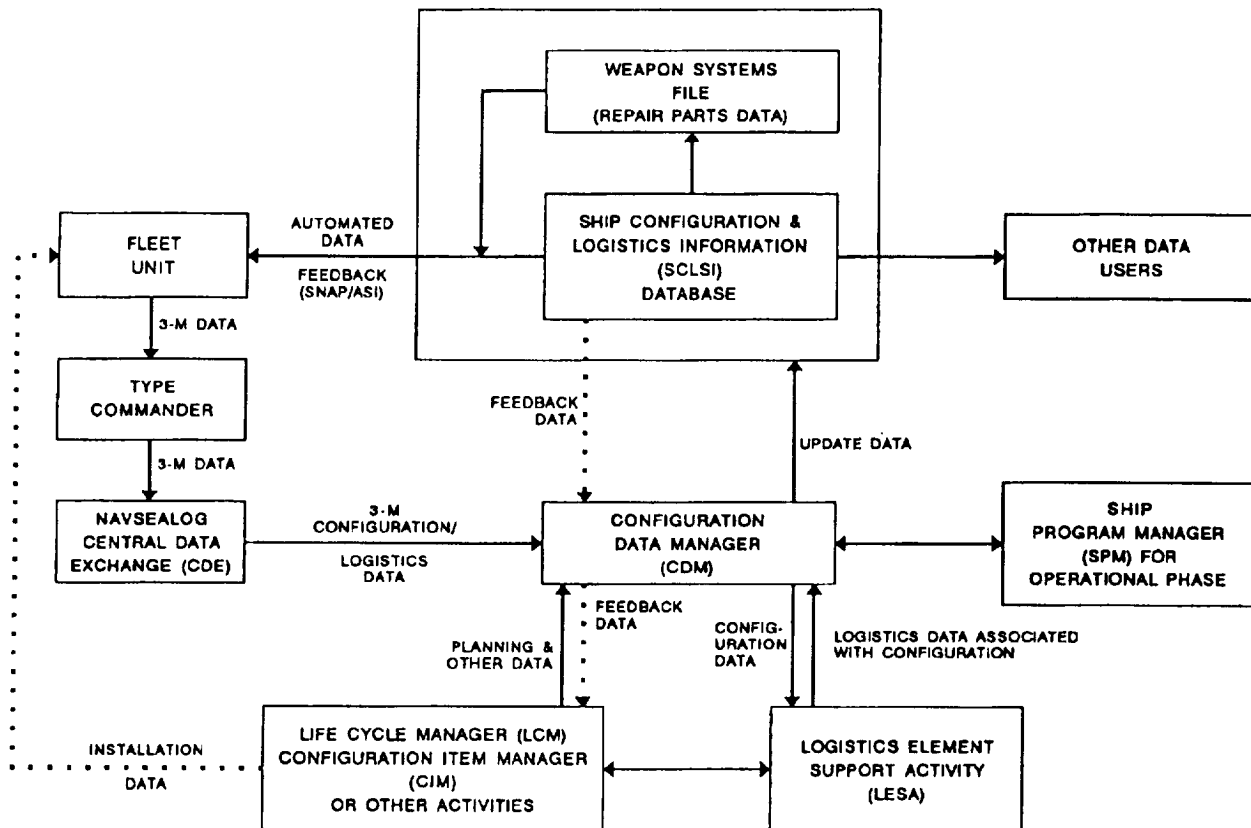


Figure 2-7.-SCLSIS Organizational Data Flow (Operational Ships).

maintenance, modernization, and support of shipboard equipment.

An item is considered “configuration-worthy” if

1. It requires any one of the following elements of logistics support: supply support, test equipment requirements, technical manuals and repair standards, Planned Maintenance System actions or drawings.
2. Configuration information (for example, nameplate data, technical characteristics data, component drawing) is required to support any level of maintenance (organizational, intermediate, or depot), and modernization (planning and execution).
3. It is needed to fully describe the functional hierarchy of the ship.

Within NAVSEA TECHNICAL SPECIFICATION 9090-700 series, which governs SCLSI, ship configuration identification and data controls are divided into four levels of detail, kept as follows:

1. Ship Level Configuration. The Planning Yard maintains ship level configuration information with general arrangement drawings and various ship level records such as weight and stability analysis.
2. System Level Configuration. The Planning Yard maintains system level configuration information with system selected record drawings and configuration control drawings.
3. Component Level Configuration. The SPCC maintains component level configuration data, along with ship and system level configuration data in the SCLSI database.
4. Parts Level Configuration. The Life Cycle Manager (LCM) and the SPCC maintain parts level configuration data in the Equipment File of the WSF.

### **Validation and Audits**

Validations and audits are basically inventories and are grouped into several basic categories. Each validation or audit may require various amounts of effort and time to complete. The basic validations and audit categories include:

1. Baseline Validation. An inventory process that compares, by type and serial number, what equipment is on board a ship with what supply

documents indicate should be on board the ship. The purpose of the validation is to establish a data baseline against which future inventories and equipment changes can be compared. The baseline data accounts for original equipment configurations, as well as alterations. Baseline Validations are conducted for the first ships of a class and are used to produce the ship Class Standard Data Base (CSDB). Configurations for future ships of the class are based on the CSDB.

2. Audits. A sampling validation performed to ensure that configuration and logistics data in the SCLSI database is accurate.
3. Correction Validation. An inventory conducted on items flagged during a previous audit because of some identification or records problem. This includes follow-on Clarification Audits to identify further validation candidates needed to update the database.
4. Installation Validation. Verifies the configuration and logistics data being reported for new configuration item installations.

As a supervisor, you must remember to submit the proper 3-M documentation to the TYCOM when changes in the configuration of your shop equipment occur. This is the only way that the Configuration Data Manager will know to put the information on the SCLSI76 database. If the information is not on the database, you will not get the parts support you need to ensure proper repairs.

### **INSPECTIONS**

Inspections of electronic equipment and digital data equipment systems are made at least once during each ship's training cycle and at other times when necessary. These inspections determine the state of readiness of equipment and compare its condition with a previously established condition to detect deterioration. They also help determine the readiness of equipment after it has been installed, overhauled, repaired, or altered.

### **INSURV INSPECTIONS**

INSURV inspections are conducted by the Board of Inspection and Survey to determine the material readiness of the ship's equipment and systems. Any discrepancies or deficiencies discovered by the INSURV inspection team are documented on 4790/2K work requests. These work requests are then used in planning an availability or

overhaul. OPNAVINST 4730.5 requires an INSURV inspection for active ships at least once every 3 years.

## **TYPE COMMANDERS' ADMINISTRATIVE INSPECTIONS**

Type commanders' administrative inspections are held at least once each training cycle and are divided into a whole ship category and a department category. Administrative methods and procedures are examined to see if they are intelligent and efficient. They are also checked to see if they are directed toward keeping the ship prepared for wartime mission performance.

## **MATERIAL READINESS INSPECTION**

The purpose of these inspections is to determine the material readiness of shipboard equipment and systems installations. These inspections are conducted once during each ship's training cycle and are supervised by an officer who is qualified in the particular equipment or system. When practical, this officer will be assisted by an engineer finished by the systems command responsible for that equipment. In the interest of reducing costs and conserving manpower, these inspections are normally conducted concurrently with, or as part of, the INSURV inspection.

The material readiness inspection consists of three specific types of inspections: performance inspections, physical inspections, and maintenance administration inspections.

The performance inspection includes, but is not limited to, the following actions:

1. Making the basic measurements listed on the MRC for the equipment and systems designated by the inspecting officer as essential to the primary mission and task of the ship being inspected.
2. Conducting system tests on designated systems at a test and calibration facility. If any of these tests are not done at the time or just prior to the inspection, they should be done shortly afterwards. In any event, additional measurements, as noted on system MRCs, should be taken at the time of the system test.
3. Conducting interference tests to determine if operating the equipment causes problems with other installed electronic equipment or if it is hampered by interference from other electronic or nonelectronic equipment. The interference tests also identify the source and amplitude of

interference emanating from nonelectronic equipment.

4. Listing all approved modifications required but not made, as well as all unauthorized modifications.

The physical inspection includes visually inspecting and determining the condition and adequacy of all equipment, cabling, repair parts, and tools.

The maintenance administration inspection determines if there is an established Procedure for submitting SCLSIS and OPNAV 4790/2 and 4790/CK forms. Checks are also made to ensure that there is a procedure for listing field changes on field change plates and updating electronics publications.

This inspection includes, but is not limited to, checking whether the quantity and rates of electronics personnel on board meet the ship's allowance and whether the electronics personnel assigned to the ship are capable of supporting the allowed equipment. It also is used to see if there is an established program for on-the-job training (OJT) as well as a program for sending personnel to fleet and NMPC-controlled electronics schools.

## **TEMPEST INSPECTIONS**

Compromising emanations, generally referred to as TEMPEST, are unintentional data-related or intelligence-bearing signals. These signals, if intercepted or analyzed, can disclose the classified information transmitted, received, handled, or otherwise processed by electrical information processing equipment or systems. Any electrical information processing device, whether an ordinary electric typewriter or a large complex data processor, may emit signals that can be intercepted and used to compromise security. The Navy holds TEMPEST inspections to measure these emanations and determine how they can be eliminated.

There are two types of TEMPEST inspections. One is the instrumented TEMPEST survey, an on-site (field) test to determine the nature and amplitude of conducted or radiated signals that may contain compromising (classified) information. A field test normally includes detection and measurement of these signals, and analysis to determine correlation between emanating signals and classified information being processed. A National Policy Certification is issued to the ship when the ship's equipment has been found to meet the requirements of the national policy. This permits the

ship to operate all its information processing systems according to prescribed procedures. Because of its cost, this survey is usually completed on only one ship of a class. The second inspection is the Visual TEMPEST Configuration Control Inspection (VTCCI), which is conducted independently or concurrently with the instrumented TEMPEST survey, to determine whether or not the shipboard secure electrical information processing systems are installed properly. Any change, however minor, within the secure electrical processing center, whether by forces afloat or the normal installation activity, must be made and inspected according to current criteria outlined in MIL-STD-1680.

### **PREOVERHAUL TEST AND INSPECTION (POT&I)**

Preoverhaul inspections are held approximately 10 to 12 months before an overhaul. These inspections cover work on combat system items to be done during the upcoming overhaul. A preoverhaul inspection provides information used in developing plans for overhaul of the ship. Personnel performing this inspection are normally from the ship's home yard. Personnel from SPAWAR or NAVSEA may also perform part of the inspection.

### **POSTOVERHAUL INSPECTION**

The purpose of the pxtoverhaul inspection is to furnish the commanding officer of the ship a report on the condition, capabilities, and limitations of the shipboard equipment and systems. This inspection includes new installations of equipment and systems, and the equipment or systems that were included in the overhaul job orders.

### **MAINTENANCE PERIODS, OVERHAULS, AND ALTERATIONS**

Maintenance periods (also called availabilities) and overhauls are scheduled at various times according to the needs of the ship, the fleet, the type of ship, and the available funds.

Regular overhauls are normally scheduled about every 60 months. Doing the required heavy maintenance and overhauls that cannot be tended to while the ship is underway usually takes 2 to 6 months. During this time, many new electronics installations and equipment or system overhauls can be done with the assistance of yard, tender, or civilian contract personnel.

## **FLEET MODERNIZATION PROGRAM (FMP)**

The fleet modernization program is a major effort to ensure that ships of the fleet are as ready as possible to meet operational requirements.

Each year the Navy re-evaluates its missions and the threat faced by its forces. Analysis of these factors leads to a new statement of required operational capability (ROC) in the new projected operational environment (POE) for each class of ships. The new ROC and POE are then used as the basis for determining the characteristics required in new ships to be built and the requirements for modifying and modernizing existing ships. Attaining the required operational capabilities to enable every ship to best carry out its assigned missions is the primary goal that drives the fleet modernization program (FMP). Other major supporting goals served by the FMP include increasing fleet readiness by improving safety, repair, habitability, reliability, and maintainability; and accomplishing the highest priority alterations in the most timely manner. The FMP needs are reviewed and updated annually by both the CNO and TYCOM. This forms the approved class improvement plan for each ship class.

### **AVAILABILITIES**

An availability is an assignment of a ship to a repair facility for repairs beyond the capability of the ship's force. Besides regular overhaul, several types of availabilities are assigned, according to the needs of the individual ship or the fleet.

#### **Restricted Availability (RAV)**

A restricted availability (RAV) is normally assigned for emergency repairs of problems with prime systems that prevent the ship from fulfilling its mission. When emergency repairs to primary systems cannot be made by ship's force, the commanding officer can request the type commander to assign a restricted availability for the repair of these specific systems. During a restricted availability, the ship is rendered incapable of performing its mission.

#### **Technical Availability (TAV)**

A technical availability (TAV) is used when repairs on noncritical systems or equipment must be made by a repair facility or yard. These repairs do not affect the ability of the ship to complete its mission. If necessary,

the ship can get underway without the system or equipment being repaired

#### Intermediate Level Maintenance Activity Availability (IMAV)

Intermediate level maintenance activity availabilities (IMAVs) involve repairs made by either afloat repair activities (tenders and repair ships) or shore intermediate maintenance activities (IMAs). Their purpose is to accomplish as much intermediate level maintenance and repair work as possible within workload limitations, available funds, and the relative priority of the required work. Although the primary emphasis of IMA effort is on repair work authorized SHIPALTs and AERs are undertaken as IMA workloads permit.

#### Upkeep Period

The upkeep period is a period of time in a port where the facilities of a yard or tender are available for routine maintenance that cannot be done while the ship is underway. Upkeep scheduled with the assistance of a tender or repair ship is sometimes called tender availability.

#### Voyage Repairs

Voyage repairs are emergency repairs that must be made to enable a ship to continue on its mission and which can be done without requiring a change in the ship's operating schedule or the general steaming notice in effect. These repairs normally cannot be made by ship's force.

#### SHIPYARD OVERHAUL

Ships are assigned availabilities at shore-based repair activities as directed by the Chief of Naval Operations. The first scheduled overhaul is normally granted to a ship after an initial operating period of about 2 years. Thereafter, scheduled overhauls depend on the ship type. The amount of time in the shipyard for these overhauls varies. If the shipyard works on a one-shift basis, the overhaul often requires 6 months or longer, depending on the type of ship. The employment schedule, an operating directive furnished by the type commander, indicates when a ship is scheduled for overhaul.

#### Availability Work Package Development and Modification

For an availability to be a success, the work to be done must be clearly defined in sufficient time to order material and to issue the necessary job orders or contract specifications. The definition of work required is obtained from the ship's database, as reflected in the Current Ship's Maintenance Project (CSMP), and from the results of preoverhaul tests and inspections (POT&I). The work package is developed through a sequence of events that starts with the ship's CSMP and results in an authorized work package control document and the *ship alteration and repair package* (SARP). The development of the SARP is as follows:

- Step 1. CSMP validation.—The CSMP undergoes formal review to ensure its accuracy and completeness. This is the responsibility of the ship; however, external assistance is generally provided to enhance the effort. The CSMP provides the biggest input into the development of the SARP.
- Step 2. Preoverhaul tests and inspections (POT&Is).—These identify work not previously covered in the CSMP. (They also define more clearly the CSMP work requirements.)
- Step 3. TYCOM screening of the CSMP and work identified by POT&Is.—Work may be assigned to off-ship activities or ship's force, or may be deferred until a later availability. Some categories of work will be authorized immediately to allow advanced planning (ordering of material and estimating of the work package).
- Step 4. Other POT&Is designated by the TYCOM and the concurrent development of estimates by the naval shipyard or Supervisor of Shipbuilding (SUPSHIPS).—At this time, in preparing for the Work Definition Conference, the ship must place in priority order all work requirements that have been screened but not yet authorized.
- Step 5. Maintenance Work Definition Review (complex overhaul [COH]/selected restricted availability [SRA]).—This meeting is scheduled by the TYCOM and held aboard ship with the planning and estimating group. The POT&I information

is used to make the work package fully defined within funding constraints and to prepare it for presentation to the Work Definition Conference.

### **Preoverhaul**

For the best use of the time and funds available for an overhaul, planning for the repairs to be made during the overhaul must be done in advance of the ship's arrival at the repair activity. Advanced planning is required of both the ship and repair activity.

In preparing the electronics work list (most information is obtained from the CSMP) for submission to the EMO, the leading ET must give all the information necessary to assist the shipyard in locating and rectifying the troubles.

The work list indicates all work which should be done during the overhaul, the priority for each item, and the names of the ship's QA inspectors.

The list will be combined with the work lists submitted by the other divisions. Before the ship enters the repair yard, a complete ship's work list will be submitted.

### **During Overhaul**

During an overhaul the electronics division personnel continue to have responsibility for their equipment and its repairs. This includes inspecting the work both during and upon completion of the repairs. Your responsibilities will also include signing off jobs that are completed. To do this properly as a member of the ship's quality assurance team, you must understand and apply the requirements of the Quality Assurance Manual. Remember, once you have signed off the work as being completed, you have "bought" the equipment, whether it works or not.

### **Postoverhaul**

Completing an overhaul requires submitting a report on the completion status of all authorized repairs, canceling or rescheduling of uncompleted work and preparing the ship for its initial voyage after the

Except in unusual circumstances, job orders for uncompleted repair work are closed or canceled when the ship leaves the repair activity. Job orders for authorized alterations, however, are held open until the

work is either completed later or canceled by the appropriate systems command.

If the ship leaves the repair facility with unfinished work to be completed by another activity, all outstanding job orders are transferred to the other activity together with all pertinent information and whatever material was assembled for the work.

Should work be desired later on job orders that have been closed or canceled, new requests must be made. When readying a ship for sea, including its initial voyage after an overhaul, the electronics personnel must see that allowances of equipment, tools, and repair parts are on board and properly stowed. The reason is obvious, since negligence can make the ship a liability during action.

### **Alterations**

In addition to the routine maintenance and emergency repairs already mentioned other types of maintenance (such as test equipment calibration and outstanding alterations) can be performed during the availability.

In general, an alteration is any change. It can be major or minor, affecting almost anything about the ship. An alteration can be any of several types: ship alteration (SHIPALT), boat alteration (BOATALT), machinery alteration (MACHALT), ordnance alteration (ORDALT), or alteration equivalent to repair (AER). These alterations are considered military or technical improvements.

A military improvement results in a change of a ship's operational or military characteristics, qualities, or features. It also increases the ability of the ship to meet its ROC. The decision to incorporate a military improvement rests solely with the CNO.

A technical improvement is a change to improve the safety of personnel and equipment and to provide increased reliability, maintainability, and efficiency of installed equipment.

Ship alterations have the following category titles:

*Title K*, funded and authorized by CNO

*Title D*, funded and authorized by TYCOM

*Title F*, funded and authorized by TYCOM

*Title K/P*, funded and authorized by CNO

*TIA*, TYCOM issued alterations, no funding required, authorized by TYCOM.

All alterations are managed through the fleet modernization program.

## Modifications

Most changes to electronic equipment are modifications called electronic field changes (FC) (previously called electronic alterations). The basic purpose of a field change is to improve performance, reliability, maintenance, operational characteristics, or safety. The type designator indicates how complete the change package is. Some packages contain all necessary instructions, parts, and tools. Other packages contain only instructions. The four types are defined below:

- Type I. Requires parts, all of which are included in the FC kit. Also included in the kit are the publication package changes and the materials and special tools required to change one equipment and to revise existing equipment nameplates, publications, and charts.
- Type II. May require parts, none of which are included with the field change. This type of FC usually affects only the publications package. If parts and tools are required, they are considered standard stock items and are available as bench spares (for example, wire, lugs, soldering irons, and so on).
- Type III. Requires parts, some, but not all, of which are included in the field change kit. The parts not included are considered standard stock items.
- Type IV. Does not require parts or use of any special tools. This type of FC is usually published in an EIB article and consists of only a publications change.

There are three classes of field changes. The class designator indicates who is responsible for the funding and installing of the FC.

- Class A. Modification may be made by forces afloat or station personnel; no installation funding is required. Approval of Class A field changes to be made by forces afloat indicates only that the work content is within their technical capability. The Class A designation does not require the modification, nor does it require forces afloat to make the modification. The

decision of when and how to make the modification is considered to be a forces afloat prerogative.

- Class B. Requires fleet funding for and work by naval shipyards, tenders, and so on, when authorized by the TYCOM. Except for Class B field changes presently under way or in the fleet planning stage, this type of field change will no longer be issued.
- Class C. Normally requires industrial assistance and requires the appropriate systems command installation funding.

## SAFETY

Most accidents are preventable. However, through ignorance or misunderstanding, there is a common belief that accidents are the inevitable result of unchangeable circumstances or fate. This belief fails to consider the basic law of cause and effect. In other words, accidents do not occur without a cause; most accidents are the direct result of some deviation from prescribed safe operating procedures.

A preventable accident may be traced to an ingrained belief or work habit of an individual. This belief or work habit may cause the individual to perform an unsafe act or permit a hazardous condition to exist; when an accident occurs, the cause-and-effect sequence is completed.

One purpose of safety rules is to remind personnel of the dangers inherent in their work. Training in the observance of safety precautions can help avoid preventable accidents and encourage the maintenance of an accident-free work environment. Operating procedures and work methods should stress hazard prevention so that personnel do not expose themselves unnecessarily to injury or occupational health hazards. You can prevent accidents that are about to happen if you are alert to causes and take appropriate remedial action.

## SAFETY TRAINING

As a leading ET, you have safety-related responsibilities that may be grouped into three general areas as follows:

1. Responsibilities concerning the electronics division. These responsibilities include ensuring that all personnel in the division are aware of and observe all shipboard safety precautions,

especially those precautions regarding electrical safety.

2. Responsibilities concerning nonelectrical ratings. As an ET1 or ETC, you will automatically be considered an expert on electrical safety precautions. Therefore, you have a responsibility to educate the personnel whose primary duties are nonelectrical about these precautions. The responsibilities in this area are ever increasing, as more and more electronic equipment is used in the various jobs aboard ship.
3. Responsibilities as a petty officer. In this area you have the same responsibilities as all other petty officers in enforcing all safety precautions.

Any failure to follow electrical safety rules or procedures may result in mild to severe shocks. In some cases, death may result. Nearly all shipboard electrical shocks are caused in one or more of the following ways:

1. Unauthorized use of, or unauthorized modifications to, equipment
2. Failure to observe applicable safety precautions in the use of equipment or in working on or near energized equipment
3. Failure to repair equipment that was known to be defective and had previously given users a mild shock
4. Failure to test and inspect equipment for defects, or failure to remedy all defects found by tests and inspections

All of these failures maybe summarized as failure to observe applicable safety precautions.

## SAFETY EDUCATION

You cannot expect individuals to observe a precaution unless he or she is fully aware of the dangers involved. One of your first duties, therefore, will be to ensure that all personnel in the electronics division are aware of the dangers and the safety precautions necessary to combat these dangers.

Safety precautions depend to some extent upon the type of ship involved. Ships such as AOs and AEs necessarily have some precautions that must be strictly observed but which are not applicable to other types of ships. Therefore, you should ensure that all personnel read and understand all safety precautions pertaining to the electrical and electronic equipment on your own ship.

Safety precautions for personnel in nonelectrical ratings should include information concerning electrical shock and precautions these personnel must observe when using electrical equipment aboard ship.

Facts to be brought out and points to be stressed to the nonelectrical rating personnel concerning electric shock should include the following:

1. Voltages as low as 30 volts can be dangerous.
2. The dangers from electric shock are much greater aboard ship than ashore.
3. There is little middle ground between a slight tingle and a fatal shock.

Fundamentally, current rather than voltage is the criterion of shock intensity. The passage of even a very small current through a vital part of the human body may cause death. The voltage necessary to produce the fatal current depends on factors such as the resistance of the body, contact conditions, and the path the current takes through the body. The probable effects of shock are shown in the following table.

<u>AC 60Hz (mA)</u>	<u>DC (mA)</u>	<u>Effects</u>
0-1	0-4	Perception
1-4	4-15	Surprise
4-21	15-80	Reflex action
21-40	80-160	Muscular inhibition
40-100	160-300	Respiratory block
Over 100	Over 300	Death

It is imperative to recognize that the resistance of the human body cannot be relied upon to prevent a fatal shock from 115 volts or even lower voltages—fatalities from as low as 30 volts have been recorded. Tests have shown that body resistance under unfavorable conditions may be as low as 300 ohms and possibly as low as 100 ohms from temple to temple if the skin is broken. Volt for volt, dc potentials are normally not as dangerous as ac potentials. This is shown by the fact that reasonably safe “let-go currents” for 60-Hz ac are 9.0 mA for men and 6.0 mA for women, while the corresponding values for dc are 62.0 mA for men and 41.0 mA for women.

The instruction to personnel in nonelectrical ratings regarding the safety precautions they must observe



when using electrical equipment should emphasize the following points:

1. Always visually inspect portable electrical equipment before you use it. Look for damaged plugs, frayed cords, broken or missing ground connections, and the like.
2. Never use portable electrical equipment if there is reason to believe it might be defective. Have it tested by authorized personnel.
3. Make no repairs.
4. Do not use any personal portable electrical equipment aboard ship unless it has been inspected and approved.
5. Always report any shock you receive from electrical equipment, regardless of how slight.

### **PROMOTING SAFETY**

Promoting safety within the electronics division or on the ship in general will require that you, the ET1 and ETC, become safety conscious to the point that you automatically consider safety in every job or operation. Through the use of safety reminders and by your personal example, you will pass safety consciousness on to other personnel. You must be thoroughly familiar with OPNAVINST 5100.19, *Navy Safety precautions for Forces Afloat, and Naval Ship's Technical Manual*, chapter 400. These are the primary sources of safety rules and regulations. Good information concerning safety is also given in the *EIMB, General NAVSEA SE000-00-EIM-100*.

### **SECURITY**

Security of the United States, in general, and of naval operations, in particular, depends in part upon success in safeguarding classified information. All ETs must be security conscious to the point that they automatically exercise proper discretion in performing their duties and do not think of security of information as something separate and apart from other matters. In this way, security of classified information becomes a natural element of every task and not an additional

burden. You should be thoroughly familiar with the Department of the Navy Information and Personnel Security program Regulation, OPNAVINST 5510.1. Following its guidance should be second nature to you.

### **SPACE UPKEEP AND CLEANLINESS**

Upkeep and cleanliness of spaces is a very important in the electronics division. The safety and operation of equipment depend on correct and routine upkeep. As a senior petty officer, you should ensure that all spaces are always in excellent shape, with tools properly stowed and equipment properly mounted and covered. The upkeep of spaces should be a daily routine regardless of priorities. Sometimes equipment repairs or other unforeseen events dictate maintenance; however, space upkeep and cleanliness should not be forgotten.

Dangers of fire, damage control, safety of personnel, the possibility of equipment filters clogging up because of dirty space, and many other reasons dictate that your spaces should be kept up and should remain clean.

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## CHAPTER 3

# SUPERVISION AND TRAINING

As you advance to ET1 or ETC, you will function as a first-line supervisor. In other words, you will be in immediate control of workers. You will also act as the liaison between your superiors and the workers. You will be responsible for planning the work, issuing jobs, instructing personnel, checking the work, and reporting to your superiors on the progress of assigned tasks.

You will have many more responsibilities added to those you had at your previous paygrade. You have acquired much valuable job-related knowledge. Now it is your turn to pass that knowledge onto others. In this chapter, we will discuss the management (supervision and training) of an electronics shop and some of the problems that are found in technical ratings. In no way can we cover all areas of supervision and training, but we can provide you with a solid foundation of knowledge on which to build. If you desire other good sources of information on this subject, obtain copies of the military requirements training manuals and Navy Leader Development Program courses.

As an electronics supervisor, you will be responsible for maintaining electronics systems equipment. Maintaining this equipment is a job of vital importance. It requires a leadership ability that can be developed only by personnel who have a high degree of technical competence and a deep sense of personal responsibility. These responsibilities range from satisfying the needs of the "users," to notifying upper management of equipment status and problems. A user, in this instance, is anyone who requires the services of the equipment maintained by your shop, such as Operations Specialists, Radioman, or Air Controllers.

An electronics supervisor spends less time working on equipment and more time ensuring that the shop is running smoothly. Instead of working on a specific equipment, you will spend time on such jobs as updating a personnel qualification standard (PQS) progress chart or scheduling next week's maintenance. As a senior petty officer, you will find more people asking your opinion on technical matters. Your responsibilities for technical leadership are special to your rating and are directly related to the nature of your work.

The electronic systems field is growing rapidly, caused in part by the swift pace of development in

modern technology. This requires that you keep up with the latest developments. As technology advances, you will find yourself involved with equipment and systems much more complex than any you have previously encountered. Sometimes you may need to develop a method or procedure to check out the operation of a new piece of equipment because the technical information or technical manual has limited information for isolating a malfunction. You must then be able to direct your subordinates in using these specially developed methods or procedures as an interim maintenance procedure. You must acquire the technical and leadership skills required to translate these ideas into actions.

### SUPERVISION

As a shop supervisor, you must be aware of the greater scope of your duties and responsibilities. You must also learn and practice the characteristics of a good supervisor. You should continue this learning process as you attempt to master all phases of supervision and management. The following pages discuss many of the elements of shop management that you will encounter as an electronics supervisor.

### MANAGEMENT

As an ET1 or ETC, you will normally be a work center supervisor or shop supervisor. In either position, you will be confronted with the many responsibilities of management. As a shop supervisor or work center supervisor, your primary job will be to ensure that the shop or work center functions smoothly. You and your maintenance personnel will have to meet both technical and military requirements. The skills required to manage a maintenance shop are not acquired overnight. You will need to spend time and effort to develop the management ability necessary to accomplish all of your shop's goals.

The problems and responsibilities that an electronics shop supervisor must face are similar to those encountered in other functional areas of any command. For example, increasing productivity while reducing cost is a goal of all shop supervisors.

While the growth of electronic and computer technology has helped to ease the burden and increase the effectiveness of supervisors and managers in nearly every aspect of command operations, it has sometimes turned the electronics maintenance supervisor's job into an overwhelming problem. You may be responsible for maintaining a multimillion dollar resource ashore or at sea. Your shop will have to keep high-cost, highly sophisticated electronic systems and equipment in the highest possible state of readiness under a variety of working conditions. No matter how well designed an electronic system or equipment is, its value to the command lies in the ability of the maintenance supervisor to provide a maximum amount of "up time."

Consider a few of the problems that the maintenance supervisor faces nearly every workday:

- **User complaints**– Are user complaints about poor maintenance service justified? If so, what are the most economical and effective methods of correcting the causes? If not, what human factors may have led to user dissatisfaction, and are the technicians providing sufficient technical assistance to eliminate the problem-causing human factors (such as poor operator procedures)?
- **Procedural changes**– What improvements could be realized by minor modifications to existing procedures?
- **Future requirements**– Will future system demands affect present resources?
- **System down time**– Is the amount of down time the system suffers reasonable, given the personnel and material assets available?
- **Training requirements**– Have all technicians acquired the highest level of technical competence? If not, can the on-site training program bring them up to speed?
- **New personnel**– Is the in-house training program adequate for new personnel?
- **Material assets**– Will the material assets be adequate for any upcoming deployment ?

If you, as supervisor, have reasonable and well-documented answers to these questions, it is likely that you are effectively managing the shop, instead of merely supervising it. Good management and good supervision are inseparable for the control, operation, and financial budgeting of an electronics maintenance group. The right answers to questions such as those listed above will

significantly enhance a command's ability to carry out its mission. Your prime objective is to maintain control of complex, costly electronic systems and equipment through a sound maintenance management program. You must be aware of the alternatives that are available to make a maintenance management program perform most effectively and efficiently.

## **SUPERVISORY DUTIES AND RESPONSIBILITIES**

An exact list of duties and responsibilities can be made only when the list concerns a specific position; however, here are some typical duties and responsibilities you will have as a maintenance shop supervisor:

- Keeping maintenance operations running smoothly and efficiently
- Promoting teamwork
- Maintaining discipline
- Keeping morale high
- Getting the right person on the job at the right time
- Maintaining the quality and the quantity of work
- Checking and inspecting jobs and personnel
- Preventing accidents and controlling hazards and hazardous material
- Using and storing materials economically
- Maintaining good housekeeping on the job
- Keeping records and preparing reports
- Planning and scheduling work
- Training personnel
- Procuring the supplies and equipment to perform the work
- Inspecting, caring for, and preserving equipment
- Giving orders and directions
- Maintaining liaison with other units, departments, and divisions

Looking at the typical duties and responsibilities in the preceding list, we can see that the following major areas are common to all supervisory positions:

1. Production

2. Safety, health, and physical welfare of subordinates
3. Development of cooperation
4. Development of morale
5. Training and development of subordinates
6. Records and reports
7. Balanced supervision

These seven areas of responsibility are discussed in the following paragraphs:

1. Production. The supervisor is responsible for seeing that all work is done properly and on time. This is true both in the office and in the shop. To meet these goals, the supervisor must function in three main ways:

- a. The supervisor must organize and plan the workload to ensure maximum production with a minimum of effort and confusion.
- b. The supervisor should, as often as possible, delegate the authority for completing work assignments, keeping in mind that the final product is the responsibility of the supervisor.
- c. The supervisor must control the workload and see that all work is completed correctly.

2. Safety, health, and physical welfare. Safety and production go hand in hand. The safe way is the efficient way. When shop personnel are absent because of injury, they are nonproducers. A good supervisor stresses safety to the crew; sets an example by working safely; teaches safety as an integral part of each job; and, most of all, plans each job with safety in mind. A good supervisor does not wait until after an accident happens to start a safety program.

Showing concern over the health and physical welfare of your crew will pay off in increased production. It will add to their feelings of trust and confidence in you as a shop supervisor and will increase the amount of respect they have for you.

3. Development of cooperation. Developing cooperation among the members of your shop is paramount to effective production. Some supervisors, however, tend to overlook the need for cooperation in two other directions:

- a. Cooperation with management
- b. Cooperation with supervisors on other ships, or in other departments, divisions, or work groups of your ship

In the course of a routine equipment overhaul, you will often have to deal with numerous people in shops or units of the repair activity. It is particularly essential, therefore, that you develop a rapport with the management and supervisory personnel of the repair activity.

4. Development of morale. The esprit de corps of a group and their willingness to work toward common goals depend to a great extent upon your leadership. A group with high morale is a producing group.

5. Training and development of subordinates. A good shop supervisor is invariably a good teacher and leader and is a developer of men and women. One of the greatest contributions you can make as a supervisor is the development of your people. You should make sure that at least one trained person is ready to assume responsibility as shop supervisor should the need arise. It is a sign of good leadership when you can take leave and have the shop or division continue to run smoothly. Do not be afraid to teach every phase of your own work to at least one or two subordinates. Since much of your time will involve teaching, you should try to improve your teaching ability.

6. Records and reports. In chapter 2, we discussed a few of the records and reports with which you will be associated. Keeping records and preparing reports are not tasks that you will always enjoy doing, yet they are a vital part of your work. Make it a point to keep neat, accurate records and get reports out on time. Paperwork may seem to be a waste of time, but in the long run, you will realize how much your success as shop supervisor depends upon your ability to handle paperwork properly.

7. Balanced supervision. Think about the major duties and responsibilities we just covered. You must pay the proper amount of attention to each phase of your job. Do not emphasize production at the expense of safety or training. Also, do not become so concerned with the human element that production is neglected. Keep up with paper work as it occurs. In this way you can maintain control of your work day by day and will never need to neglect your more active duties so you can attack a stack of papers. Always attempt to place the proper emphasis on each of your responsibilities, and you will be practicing balanced supervision.

## **RESPONSIBILITY TO USERS**

Your responsibility to users is twofold. First, you must ensure that all equipment is ready for maximum use at all times. Second, you and your shop personnel

should be a source of technical knowledge and training for all users.

Having the most up-to-date electronic equipment and systems is of no value to the user unless the equipment is operating at peak efficiency at all times. Many trouble calls received by electronics repair personnel turn out to be operator errors. An unusually high incidence of operator errors may indicate inadequate training. The problems associated with inadequate training usually occur because of one or more of the following circumstances:

- A large number of new personnel
- A new system being operated
- Installation of new equipment
- Operations following an extended in-port period

The effects of the first three circumstances can be eliminated with an adequate shipboard training program to supplement formal off-ship team training. Since you have the technical expertise, you should assist (or provide) the users with the technical training necessary to operate the electronic equipment and systems correctly. By doing so, you will simplify both your job and the job of your shop personnel. Problems that result from an extended in-port period are usually caused by forgetfulness. Since this is part of human nature, you cannot correct it; however, if the problem continues, you should inform the users' supervisors so that they are aware of the problem.

## **RESPONSIBILITIES TO UPPER MANAGEMENT**

As a maintenance shop supervisor, you will find yourself in a middle management position. You have more responsibilities and direct input to the upper echelon than you did as a petty officer second class. One of your responsibilities is to support the goals and requirements of upper management (the EMO and the department head). This support may take many forms, such as providing unscheduled corrective maintenance, technical reports, additional manpower for important command functions, operation training in specialized areas, or any one of a dozen other tasks that may be required of your shop personnel. On occasion, you may be called upon to solve a difficult problem. If, after much "brain-storming," you are unable to solve the problem, you should seek assistance from the next senior person in the command chain. Keeping a problem to yourself when you have run out of ideas will not solve it. Let the

division LCPO or EMO in on your problem. One of these individuals should be able to assist you.

## **TRAITS OF A GOOD SUPERVISOR**

Good supervisors usually have certain desirable traits. These traits are described in the following paragraphs.

### **LOYALTY**

One trait that should stand out in every supervisor is loyalty. You must show loyalty to your country, the Navy, your unit, your superiors, and the personnel who work for you. To get and keep the respect and loyalty of your personnel, you must be loyal yourself.

### **POSITIVE THINKING**

Good leaders will always be positive thinkers. They think in terms of how things can be done, not why they cannot be done. They maintain an open mind to changes, new ideas, and training opportunities. Positive thinkers look to the future with confidence, and this confidence is contagious. They are enthusiastic about their jobs and the part they play in the Navy. If you want to lead others, start practicing the art of positive thinking today!

### **GENUINE INTEREST IN PEOPLE**

Did you ever meet a really great leader? If so, you probably found that instead of being cold and aloof, this individual was a warm, friendly human being who seemed to make you feel important by paying close attention to what you had to say.

One of the first steps you, as a new supervisor, should take is to get to know your technicians personally. This not only creates a feeling that you are genuinely interested in them, but also it helps you place the right person in the right job at the right time.

You will appreciate the importance of knowing your technicians personally when the need arises for them to convert from electronics technicians to professional defensive tacticians and fighters. Here, the wrong person in the wrong place could prove disastrous.

However, you must avoid falling into the "familiarity" trap. Many experienced supervisors will tell you of cases where they were friendly with certain individuals. When the time came for discipline or some other adverse action, it was very difficult to deal with these people.

## **INITIATIVE**

People with initiative are always needed in the naval service. Initiative is evidence of an open and alert mind. Individuals with initiative continually look for better ways to do things; they don't wait for another person to take action. To be a good supervisor, you must show initiative. Don't put off until tomorrow what you should do today. If you see an unsafe condition, take action to correct it before an accident occurs. If you see that a new form or procedure would simplify a job, devise the new form or procedure. If you see an inadequacy in yourself, try to overcome the inadequacy. Weak people lack initiative. Leaders are characterized by strong initiative.

## **DECISIVENESS**

Leaders are able to make decisions. A common complaint heard from subordinates is, "You can't get a decision from them."

Most of the decisions that must be made by supervisors in the naval service concern relatively minor actions. As often as not, the subordinates merely want the supervisor's approval to perform some action that they already know should be done. A prompt go ahead from the supervisor is all that is needed. In many trivial matters, it makes little difference whether an answer is yes or no. The important thing is to give an answer. The supervisor who stalls, puts off, evades, or refuses to give a decision is a "bottleneck."

Of course, there are times when a decision requires careful consideration of many factors and, therefore, much deliberation. In such cases, you should tell the person when to return for the decision and see to it that you have the decision.

## **TACT AND COURTESY**

Good leaders are habitually tactful and courteous. Whether in the shop or in the office, supervisors can be thoughtful of others without being considered weak.

Tact can be defined as saying and doing the right thing at the right time. It is the lubricating oil in human relationships. It is the regard for the feelings of others based on an understanding of human nature—the little considerations that make the job pleasant and smooth.

Courtesy can be defined as treating others with respect. It means treating people as important human beings, not tools to be used for your convenience. It means following the accepted rules of conduct and being polite. Courtesy is important to the supervisor. One

discourteous act, even though unintentional, can make an enemy—and the supervisor cannot afford to have enemies. If you have one enemy, you have one too many. Remember, courtesy is contagious.

## **FAIRNESS**

The personnel in a shop or crew are extremely sensitive to partiality by the supervisor. (They will even single out little incidents where there was absolutely no intent to show favoritism.) To avoid causing problems, you must think ahead on changes to be made, decisions to be handed down, work to be assigned, recommendations for promotion, and the like. In each instance you must try to make sure that your actions are both fair and impartial.

## **SINCERITY AND INTEGRITY**

You should deal with your personnel squarely and honestly at all times. This will win and hold their respect. Talk to your crew on a one-to-one basis. Don't be afraid to face the facts and say what you think. You often hear, "Give me the person who looks you straight in the eye and tells the truth every time!" A reputation for being a "square shooter" is worth every effort on your part.

Consistency of thought and action are important if your personnel are going to know where they stand. Being too strict one day and too lax the next is worse than being consistently strict or consistently lax. Try not to exhibit good and bad moods to your crew. Your crew tends to reflect your attitudes. Exhibit a firm and positive attitude—and be consistent.

Dependability, one of the marks of integrity, involves meeting obligations promptly. A reputation for being "on time, every time" is worth every effort on your part. Build this reputation early, even before you become a supervisor, and maintain it. Any violation of dependability or integrity will cast serious doubts upon your ability to act as a responsible supervisor. One violation of integrity may take months (or forever) to rectify.

## **TEACHING ABILITY**

A great part of your job will involve instructing personnel in one way or another. Even the giving of orders is a form of instruction. You should learn and practice the art of public speaking, the principles of on-the-job instruction, and the techniques of conference leadership. Supervisors who cannot stand on their feet and express their ideas to an individual or a group of

individuals should not be supervisors. To be a successful supervisor, you must be able to train and develop others.

## CONFIDENCE

Good supervisors have a quiet confidence (not an arrogant or cocky manner) based on thorough knowledge of the job and belief in their own ability. Confidence begets confidence. It is amazing to see how people will follow individuals who are charged with confidence in themselves and an idea. Mousy, hesitant supervisors who lack confidence in themselves cannot inspire confidence in others. On the other hand, beware of arrogance. Some supervisors put on a front of aggressive confidence to hide a feeling of inferiority. They ridicule the opinions of others; they dominate conversations; they are arrogant. Such individuals are much less effective than they think they are.

Supervisors who have a quiet inner confidence, which is expressed in their confident manner, their actions, and their words, are respected and followed.

## MAINTAINING DISCIPLINE

One of the major problems you may encounter as a new supervisor is that of maintaining discipline in your crew. The following discussion provides some pointers to help you achieve success in maintaining discipline.

## GIVING ORDERS

A good supervisor gives much thought to the art of giving orders. Notice we said "art," for giving orders really is an art that you must practice. Proficiency in giving orders will reap you many benefits; and since most disciplinary problems are the result of individuals not carrying out orders, this subject cannot be overemphasized. There are three basic types of orders:

1. The command
2. The request
3. The suggestion

You should always consider (1) the situation under which you will give the order and (2) the individual who is to carry out the order. In the following paragraphs, we discuss the three types of orders, based on each of these two considerations.

### The Situation

In a military formation, the direct command, or formal type of order, is always used. The direct

command is also used when there is immediate danger, fire, an accident or other emergency, disobedience of safety rules, and so forth.

The simple request is the best type of order to give for daily routine work. The request is used for most orders given by good supervisors.

The suggestion is excellent when you wish individuals to proceed on their own when you do not know exactly how the job should be done. It is also excellent for building initiative. This method of giving orders builds morale and shows your personnel that you have confidence in them. However, it is not clear cut, and you certainly would have no recourse if the job were not done properly.

### The Individual

The direct command is normally used to direct careless, lazy, insubordinate, or thick-skinned individuals. Except in the unusual situations mentioned above, the direct command is normally reserved for those to whom we must speak firmly and positively.

The request is by far the best type of order to use with the normal individual. With most people, a simple request in the form of a question has the full effect of a direct order. Moreover, the request fosters a feeling of cooperative effort and teamwork.

The suggestion is excellent for those to whom a suggestion or hint is sufficient. People with real initiative like to work on their own. In dealing with a sensitive, highly intelligent individual, a mere hint that something is desired is enough to get a project started. Toss this person an idea by saying something like, "Petty Officer Jones, I wonder if it would be a good idea to do this?" or "Seaman Smith, do you have any ideas on how this can be done?" This makes the individual a key person in the project and provides a feeling of importance. It also shows that you have Confidence in this individual and provides excellent training. The suggestion type of order stimulates people to show what can be done.

Although the situation and the individual are the prime considerations in giving orders, the attitude and tone of voice in which they are given are very important. Whenever you give orders, apply the five Cs— Clearly, Completely, Concisely, Confidently, and Correctly. Also, avoid orders that are unnecessary and unneeded.



## REPRIMANDING

When one of your subordinates disobeys or fails to carry out an order, you must take action. You would be remiss in your duties as a supervisor if you did not do something about it. The most common type of discipline is the simple reprimand.

The reprimand, too, must be fitted to the individual and the situation. A sensitive individual might be crushed by the slightest hint of something wrong, while a thick-skinned person could easily deal with a severe rebuke.

The reprimand should be a calm, constructive action, not a destructive one. You are interested in the underlying causes, not in how to get even with the person.

Failure to act when a reprimand is due is a sign of poor supervision. No one likes a supervisor who is too lenient and ingratiating. If one individual gets by with something, the supervisor may lose control. On the other hand, issuing too many reprimands is just as bad.

A good supervisor knows how to draw a fine line between harshness and leniency. A person with a keen understanding of human nature is able to discern this line.

Be sure to practice the three Fs of discipline: Fairness, Firmness, and Friendliness. The recommended procedure for administering reprimands follows:

- Get all the facts.
- Do not reprimand a person in front of others.
- Put the person at ease. Find a word of praise first, if appropriate, to take out the sting.
- Use no sarcasm, anger, or abuse.
- Fit the reprimand to the individual.
- Have all the facts at hand; the person may attempt to deny the charge.
- Present the facts.
- Ask the person why there was an error.
- Try to get the person to admit the mistake.
- Do not threaten; this person knows how far you can go.
- Once the wrong is admitted, the reprimand is over.

- Leave on a friendly note, and let the person know the incident is closed. Do not nag.
- Later, follow up with a casual and friendly contact at the shop.

To test the effectiveness of your reprimand, ask yourself, Did it build morale? Remember, you must get along with this person in the future; you must keep this person as a working, producing individual; and you must be able to get along with your own conscience. You do not have to be soft, but remember that there is a great deal of difference between dignity and arrogance.

**POSITIVE AND NEGATIVE DISCIPLINE.** So far, discipline has been discussed in terms of punishment. Actually, discipline is much more than reprisal for wrongdoing. Discipline exists also where no disciplinary actions ever have to be taken. Most people realize they cannot get along without self-discipline and that no organization can function and no progress can be made unless individuals conform to what is best for the whole group. The supervisor who can build the spirit of cooperation, which is the basis for true discipline, has no discipline problems.

Positive discipline, the trend in discipline being studied widely by intelligent executives and supervisors, is the force that originates within individuals that prompts them to obey the rules and regulations. People in a Navy organization do what is right because they do not want to hurt the group as a whole and because they believe that by following the accepted rules, they will help the group achieve its objectives. This is called "esprit de corps." The supervisor who builds esprit de corps has little need to resort to negative discipline.

Negative discipline is a discipline of fear based on threat of punishment. This type of discipline originates from without. If you subject people to this type of discipline, they will do only enough to get by when you are watching. When you leave for a few minutes, discipline leaves too. Their only motivation for working is fear of reprisal.

Discipline and high morale go hand in hand. Positive discipline is closely tied to the admiration and respect personnel have for their supervisor. This, in turn, is bred on good human relations.

**THE HUMAN RELATIONS ASPECT OF DISCIPLINE.** Good human relations between supervisors and their work force are easy to spot. The upbeat, enthusiastic atmosphere in the shop indicates that supervisors appreciate and understand the workers;

that they have workers' interests and welfare at heart; and that they respect workers' opinions, knowledge, and skills.

In the list below, we have provided some of the human relations factors that lead to positive discipline. Good supervisors

1. understand the principles, standards, rules, and regulations necessary to good conduct; they believe in these things and practice them themselves;

2. know their personnel as individuals, and treat them fairly and impartially;

3. develop the feeling of "belonging" and security in the group;

4. get information to the group through proper channels, and promptly eliminate rumors;

5. use authority sparingly and always without displaying it;

6. delegate authority as far down the line as possible;

7. never make issues of minor infractions or personal issues of disciplinary matters;

8. display confidence in the group, rather than suspicion of it (workers are reluctant to betray expressed confidence);

9. train the group technically;

10. look after the mental and physical welfare of the group;

11. try to avoid errors, but show willingness to admit errors when they make them;

12. develop loyalty in the group and of the group; and

13. know that because of individual differences, discipline cannot be a completely routine matter. Some of the principal causes of misconduct are discontent, idleness, lack of interest in the job, misunderstanding of regulations, resentment, and emotional strain. The wise supervisor avoids the necessity for formal discipline by removing as many of these causes as possible.

### **RELATIONSHIPS WITH YOUR SUPERIORS**

Your bosses are very important people to you. In their hands rests much of your success in your job. Whether or not you like them personally, you have to cooperate with them if you hope to advance.

Many supervisors rate loyalty at the top of the list of desirable qualities. A loyal supervisor does not criticize the boss to others even if there is cause for occasional disagreement.

Dependability is another desirable quality your superior looks for in you. Your boss likes to know that when you are given an assignment you will complete it to the best of your ability and on time. There are few things more annoying to a boss than a subordinate who always has an alibi—who cannot be depended upon.

Do not be a "yes" person; but, on the other hand, do not go to the extreme of being a "no" person. Good bosses want subordinate supervisors who are not afraid to tell them tactfully what they think, even if it means telling them that they are wrong. But they do not like having a subordinate who is against everything and who stubbornly resists every idea!

### **MAKE SUGGESTIONS TACTFULLY**

Most bosses resent employees who make it a common practice to tell them bluntly what should be done or what should not be done. It is easy to get your ideas across to the boss without incurring resentment; just put them in the form of a question: "What do you think about this idea?" or "Do you think this would work?"

If the boss gives you an assignment that is obviously a mistake, tactfully ask about handling it from another angle. However, if the boss insists on carrying out the order as specified, do not argue.

### **KEEPING THE BOSS INFORMED**

Bosses like to know what is going on, but they do not want to be bothered with all the petty details. Keep them advised of personnel problems, proposed changes, and other important matters.

If you make a serious mistake, tell your boss about it immediately. Don't wait until your boss discovers the mistake and then try to defend your actions. And remember—lengthy explanations of your actions are not required.

### **WORKING RELATIONS WITH YOUR FELLOW SUPERVISORS**

Friction and jealousy are your prime enemies in establishing cooperation with your fellow supervisors. A good supervisor avoids "backstabbing," gossiping, and criticizing fellow supervisors when the competition

5-2 becomes keen. The main thing to remember is that you cannot rise by putting others down. If you try to do so, your unkind actions will ultimately cause you to fail in your job.

In addition to being cooperative personally, a good supervisor may sometimes have to encourage cooperation on the part of other supervisors. In the long run, the person who is able to foster and maintain harmony in all relationships is the one who will be assigned to the Navy's key jobs.

### **ACHIEVING TEAMWORK WITHIN YOUR OWN SHOP**

Even in primitive times, people banded together. To have a working band or team, you should know and appreciate the psychological rewards that a group must provide in order to hold its members:

- A feeling of security.
- A feeling of belonging.
- A feeling of being somebody within the group.
- A feeling of pride in the group.
- A feeling of recognition from outside the group. (The harder it is to get into the group, the more important the members feel.)
- A feeling of accomplishment. (The group is attaining common goals.)
- A satisfaction of certain needs (advancement, pride in work, acquiring new skills, and so on) while attaining the goals of the group.

A good leader encourages these feelings, since the stronger these psychological rewards, the stronger will be the group. Some supervisors achieve such a strong feeling of group pride that their personnel actually feel privileged to work in the group. The people we supervise are human beings with individual differences. They usually produce only to the extent that they feel like producing, and their will to produce is based primarily on the ability of their supervisors to win their cooperation. Good leadership is reflected in this ability to get cooperation; and cooperation, in turn, is a reflection of the respect the personnel have for their supervisors. Teamwork or cooperation, then, is based on good human relations.

When you walk into any shop or office, you can almost feel whether or not the spirit of cooperation is present. If it is there, you can see it in the faces of the

people, in the appearance of the work space, in the reception you receive, and in the way the work is performed.

Poor cooperation and poor management are indicated whenever bickering, jealousy, and friction are present. Low production is the inevitable result. Frequent accidents, indifference, sloppy work, griping, complaints and grievances, criticism of the unit, buck-passing, loafing, many requests for transfer, poor planning, and poor training or indifference to training—all these danger signals indicate lack of cooperation and poor management.

### **ELEMENTS TO CONSIDER IN DEVELOPING COOPERATION**

Developing cooperation within your group is largely a matter of adapting your behavior to meet the varying situations you encounter daily—and in going out of your way to show a willingness to cooperate. You cannot simply order cooperation.

#### **Resistance to Change**

People resist change. Even when the change is clearly for the better, people persist in clinging to the old way. Remember, unless ordered by higher authority, changes must not be too fast. They should be properly timed and, if possible, explained before they are placed in effect.

#### **Correcting Mistakes**

When you think you need to correct a mistake a worker is making, unless safety is involved, make the correction through those who deal directly with the individual. Remember the worker takes orders from an immediate supervisor, and that supervisor may have valid reasons for having the individual perform in a certain way.

#### **Delegation of Authority**

Good supervisors soon learn to delegate work. They develop their subordinates and get them to do all the routine work. These supervisors then have time required to handle personnel problems, study, and do the necessary planning and creative work. Those who do not learn the knack of delegation may develop ulcers and may also have an uncooperative group!

## Training

Train at least one person to handle your position, and do not be afraid that whomever you train will surpass you. Supervisors who train and develop subordinates make possible their own advancement, because higher level managers want good people in every slot.

Good supervisors provide for each person in their unit. They encourage their people to take advantage of educational opportunities. When the individuals in the group feel that a supervisor is interested in their welfare and that the job offers more than just pay, they develop a strong sense of cooperation and loyalty.

## Setting the Example

An important part of your job is to set an example. Supervisors who are enthusiastic about their jobs, who are friendly and good humored, and who foster harmony among their associates, do much to create a cooperative attitude in their group by their own example.

## Giving Credit

Do not fail to give credit where credit is due, and do not forget to pass on any credit given to you. Good supervisors give full credit to the team. Frequent and sincere praise is a wonderful incentive to individuals and to the group as a whole.

## Tactful Handling of Personal Problems

Personal problems arise almost daily in any group of people. You must tactfully handle each problem. Rumors about any of your personnel, disputes between personnel, family troubles, and similar situations can disrupt the efficiency of the group. Usually, positive action from you is required.

Try to solve problems that arise in your shop or between crew members, if solving those problems is within your capability. This does not mean that you should act as a chaplain, marriage counselor, or psychiatrist. It emphasizes the need for you to be able to recognize the symptoms of problems that require special help, so that you may arrange to have those problems placed in proper hands as soon as possible.

In each case, first listen and get all the facts; then tactfully bring about a solution so that all concerned can go back to the job and work in harmony. The best course of action is usually to face problems squarely and honestly, bringing them out into the open on a

one-to-one basis, and solving them before they become major situations.

## BREAKING IN NEW PERSONNEL

Suppose you are in the middle of a rush job. You are behind in your paper work. You have been called to the phone unceasingly. You are considering going on "special liberty" because nothing has gone right. Then, right in the middle of it all, a new crew member, now assigned to your shop or crew, arrives.

The most important thing at the moment is to get this person off to the right start. Remember, the impressions this individual receives during the first days on the new assignment will carryover for a long time to come. The future attitude of this person concerning the outfit is being molded, good or bad, during this period. Below are some suggestions for properly handling new members of your crew.

- Put people at ease. Give them a cordial greeting. Make them feel that you are glad to have them. Be tactful. Get their names straight and remember them.
- Show personal interest. Seek out topics of mutual interest. Ask about their previous work, their families, and if they have been properly berthed.
- Give them the right point of view. Let them know you have confidence in them and that you expect and demand good work. Now is the time to build proper attitudes and loyalty.
- Tell them about the work. They are eager to know what they will be doing. Show them how their jobs will fit in with the whole picture and help them feel that their jobs are important.
- Give them essential information. Do not confuse them with endless details. Write down for them some of the essential information, since at this time they have so much other information to remember.
- Introduce the new people to each member of the crew they will work with and to any others whom they need to know.
- See them again at the end of the day. Ask them how they are doing and give them a few words of encouragement.
- If you cannot personally carry out the foregoing suggestions, put new personnel in the hands of a trusted subordinate who is well qualified to handle the situation. Explain the reason for your unavailability and tell the

new arrivals that you will want to talk to them later in the day—and be sure to do it.

## PERSONNEL PROBLEMS

Since misunderstandings can arise in almost any working situation, a complaint in good faith, a disagreement between the members of the crew, or direct or indirect disobedience are problems that you must face and attempt to settle or solve as expeditiously as possible.

## SCIENTIFIC APPROACH TO PROBLEM SOLVING

Whenever you have a problem to solve, you should use a logical, proven method to guide you to a solution. Problem solving is primarily a method of thinking based on scientific procedures. In the following paragraphs, we will show you how to use a scientific approach to solve a problem. Place yourself in the hypothetical situation of being leader of a group of problem solvers as you read about the basic steps in problem solving.

One of the most important steps in learning to use the scientific approach is accepting the need for a logical, orderly procedure for evaluating a problem. The procedure we will teach you is known as the six-column approach. Over the years, the six-column approach has been found to give excellent results. The column titles represent the phases and sequence of the problem solving process: (1) Facts, (2) Problem, (3) Possible solutions, (4) Consequences of possible solutions, (5) Accepted solutions, and (6) Cause or causes of the problem.

A shallow look at the system may lead you to think that the process is fine, as long as time is not an important element. You may think you won't often have enough time to use it. A deeper look, however, will show you that this process, properly learned and properly used, applies to any problem regardless of the time element. You must then realize that time is relative. Extra time spent "up front" saves time later on. By using the scientific approach, you will prevent "wheel spinning" and make better use of whatever time you have available to solve the problem. Some problems require lengthy consideration. Others may require only a few seconds to determine the facts, identify the problem, consider a course of action, and then act. In either case, the process works. After you have used the process several times, you will start

to use it automatically whenever you encounter a problem.

1. Determining the facts (column 1). In the problem-solving method, you must determine the facts. All good objective reasoning is based on facts, things, or events that have actually occurred. People often interject assumptions, which are subjective and have not occurred. In learning the problem-solving method, insist that your group deal only with the facts as outlined in each problem; or, if an assumption is accepted, make sure it is identified as an assumption, not a fact. After the group has discussed the problem and agreed upon the facts, list the facts under column #1.

Delay discussion of any facet of the problem until you are sure you have obtained all pertinent facts.

2. Defining the problem (column 2). In any human relations incident or any other problem, there are usually two elements or problems—the apparent and the underlying. You will notice this when your group tries to define the problem. Most people can easily see the immediate problem: the equipment does not work someone is in trouble, relationships are poor between people—these things are apparent.

The individual must face all these problems. A person can usually define the immediate (or apparent) problem but must be trained to define the underlying difficulty. A statement defining the problem should be written out; an oral statement is not enough. The group should analyze the written definition critically and come to an agreement concerning it. Only then is the group equipped to explore the best possible course of action.

3. Possible courses of action (column 3). Any problem has many possible courses of action to achieve solution. Before you decide on any single course of action, try to determine all the courses of action. In handling technical or human relations problems, you should be aware that many alternative solutions exist. Remember, in this phase you are not evaluating the courses of action; you are merely listing the alternatives. Enter the possible courses of action under column #3. The fourth step determines, to a large degree, which one (or combination) of the courses of action from column 3 you can use in solving the problem.

4. Consequences of possible actions (column 4). No leader worthy of the name leaps to the solution of a problem without considering the consequences of all proposed courses of action. What will occur if I do this instead of that? You, as a military leader, are responsible for the action you take. Therefore, you must be

completely aware of the consequences of each decision you make.

In this step you consider the relative importance of each of the course of action. Whichever action you accept in the next step (step #5) will involve the use of manpower and/or materials; therefore, you must consider this step carefully to obtain the most economical result. This phase of the problem requires much discussion and thought.

5. Accepted courses of action (column 5). In this step, one (or a combination) of the possible actions will be chosen as the solution of the problem. Do not think that you need unanimous agreement to achieve a solution. Usually, you will give serious consideration to the opinion of the majority; however, the final decision is your responsibility as leader, based on your personal evaluation of the facts and recommendations submitted.

6. Cause of the problem (column 6). Now assume that you have solved the immediate problem; it no longer exists. What is left for you to do? You should ask, "What caused this problem to occur?" By asking this question, you have begun to think in terms of preventing the problem from happening again, if possible. You should give considerable time and discussion to this phase. To be a good leader, you must develop insight to determine the basic causes of problems. Good thinking in this area can help the organization to function smoothly. The goal is to prevent problems from occurring, rather than solving them after they occur. Remember, if you don't make a concerted effort to prevent problems, you will have to make a concerted effort to solve them.

## COMMUNICATING

You must develop good communication habits if you are to succeed as a supervisor. Communication can be broken down into two broad categories: internal and external.

### INTERNAL COMMUNICATION

To achieve good internal communication, keep your personnel informed. Your personnel should know the reasons behind changes that affect them. If security prevents you from giving reasons, let them know security is the reason. They will understand. Communication is a two-way street. You, as the supervisor, need feedback from your crew on everything that is happening so you can make decisions and formulate plans. Be open and free in communicating

with your people and encourage them to discuss their feelings and opinions.

Good internal communication also means each person is taking to every other person. Work centers and work groups should communicate freely with each other. This is important in developing harmonious relations within your work center. Investigate any breakdown in communication and try to correct the problem immediately.

## EXTERNAL COMMUNICATION

Without proper external communication, you will not be able to coordinate complex jobs involving a number of work centers and divisions. You must develop good lines and methods of communication external to the shop. Running systems tests may involve several work centers aboard ship and, in some cases, other ships or activities. Unless you can effectively communicate your requirements to each work center, you will be unable to successfully complete the systems tests.

Much of your external communication is in the form of correspondence. The correspondence will be of little value unless you have an effective way of keeping track of the information and ensuring that it gets to the ultimate users. You should develop controls to ensure that information gets to and from the people who will benefit the most from it. If you do this, you, the shop supervisor, will be the winner. Methods of control were discussed in chapter 2.

## ASSET USAGE

Effective shop supervisors make the best use of their assets. (These assets can be either personnel or material.) To do this you must thoroughly understand the limitations and capabilities of your personnel and know if there are any major deficiencies in your material assets.

## PERSONNEL ASSETS

Personnel assets are the most complex to manage, as well as the most flexible to use. Electronics personnel are responsible for maintaining a variety of electronic and digital equipment and systems. Because the various pieces of equipment and systems maintained by electronics personnel are very complex, long periods of training are required to qualify personnel for the maintenance role. Personnel graduating from formal schools are assigned Navy enlisted classification codes (NECs). There are many different NECs assigned to the

ET rating; your shop will normally have several of these NEC requirements. At the present time, almost all ETs are assigned, by the Bureau of Naval Personnel (BUPERS), according to the requirements of the NECs.

Shop personnel are the key to your success as a shop supervisor. Without their continuing loyalty to you and their willingness to follow in the direction that you lead, you will be unable to effectively achieve the required results. You may be a good technician; but remember, you cannot do everything yourself.

## **MATERIAL ASSETS**

Basically, your material assets are every material thing, such as parts, tools, test equipment, and work space, that you need to perform the shop's maintenance role. A deficiency in any one area makes it difficult for you to perform your job in the most efficient manner. By carefully surveying your shop and identifying its shortcomings, you can take corrective action and improve the conditions under which your shop personnel will be working.

## **ADEQUACY OF SPACES**

Sometimes it seems as if electronics spaces are designed by people who will never have to use them for maintenance. Ashore, the facilities are normally adequate to provide proper maintenance. However, aboard ship there is little space that is not dedicated to some other vital function.

As a shop supervisor you may feel there is little you can do about the inadequacies of your shop spaces. Sometimes this may be true; but, in most cases, if you analyze carefully and do some brainstorming, you can devise better methods of arranging the workspace. This, in turn, should result in more efficient working conditions. Consider each shop on a case-by-case basis. Brackets, stowage bins, book shelves, and collapsible workbenches can be installed in an amazing number of places that previously may have been overlooked. Get all of your people in on the planning. They will be more likely to excel when they play a vital part in fixing up the shop.

If you are fortunate enough to be in on the planning stages of a maintenance shop, there are a number of things that you should consider:

- Is adequate lighting available?

- Are adequate 60-Hz and 400-Hz (if applicable) power receptacles available?
- Is the layout of the shop the most effective use of the space?
- Are special safety devices or safety precautions needed in the shop area?
- If parts storage is included, is it centrally located to all work stations as practically as possible?

These are just a few of the questions that you will be asking. The only limits to how well a shop can meet your needs are the space available and your ingenuity and imagination. If space is available, you should be able to develop the plans for an efficient work area.

## **MATERIAL AVAILABILITY**

Material availability determines how long it takes to complete a maintenance action. A spare part for a particular piece of equipment could require from 6 months to over a year to acquire from a vendor who has to produce it on a special order. There is little the shop supervisor can do about this situation. There are many other situations, however, in which the shop supervisor can play a controlling role. Consider a few of the materials that are under the control of the supervisor:

- Tools
- Test equipment
- Consumables
- Safety equipment
- Other materials specific to your shop

Respect your personnel by having the correct material available so they can perform their preventive and corrective maintenance without delays caused by lack of material.

## **CONTROL OF MATERIAL ASSETS**

The most effective way to control material assets is to maintain some form of accountability. Mass issuing of tools to all shop personnel represents a major expense, and it usually means the tools will not be available when needed. Loaning test equipment items to every work center that wants to borrow them may mean the equipment will not be

in the correct spaces when you need it. As shop supervisor, you should always be willing to help others, but you must have a system to keep track of material assets.

You can make a simple equipment checkout log containing information, such as item description, serial number, work center, name of the person to whom the item is checked out, date loaned out, date returned, and a space for the lender's initials. Logging this information will allow you to track tools borrowed and returned and to identify the borrower. (This accountability system works only if everyone uses it!)

Whenever you issue tools to ship personnel in the form of toolboxes or kits, keep an inventory of the tools issued. Tools are government property and, as such, are accountable items. Thousands of dollars are needlessly spent on tools each year because tools "walk off" or are carelessly left lying around to be lost or stolen.

## TRAINING

Training for personnel may be either formal off-ship training or shipboard division/shop training. As a supervisor, you spend a good part of your time training your work force or arranging for training. Much of this training is informal, such as showing a new technician how to align or adjust a radar repeater or how to use a technical manual. A good training program contains a balance of the various elements of training. The better trained your work force is, the more readily your shop can perform the required maintenance with which you are tasked.

### FORMAL OFF-SHIP/SHOP TRAINING

Formal off-ship training is composed of one or more of the following schools:

- Factory schools—held by various vendors or contractors. This is the costliest form of training available. In addition to travel funds, full or partial per diem usually must be funded by the type commander (TYCOM). Often these schools are the only source of training available for new types of equipment being installed on new vessels or vessels undergoing modernization.

- Navy class A and C schools—designated class A or C to identify the level and type of training offered. Class A schools offer the basic technical knowledge and

skills required to prepare personnel for job entry level performance and further specialized training. Class C schools offer the advanced knowledge, skills, and techniques required to perform a particular job in a billet. To send your personnel to these schools, you must obtain training quotas. The *Catalog of Navy Training Courses (CANTRAC)*, discussed later in this chapter, contains information on how to obtain quotas.

- Other formal schools—available from mobile technical units (MOTUs). The classes offered cover a wide range of equipment in use in the fleet and some of the basic skills required to maintain this equipment. MOTUs announce scheduled classes via messages to all local units. This is done on a monthly or quarterly basis, depending upon the location of the MOTU.

The *Catalog of Navy Training Courses (CANTRAC)*, NAVEDTRA 10500, lists all formal courses of instruction offered to naval personnel. This catalog contains the following information on each of the courses listed:

Location  
Length  
Class school (A, C, P)  
Convening frequency  
Purpose  
scope  
Prerequisites  
Quota control  
Reporting destination

The *CANTRAC* is an invaluable aid for the senior ET and supervisors as they plan off-ship training. The *CANTRAC* is normally located in the Educational Services Office (ESO).

### SHIPBOARD OR SHOP TRAINING

Shipboard or shop training is necessary throughout the naval establishment. Technicians reporting to their first duty station from a C school have much to learn about their particular work center or work group operation and system configuration. The courses of instruction that ETs attend generally provide only the fundamental theory and skills required to perform the minimum maintenance on electronic and digital equipment. Most C schools do not have the manpower or equipment available to have the students perform all



of the maintenance tasks they will ultimately be required to perform. Most of the hands-on training ETs receive comes at their first duty stations. As a shop supervisor, you are responsible for providing the extra training the new ET will require to become a competent, technically skilled technician. You can do this by using a combination of the following training methods:

1. On-the-job training (OJT)—One of the most used and easiest ways of providing training

2. Personnel qualifications standards (PQS)—A method of developing the ability of a person to stand a watch or maintain a piece of equipment

3. Formal shipboard training—The best way to train large groups of people, but requires more effort and preparation than the two preceding methods

### **On-the-Job Training (OJT)**

This is by far the simplest and easiest way to train. It can be used almost anytime the shop supervisor desires. Showing a new ET how to perform an hf transmitter alignment, how to perform rf power measurements, and how to perform a receiver sensitivity check are all examples of OJT. When used wisely, OJT allows new ETs to gain the hands-on experience under operational conditions that could not be acquired at a formal school. You perform OJT many times a day without ever thinking about it. By emphasizing OJT, you will be able to increase the technical competence of your new personnel in a shorter time. Although you can use OJT informally, you should also schedule it as part of your shop's in-rate training program.

### **Personnel Qualification Standards (PQS)**

The PQS system was discussed earlier in chapter 1. We will now show you how you can use the PQS system in training your personnel. You can use PQS as a method of training or qualifying new personnel reporting aboard. You can also use it as a method for cross-training and requalifying experienced personnel. The concept of standards for personnel qualification is not new in the Navy. For many years, various forms of qualification standards have been in use. Observing the performance of new technicians in a shop routine helps the shop supervisor decide when the technicians are ready to stand a watch or work on equipment by themselves. The first lieutenant applies a similar approach to hands-on performance evaluation in the qualification of helmsmen and boat coxswains. The detailed checkoff list approach to watch station qualification in submarines has been used for many years with great

success. By developing a step-by-step watchstander's PQS for a particular installation, you can ensure that any new ET reporting aboard will receive all pertinent information. The Personnel Qualification Standards developed to date have been very beneficial as an element of a well-managed unit training program.

The success of the PQS program in your division or shop depends upon you. To make this program a success, you must take the following steps:

1. Have and maintain an adequate PQS reference library of technical, procedural, and rate training manuals.

2. Effectively manage the overall division or shop training program.

3. Have a program to prepare work group supervisors as PQS qualifiers, Supervise and assist designated PQS qualifiers.

4. Have realistic individual qualification goals and time limits.

5. Monitor individual qualification progress.

### **Formal Shipboard/Shop Training**

The most difficult training to perform is that aboard ship or in a busy maintenance shop. There are many variables to consider when you attempt formal training aboard ship. First, consider the preparation required for presenting a formal class. Four factors you must consider when you prepare for a formal training session are as follows:

1. Are adequate up-to-date lesson plans or instructor's guides available?

2. Can the presentation be scheduled at a time that will give maximum attendance?

3. Is there an adequate location available to use as a classroom?

4. Is there a method available for measuring class achievement?

The following paragraphs discuss each of the four factors listed above.

1. Availability of lesson plans. If lesson plans or instructor guides (IGs) are available, you should carefully screen them to be sure they contain the topics you want to present and all of the points you want to emphasize—the need-to-know material. If lesson plans or instructor guides are not available or are inadequate

TITLE:	WRITE TITLE AND LESSON NO.
OBJECTIVES:	LIST LEARNING OBJECTIVES; (List the learning objectives the instructor desires to meet with the lesson. Make objectives realistic.)
MATERIAL:	1. TRAINING AIDS: (List training aids needed to teach this lesson.) 2. REFERENCES: (List the sources from which this material was obtained.)
INTRODUCTION:	The instructor should introduce the lesson at this point and create interest in the lesson by possibly relating a short story to catch the trainees interest. (Related story should key up the importance of knowing lesson.)
PRESENTATION:	The vital information to be taught should be placed in this portion of the lesson plan in outline form. It should be outlined in such a manner as to provide the instructor with a coordinated flow of information.
APPLICATION:	A list of questions should be prepared in advance to see if the trainees have absorbed the presented material (Answers to the questions should be included for the instructor to refer to.)
SUMMARY	The instructor should then review the vital elements of the presentation.
TEST	A small quiz maybe administered though not required.
ASSIGNMENT:	An assignment maybe given to reinforce the lesson. Not mandatory.

**Figure 3-1.-A lesson plan outline.**

for your needs, prepare new ones. Figure 3-1 shows an example of a lesson plan format.

Whenever you start to prepare a lesson plan or IG, you should remember one important point: Instructors are the experts; they should be fully knowledgeable in the subject area. If you are hazy on some areas, get out the books and refresh your memory. Instructors who have not adequately prepared themselves lose their credibility when they falter and hesitate while covering a subject.

2. Class scheduling. Schedule formal class presentations as early in the day as possible. (Shortly after morning quarters is an ideal time.) At this time, people are rested, ready to start the day, and in a more receptive mood than if they had already worked a full day and were waiting for liberty call. There are always interruptions to class schedules. By planning well enough in advance and ensuring that all persons attending the formal class are aware of the schedule, you can minimize the effects of outside events. Keep your training sessions short and schedule them over a number

of days. Trying to cover too much material in one day may produce poor results due to

- interruptions because of ship evolutions,
- loss of interest because of the length of the class, or
- the technical nature of material covered.

3. Class location. Find a suitable location to hold the training session. This is often a problem on small ships since spaces are cramped and room is at a premium. At a shore station, training rooms are usually available. An adequate space for a classroom should be

- as comfortable as possible,
- well lighted,
- arranged so the entire class can see the instructor and vice versa,
- free from outside noise,

- capable of seating the personnel attending the class, and
- adequately equipped with the necessary training devices before the start of class.

4. Methods of measuring class achievement. There are several ways to measure class achievement. Written tests and performance tests are the two primary methods. These tests give you, the instructor, an idea of how well you have presented the material. Prepare your written tests before class, using the IG as a source topics to test. Include only questions which are based on the need-to-know information you plan to present during the lecture or demonstration. Prepare your performance tests in much the same way as you do written tests. Require each student to perform the procedure while another student assists. If necessary, you can prepare job sheets to help the students in a particularly complex procedure. Also, two students can take turns performing the same procedure as you observe and grade their performances. Wherever a hazardous condition may exist, always emphasize safety precautions on the job sheet.

### Training Presentation

The training presentation is the culmination of your effort and preparation. For the training to be effective, you must present the prepared material in an effective manner. All of the effort you put into preparing for the training session may be negated if you do not give an effective presentation. The following is a list of some of the pitfalls you should avoid when you give a formal presentation:

- Talking in a monotone voice. This will put your class to sleep.
- Jangling coins or keys in your pocket. This diverts the attention of the class from the topic you are discussing because they are distracted by what you are doing. If you have the habit of “jingling,” remove the coins and keys from your pockets before you begin the training session.
- Talking during a loud burst of background noise. Your class will not be able to hear you.
- Using distracting mannerisms, such as tugging your ear or playing with a ruler or pen. Again, the class will pay more attention to what you are doing than to the subject you are discussing.

- Talking down to the class. This will cause animosity toward you, causing you to lose the attention and interest of the class.
- Losing control of the class. An uncontrolled class will be distracted and will not learn.

Keep your presentation interesting, accurate, and to the point. Toss in a comment on personal experience when you want to emphasize a certain point, or ask questions if you see you are losing the interest of the class or of an individual. The object is to keep your class working and receptive to the information you are presenting.

### Training Topics

A wide variety of topics are appropriate to an electronics division. Some of the topics (in addition to electronic equipment and systems) for which you should have lesson plans and training are

- safety,
- use of test equipment,
- electronics-casualty-control,
- general military subjects, and
- basic electronics (NEETs modules).

In chapter 1 of this TRAMAN, you were told about four standards that you can use as a basis for your training program. These standards are as follows:

- Naval Standards
- Occupational Standards
- Personnel Qualification Standards
- Equipment Standards

By using the Naval and Occupational Standards listed in the *Advancement Handbook for Petty Officers*, you can tailor your training program to cover the professional and technical requirements of your personnel. Examine these standards and cover them in your lesson plans.

Use equipment standards when you train personnel on new equipment that they may not be familiar with. Stress the importance of equipment standards to personnel before they first begin maintenance on equipment. This will show them that you are concerned about the performance of the equipment and that they should also care about the quality of its performance.

## Training Publications

The training chapter of OPNAVINST 3120.32, *Standard Organization and Regulations of the U.S. Navy*, discusses the quarterly forecast, weekly schedules, and various personal and group training records that must be kept.

The *List of Training Manuals and Nonresident Training Courses*, NAVEDTRA 12061 (mentioned earlier) lists training manuals and correspondence courses and contains alphabetical listing of PQS products.

### Other sources of information are

1. type commander's (TYCOM) directives and shop directives,
2. NAVPERS 18068, *Manual of Navy Enlisted Manpower and Personnel Classification and Occupational Standards*, and
3. NAVEDTRA 10500, *Catalog of Navy Training Courses (CANTRAC)* (previously described).

## Training Films

Training films are valuable sources of supplementary information on many technical subjects.

There are two types of visual information libraries from which audiovisual aids can be checked out. These are the General Visual Information Libraries and the Installation Visual Information Libraries. The General Visual Information Libraries are located at the Naval Education and Training Support Centers at Norfolk, Va., and San Diego, Cal. They are operated under the cognizance of the Chief of Naval Education and Training and provide mail-order loans of audiovisual aids to fleet and shore activities. The Installation Visual Information Libraries are currently comprised of libraries located at naval aviation and medical installations. The *Department of the Navy Catalog of Navy and Marine Corps Visual Information Productions*, OPNAV-P-09B1-01-88, lists all the U.S. Navy training films in stock and the procedures for acquiring them.

## TRAINING SCHEDULES AND RECORD

Scheduling of shipboard training requires the careful attention of the training officer, department heads, and division officers to minimize conflict with the activities of the ship and to ensure that the time

allotted to training is used to the best advantage. The only justification for a record of training is that it provides continuity to the training program by indicating what training has been done.

When you develop a training schedule, you must consider the ship's operating schedule and yard overhaul periods (availabilities) assigned by the type commander. A yard overhaul (availability) takes place periodically (approximately every 3 years).

## LONG-RANGE TRAINING SCHEDULE

The ship's training cycle (fig. 3-2) is tied closely to the periods of time between overhauls. The long-range training plan, prepared by the training board, is the basic instrument for planning and carrying out the ship's training requirements.

The long-range plan contains only information of major importance needed to ensure that the overall coordination and planning of the training effort are effective. It is not concerned with minor details of the ship's training schedule. In effect, the plan outlines the periods of time that are to be considered as all-hands evolutions, during which little personal training may be scheduled. These events include major inspection, trial, and maintenance periods; competitive exercises; off-ship team training; general quarters, general drills; and so forth. When complete, the plan becomes the framework for the preparation of the more detailed quarterly forecast of all-hands evolutions and the weekly training schedules.

## QUARTERLY FORECAST OF ALL-HANDS EVOLUTIONS

Based on the long-range training schedule and general policy guidance from the commanding officer, the training officer prepares a quarterly forecast, or estimate, of the number of normal working hours required to carry out evolutions involving all hands. On the basis of that estimate, the training officer also forecasts the number of hours that are available for individual division activities.

When the ship's employment schedule is reasonably firm, the training officer prepares the quarterly forecast simultaneously with the long-range training schedule. At other times, the training officer can forecast only as far ahead as reliable estimates can be made, perhaps monthly or biweekly.

The analysis is based on a normal work week of 35 hours per person—7 hours per day for 5 days. It is obvious

A TYPICAL TRAINING CYCLE

Shipyard Overhaul Period (Availability)	Months out of Shipyard
Preparation for Refresher Training; Calibration and Alignment of Equipment; RFS; ISE; Commence	
Refresher Training . . . . .	1 (Jul)
Refresher Training; ORI . . . . .	2 (Aug)
25-Knot Economy Trial } . . . . .	3 (Sep)
Commence Competitive Year }	
	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 } . . . . .	13
Commence Competitive Year }	
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 3-2.-A ship's training cycle is adjusted to the periods of yard overhauls (availabilities).

that shipboard personnel work many more hours a week than 35. Watch standing, repairs to disabled equipment, general quarters, off-duty studies, and so on, take up much of the individual's time beyond the usual work week. The quarterly forecast of all-hands evolutions, however, must be based on the realistic assumption that most training takes place during normal working hours.

In preparing the forecast, the training officer indicates the total number of crew-hours that must be reserved for each all-hands evolution. Thus, during a week in which type training (TYT) is to be conducted, 31 hours may be reserved for one all-hands evolution and 2 hours for another evolution. After the training officer has completed the calculations, he may have reserved 10 crew-hours for training. On the basis of this computation, the training officer may then inform all division officers of the number of hours available for division activities (35 hrs -10 hrs = 25 hrs).

### **DIVISION QUARTERLY FORECAST OF ACTIVITY**

As a leading ET, you will generally be called upon to assist the EMO or division officer with the division quarterly forecast, at least the portion concerning ET personnel. The EMO or division officer may prepare a quarterly forecast to show how the time available for division activities is to be divided among watch standing, lessons and drills, and routine operations. The use of this forecast is optional because small divisions, such as those on a destroyer, receive little benefit from its use. It is most helpful in the control of fairly large groups of personnel participating in diversified activities.

The forecast is simply a weekly breakdown of total hours available during the quarter. First, the hours needed for watch standing are subtracted from the total. The hours remaining are divided according to the existing situation. Some routine maintenance, for instance, may have been included because of operational commitments, implementation of quality monitoring, or inoperative equipment. If so, the training cycle can be adjusted to absorb the extra time. A good rule of thumb, however, is a 50-50 approach to training versus maintenance, unless equipment becomes inoperable or an operational emergency arises.

### **QUARTERLY TRAINING SCHEDULE**

The preparation of a quarterly schedule requires careful planning and imagination to ensure completion of individual and team training. The division officer is

responsible for maintaining this schedule, and it is generally posted in an area where all ET rates have access. The leading petty officers generally meet with the EMO or division officer to plan the quarterly training schedule, depending upon the ship's operating schedule, the quarterly forecast of all-hands evolutions, and the administrative and maintenance needs of the division.

Most of the schedule is devoted to specific subjects that are to be taught during indicated weekly periods. A certain amount of instruction should take place during every watch, but a definite schedule ensures that each of the ship's ET drills and exercises is taught at least once every quarter, operational conditions permitting.

### **WEEKLY TRAINING SCHEDULE**

Toward the end of each week, training petty officers will consult the quarterly training schedule and prepare a training program for the following week. The weekly schedule should include pertinent information on the long-range training schedule and on training items allocated for that week from the quarterly training schedule. Any remaining training time can be used as a pickup of any lessons, drills, exercises, and so on, that may have been missed the previous week because of unforeseen circumstances. After the training petty officer has completed preparation of the weekly training schedule, he will forward it to the division officer via the leading ET for approval and incorporation into the EMO's or division officer's weekly division training schedule.

When space permits, the weekly schedule may include the names of instructors and such details as the locations and times of lectures and films. Additionally, any major maintenance activity, test, or inspection may be included in the weekly training schedule, which may then serve as a plan of the week.

The weekly schedule should make provisions for three categories of training: (1) all-hands, (2) military, and (3) professional. All-hands training is best typified by the onboard "know-your-ship" requirements. These requirements generally apply to all newly reported personnel, regardless of rate or rating. Military training applies to the mandatory naval standards for all hands, according to paygrade. Professional training is for personnel in a specific rating group, by paygrade.

### **TRAINING RECORDS**

The responsible leading petty officers should know at all times how much training has been done and how much remains to be done. Numerous records of

individual training must be maintained to keep this information current.

To standardize record keeping, the Office of the Chief of Naval Operations has developed four forms, one of which should be suitable for any record or schedule needed in the training program. One of the forms is the weekly training schedule. The three remaining forms bear the title General Record; they are distinguished by the designations Type I, Type II, and Type III. The main difference in the three types is a flexible columnar arrangement, which permits any one of the forms to be used for several records.

- Type I is useful in preparing the long-range training schedule, quarterly forecast of all-hands evolutions, and the division quarterly forecast of activity.

- Type II may be used to maintain both enlisted and officer records of training. Its format is such that a broad column on the left of the sheet permits relatively lengthy entries, such as names, functions, or training

requirements. The other columns are headed by individual blanks.

- Type III is reserved for scheduling instructional periods. The reverse side is basically a calendar with a space for each day of the year. Planned instructional periods are usually noted in pencil. Because of space limitations, the entries are coded or abbreviated. When a planned period of training has taken place, the appropriate entry is inked in to indicate that it has been done.

## REFERENCES

*Data Systems Technician 1 & C*, NAVEDTRA 10203, Naval Education and Training Program Development Center, Pensacola, Fla., 1982.

*Electronics Installation and Maintenance Books, General*, NAVSEA SE000-00-EIM-100, Commander, Naval Sea Systems Command, Washington, D. C., 1983.





## CHAPTER 4

# COMBAT SYSTEMS

Compared with older combatant ships, today's combatants have more, and increasingly complex, electronics and weapons equipment and systems. Therefore, changes must be made to the traditional organization of divisional responsibilities. This means combining some of the responsibilities of the operations and weapons departments. Current practice calls for putting one officer, the combat systems officer, in charge of all weapon system (all weapons and electronics subsystems) maintenance. This combines (integrates) the maintenance of all electronics and makes the ship more capable of fulfilling its mission. In some configurations, it is possible that the engineering department will supply personnel for supporting systems, such as gyro distribution, cooling systems, and primary and secondary power.

All subsystems of a combat system—weapons, search radar, communications, ASW, electronic warfare and sonar—interface through the NTDS/CDS subsystems. These collectively compose a “single shipboard system.” Figure 4-1 illustrates typical external components of a combat system.

In the past, technicians were only concerned with maintaining their assigned equipment so it operated when it was needed. Under the combat systems concept, technicians must also ensure the accuracy of their equipment's and systems' outputs into the combat system. This means that technicians must cross traditional boundaries and become familiar with the operation and capabilities of the overall system. The outputs of combat system equipment into the combat direction system (CDS) and weapon system control equipment must be accurate, or within assigned standards. Without accurate signals and data, the ship may not be able to handle its combat mission.

### SUBSYSTEMS

Many different subsystems are used aboard the various U.S. Navy ships. We will use the subsystems aboard some of the FFG-7 class ships as examples. Our description is basic (without security compromise), but it will give you a general idea of how the subsystems

operate and how they are integrated with the rest of the combat system.

### SEARCH RADAR SUBSYSTEM

The search radar subsystem provides primary surveillance, detection, and tracking data for anti-air warfare and anti-surface ship warfare missions. The following paragraphs functionally describe the combat system radars, radar recognition, and search radar repeaters. Search radars include Radar Set AN/SPS-49(V)4 and Radar Set AN/SPS-55. Radar identification includes the Air Traffic Control Radar Beacon System/Identification Friend or Foe (IFF) Mk XII System (AIMS). The search radar repeaters consist of three AN/SPA-25 indicators.

Search radar subsystem target information used to detect air and surface targets is provided by two-dimensional search scans. This information is sent by the appropriate radar distribution switchboard to user consoles as video and sweep data. The interrogation sets, as part of the radar recognition equipment, send IFF data via the radar distribution equipment to the video decoders and the beacon video processor.

### COMBAT DIRECTION SUBSYSTEM (CDS)

The combat direction system (CDS) subsystem is a digital computer-based data processing system that allows the crew to integrate, control, monitor, and make tactical use of the ship's weapons systems. It also allows the use of task force weapons against air, surface, and subsurface threats. Sensor data from radar, sonar, countermeasures, and remote communication links are collected, correlated, and evaluated by the CDS operational program. The CDS program then develops and sends recommendations and alerts to the console operators to enable them to use their sensor and weapon resources efficiently. The CDS is composed of the following major equipment groups:

1. CDS data processing group
2. CDS data display group
3. CDS data communications group

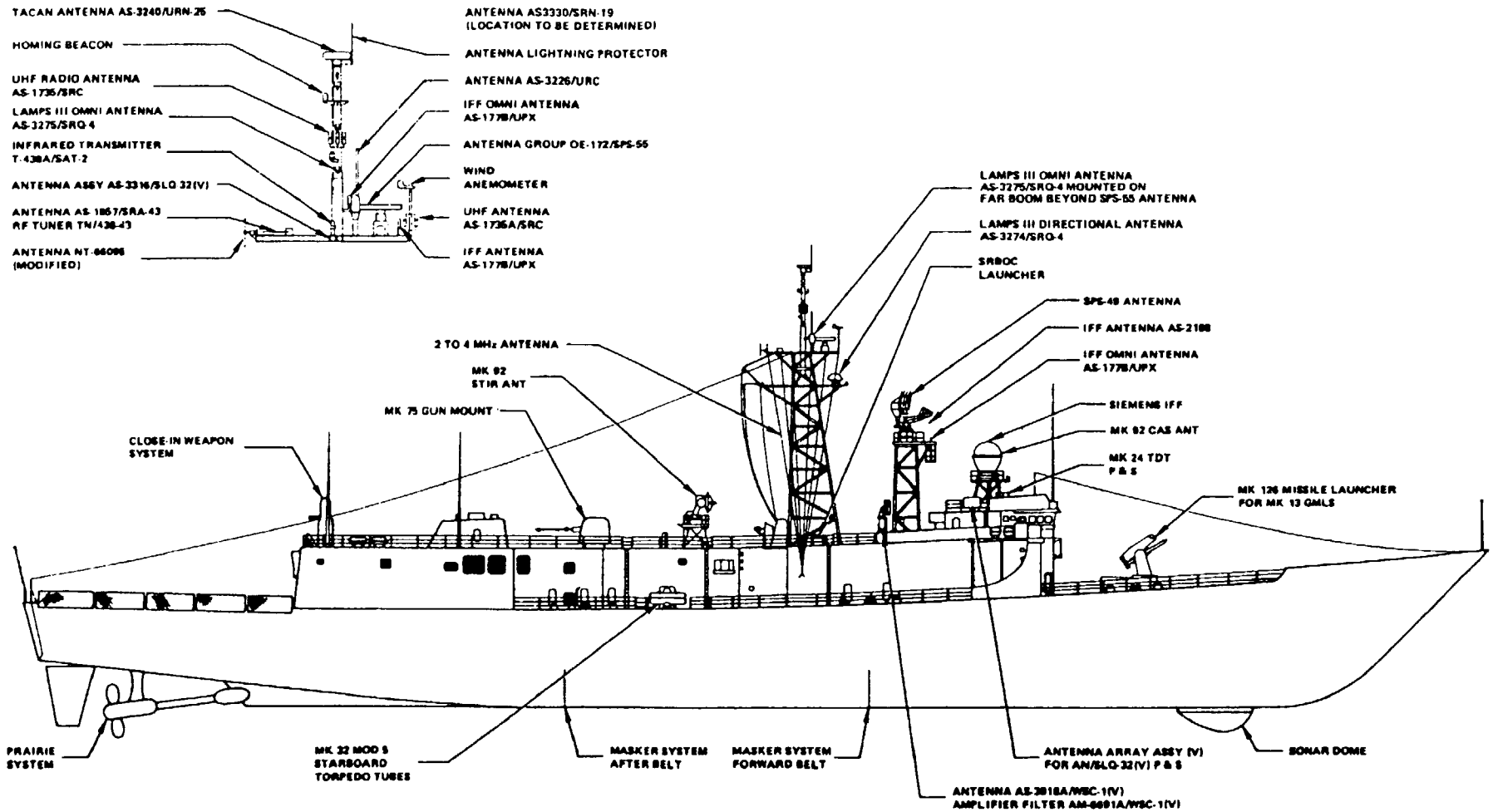


Figure 4-1.—Typical external components of a combat system (FFG-7 Class).

Figure 4-2 is a pictorial diagram of how the search radar subsystem interfaces with the combat direction system subsystem.

## **COUNTERMEASURES SYSTEMS**

The countermeasures subsystem, a stand-alone subsystem, provides the combat system with detection, surveillance, identification, and engagement capabilities against threats the ship encounters during a mission.

The countermeasures subsystem is divided into three functional groups: the electronic support measures (ESM) group, the acoustical countermeasures group (ACM), and the electronic countermeasures (ECM) group.

The ESM group supports actions taken to search for, intercept, locate, record, and analyze radiated electromagnetic energy in support of tactical operations. Thus, ESM equipment provides a source of countermeasures information required for threat detection, warning, avoidance, and target acquisition. The ESM group also receives triggers from shipboard emitters, and develops the blanking pulses required to prevent the emitters from interfering with operating countermeasures equipment. The major components of the ESM group are the Electronic Countermeasures Set AN/SLQ-32(V)2 and the Blanker-Video Mixer AN/SLA-10B.

The ACM group provides deception devices designed to provide a false or misleading acoustical target for incoming acoustical homing torpedoes. The major components of the ACM group are the Torpedo Countermeasures Transmitting Set AN/SLQ-25 (NIXIE) and the PRAIRIE/MASKER SYSTEM.

The ECM group provides false or misleading targets for incoming missiles or weapons. In conducting mission assignments, the ship will use decoy systems primarily as a defensive measure. The major component of the ECM group is the Super Rapid Bloom Offboard Chaff (SRBOC) Mk 36 Mod 1.

## **CLOSE-IN WEAPON SUBSYSTEM (CIWS)**

The Close-In Weapon System (CIWS) Mk 15 Mod 1 provides the final defense against antiship cruise missiles (ASCM) as part of the Navy's defense-in-depth concept. The CIWS will engage and destroy ASCMs or aircraft that penetrate a ship's primary defense envelope. The CIWS also provides ASCM and anti-air defense for ships operating in other than defense-in-depth

situations. The CIWS is essentially a stand-alone weapon system consisting of the Weapon Group Mk 16 Mod 1, Remote Control Panel (RCP) Mk 340 Mod 1, and Local Control Panel (LCP) Mk 339 Mod 2. The CIWS may be operated in either the anti-air warfare (AAW) automatic mode or the AAW manual mode.

## **UNDERWATER WEAPON SUBSYSTEM**

The underwater weapon subsystem provides the combat system with an engagement capability against subsurface threats. The underwater weapon subsystem is composed of the following equipment:

1. Sonar Set AN/SQS-56
2. Tactical Towed Array Sonar (TACTAS)
3. Torpedo Tubes Mk 32 Mod 5
4. Control Panel Mk 309 Mod 0

## **LIGHT AIRBORNE MULTIPURPOSE SYSTEM (LAMPS)**

The light airborne multipurpose system (LAMPS) is a combined helicopter-ship subsystem capable of supporting both combat and noncombat missions. The primary combat missions are antisubmarine warfare (ASW) and antiship surveillance and targeting (ASST). The secondary, noncombat missions include search and rescue, medical evacuation, vertical replenishment, and utility operations.

The LAMPS consists primarily of an SH-60B Seahawk helicopter. The LAMPS helicopter is an all-weather, airborne platform capable of carrying various detection devices, including a sonobuoy receiver-transmitter for transferring sonobuoy data to the ship. Shipboard LAMPS equipment consists of a Telemetric Data Receiving Set AN/SKR-4A (SKR-4) and a Sonar Signal Processing Set AN/SSQ-28.

## **MISSILE/GUN WEAPON SUBSYSTEM**

The missile/gun weapon subsystem enables the combat system to deliver to a target an SM-1 missile warhead or a 76-mm gun projectile. This subsystem uses internally and externally generated raw data and processed data to provide the combat system with weapon assignment, direction, and firing capability. The missile/gun subsystem supports the combat system anti-air warfare (AAW), surface warfare (SUW), and antisubmarine warfare (ASW) missions.



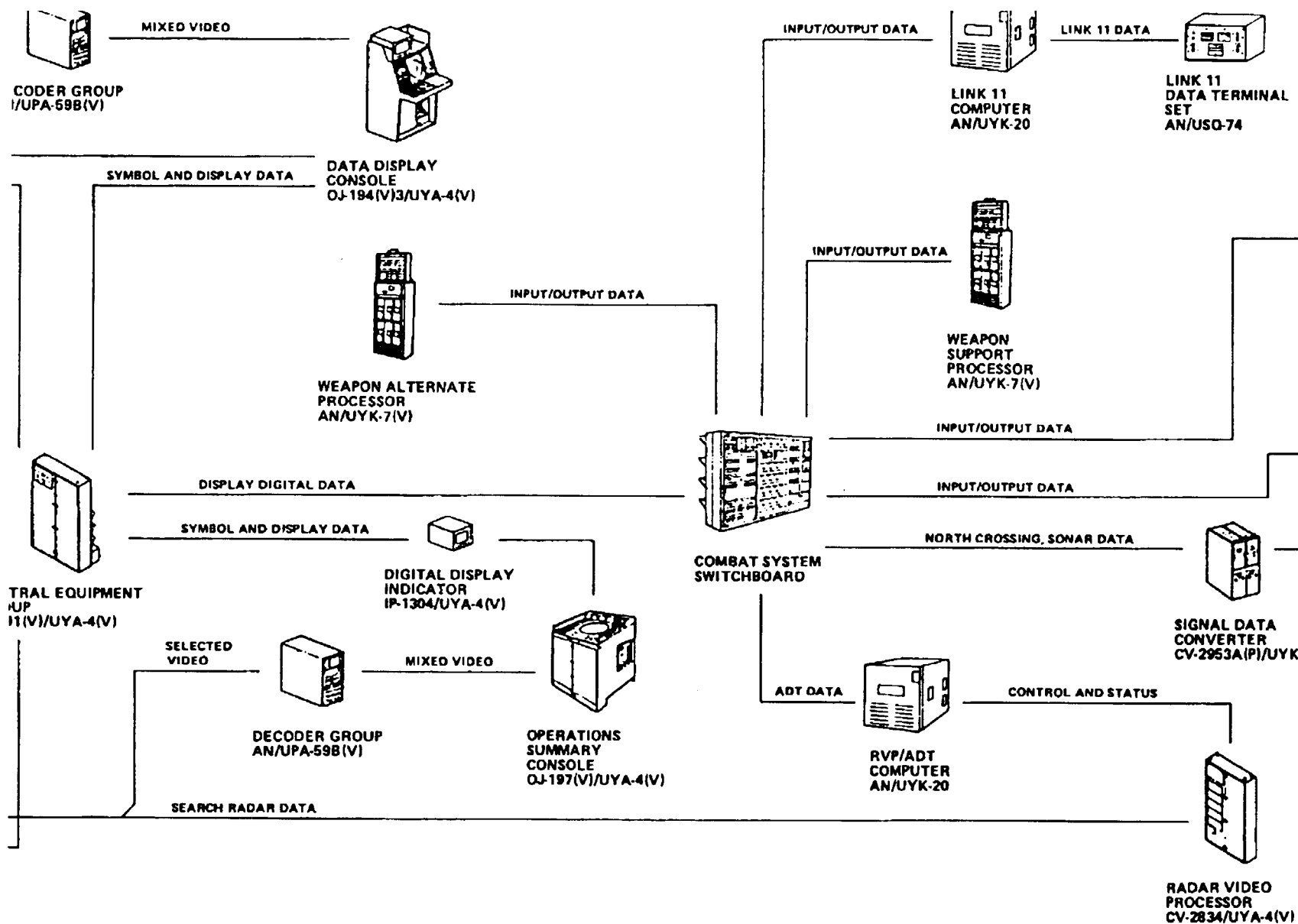


Figure 4-2.-Search radar and combat direction system subsystems-Continued.

## HARPOON MISSILE WEAPON SUBSYSTEM

The HARPOON missile weapon subsystem provides a self-contained, surface-to-surface missile system capable of launching the HARPOON missile at over-the-horizon surface targets. The HARPOON missile weapon subsystem is the ship's primary surface-to-surface weapon. The subsystem relies on the weapon control processor (WCP) computer and other elements of the combat system for target detection, threat evaluation, weapon pairing, and target data functions.

## EXTERNAL COMMUNICATIONS SUBSYSTEM

The external communications subsystem allows the ship to transmit and receive commands, orders, instructions, and reports. Its primary purpose is to fulfill tactical and operational command communication requirements; its secondary purpose is to meet essential administrative requirements.

The external communications subsystem includes antenna systems, transceivers, transmitters, receivers, terminal equipment, and security equipments. Several configurations may be used for transmitting or receiving with these equipments. Duplex, simplex, or receive-only operation may be used with both secure

and nonsecure teletype and voice systems. Duplex operation provides simultaneous transmission and reception, and is used for specific operations involving the passing of data. Simplex operation provides communication between two stations in only one direction at a time. It is most commonly used on voice, data, and continuous wave (cw) circuits. Receive-only (broadcast method) is used for many teletype, facsimile, and continuous wave (cw) operations, where receipt acknowledgement for each message is not required.

Communication services provided by the external communications subsystem are voice, teletype, digital data, high frequency (hf and ultra high frequency (uhf) relay, and very high frequency (vhf) homing. Voice communication services are provided on the R, U, Y, vhf bridge-to-bridge and fleet satellite communication (SATCOM) secure voice, and underwater communication circuits. The terminal configurations consist of the C, G, N, R, Sa, Sd, W, and single audio system (SAS) configurations. The Naval Modular Automated Communications System (NAVMACS A+) is provided as a special facility.

The **Link 11** circuit provides for interchange of track data, weapon system status, and commands. This is done on a digital link between naval tactical data system (NTDS) ships, certain airborne early warning facilities, and antisubmarine warfare aircraft via hf or uhf. The Link 11 circuit is the primary means for

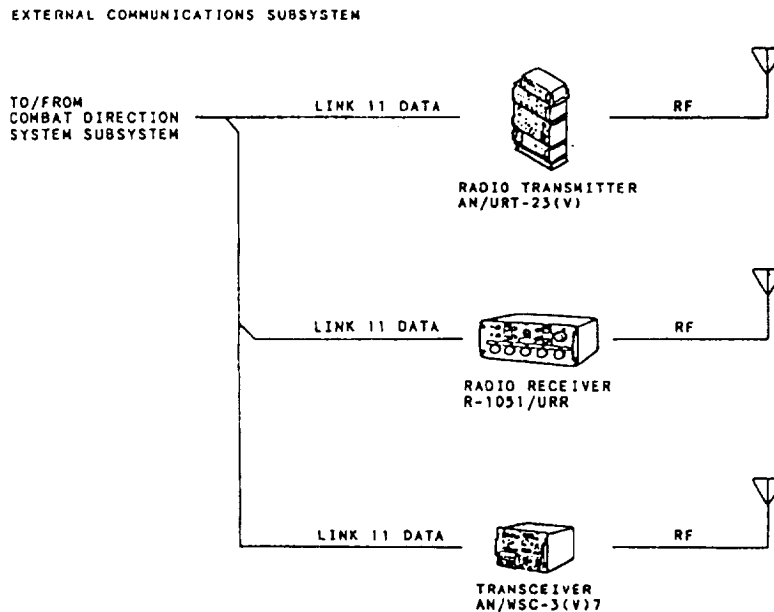


Figure 4-3.-External communications subsystem (Link 11).

intership transfer of tactical and command data. Figure 4-3 shows a pictorial diagram of the Link 11 circuit.

## NAVIGATION SUBSYSTEM

The navigation subsystem provides the combat system with accurate own-ship position anywhere in the world and the navigational information needed to maneuver own ship safely. It also provides an identity-coded TACAN beacon signal to enable aircraft to determine their range and bearing in relation to own ship.

The navigation subsystem uses shipboard, shorebased, and aircraft electronic equipment to accomplish its supporting mission. The shipboard navigation subsystem is made up of the following equipment:

1. Sonar Sounding Set AN/UQN-4
2. Satellite Navigation Set AN/SRN-19
3. TACAN Set AN/URN-25
4. Dead Reckoning System

Figure 4-4 shows a pictorial diagram of the navigation subsystem.

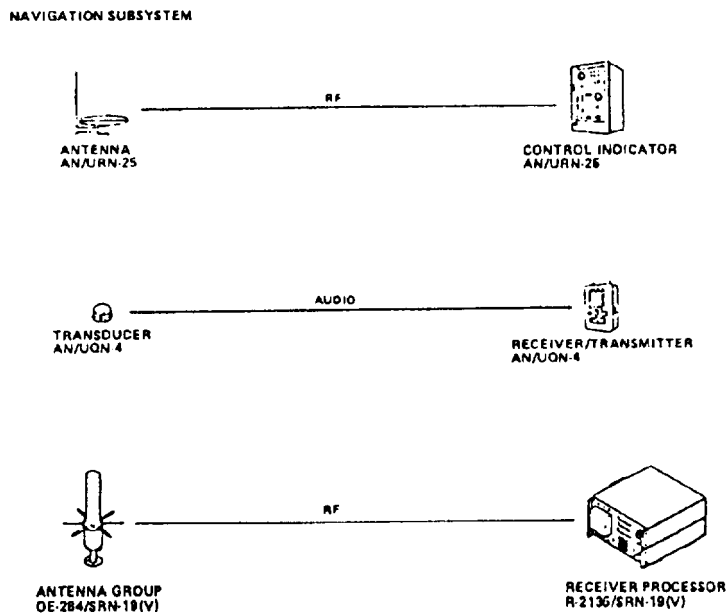


Figure 4-4.-Navigation subsystem.

## SUPPORT SUBSYSTEM

The following systems and equipment compose the support subsystem:

1. Dry air and nitrogen
2. Liquid cooling and heating
3. Ship parameters and distribution (own-ship heading, roll, and pitch, own-ship speed and distance, and wind speed and direction)
4. Ship power and distribution
5. Air conditioning and heating
6. Interior communications

## COMBAT SYSTEMS TEST AND EVALUATION PROGRAM (CSTEP)

The Combat Systems Test and Evaluation Program (CSTEP) is a combination of special teams, tests, evaluations, publications, and reports used to promote the effectiveness of shipboard combat systems. Basically, the program is designed to

1. increase the priority and focus given to combat systems during overhauls and selected restricted availabilities (SRAs);

2. increase the efficiency and effectiveness of combat systems evolutions that occur during a ship's life cycle schedule; and

3. provide a procedure for the intermediate unit commander (IUC) to use periodically in monitoring and assessing the combat system organization and readiness of individual units.

The overall goal of the Combat Systems Readiness Program is to develop and maintain a high combat systems readiness in each unit in the force. The specific objectives are as follows:

- Maintenance—To improve the combat systems maintenance condition of the force
- Overhaul planning—To improve the planning process for the combat system portion of overhauls and major ship restricted availabilities (SRAS)
- Overhaul—To improve the quality of work conducted on combat system equipment; to increase the focus on combat system integrated testing; and to ensure high levels of technical training during an overhaul or SRA
- Post-overhaul—To ensure maximum combat system effectiveness immediately after overhaul by taking full advantage of the basic and intermediate training associated with the overhaul or SRA
- Combat readiness—To maintain combat system equipment readiness and training at a high level throughout the entire operational cycle of each unit in the force; to provide for efficient and effective management of combat-systems-related training, administrative, and readiness programs; and to provide means to evaluate and report promptly a unit's combat systems readiness

Table 4-1 shows a typical life cycle schedule of combat systems test and evaluation program key events.

The program is composed of many subprograms, all of which are intended to increase combat systems readiness. Several of those programs are discussed below.

#### **GROUP COMMANDERS' COMBAT COORDINATION SUPPORT TEAM (CSCST)**

The Group Commanders' Combat Coordination Support Team (CSCST) assists in monitoring and assessing an individual unit's combat systems

organization and readiness during all combat systems readiness evolutions. During these evolutions, the CSCST conducts ship visits to evaluate and help in the development of shipboard programs to improve combat system readiness. Until permanent CSCST detachments are formed in individual home ports, group commanders form CSCSTs from assets within the group and the ship's home port. Specifically, CSCST takes the following actions:

- Reviews combat system administrative support (for example, technical manuals, CSTOM, COSAL, PMS, GPETE), assesses progress during overhauls and ship restricted availabilities, conducts reviews of the Combat Systems Integrated Test Plans (CSITP), and supports CSPOE/CSORE. (See CSTEP events 2 and 3 below.)
- Evaluates and, when required, conducts technical training to improve ship's force ability to light off, test, operate, and maintain combat systems equipment.
- Evaluates the effectiveness of the Ship's Electronic Readiness Team (SERT).
- Assists in conducting the following CSTEP events:
  - Combat Systems Pre-Overhaul Assessment (CSPOA)
  - Combat Systems Post-Overhaul Examination (CSPOE)
  - Combat Systems Operational Readiness Examination (CSORE) (Phases I and II)

#### **NAVSEACEN COMBAT SYSTEMS READINESS ASSISTANCE**

NAVSEACEN provides engineering technical support and material services to forces afloat. They assist in conducting Combat Systems Readiness Reviews (CSRR) and provide gun/missile/ASW battery and gunfire control/missile fire control/ASW fire control technical assistance. These reviews are not the same as the technical assistance for repairs provided by MOTUs, but instead provide assistance necessary to further the "self-reliance" of the ship's force in improving the operational readiness of installed ordnance.



**Table 4-1.-Typical Life Cycle Schedule of Combat Systems Test and Evaluation Program Key Events**

EVENT	TIMING
Pre-Overhaul Test & Inspection (POT&I) Phase I	Start ROH - 12 months
Pre-Work Definition Conference Meeting (Pre-WDC)	Start ROH - 7 months
Work Definition Conference (WDC)	Start ROH - 6 months
Forces Afloat Work Definition Conference (FAWDC)	Start ROH - 3 months
Immediate Unit Commander Pre-Overhaul Assessment (POA)	Start ROH - 4 weeks
Overhaul Activity Deliver ITP to Ship	Start ROH + 6 weeks
Ship Force/Overhaul Activity Complete ITP Review	Start ROH + 25%
Combat Systems Coordinated Support Team (CSCST)	Start ROH + 60%
Commence Combat Systems Level Testing	Start ROH + 75% or End -12 Weeks
Combat Systems Post Overhaul Examination (CSPOE)	As soon as practicable after ROH usually 2-3 weeks after
Training Readiness Evaluation (TRE)	End ROH + 5 weeks
Combat Systems Ships Qualification Trials (CSSQT)	End ROH + 9 weeks
Weapons System Accuracy Trials/Fleet Operational Readiness Accuracy Checks (WSAT/FORAC)	End ROH + 14 weeks
DMSR	Before sail for RFT
Refresher Training (RFT)	End ROH + 15 weeks
Naval Gunfire Support Qualifications (NGFS)	End ROH + 21 weeks
Combat Systems Operational Readiness Examination (CSORE) Phase I	5 months before deployment (NOTE 1)
Combat Systems Operational Readiness Examination (CSORE) Phase II	4 months before deployment
Combat Systems Readiness Review (CSSR)	Before deployment
Combat Systems Operational Readiness Examination (CSORE) Phase III	2 months before deployment
Deployment	End ROH + 40 weeks
Command Assessment of Readiness and Training (CART) Phase I	During deployment
Command Assessment of Readiness and Training (CART) Phase II	End deployment + 5 weeks
Interim Refresher Training (IRFT) (As Required)	End deployment + 12 weeks
Naval Gunfire Support Qualifications (NGFS)	End deployment + 16 weeks
Combat Systems Operational Readiness Examination (CSORE) Phase I	5 months before deployment
Combat Systems Operational Readiness Examination (CSORE) Phase II	4 months before deployment
Combat Systems Readiness Review (CSRR)	Before deployment
Combat Systems Operational Readiness Examination (CSORE) Phase III	2 months before deployment
NOTE 1: New construction ships will enter the CSTEP at CSORE I before the initial deployment.	

## **COMBAT SYSTEMS READINESS REVIEW (CSRR)**

The Combat Systems Readiness Review (CSRR) is a comprehensive program developed to help the ship's force achieve a high state of combat systems readiness for deployment. Implicit in this goal are the following objectives:

- To assess the readiness of the ship's combat systems material and personnel and to report the status to appropriate seniors
- To help ship's force and IUCs correct material problems
- To provide on-the-job training for ship's force personnel and to improve the ship's self-sufficiency

## **ORDNANCE SPECIAL ASSISTANCE TEAM (ORDSAT)**

The Ordnance Special Assistance Team (ORDSAT) consists of several technicians, both military and civilian, highly trained in various fire control systems. The team's primary purpose is to instruct the ship's force in how to maintain its own equipment, thereby improving its battery system as a whole. Ordnance equipment includes: gun battery, gunfire control, guided missile tire control, and underwater battery fire control systems.

## **COMBAT SYSTEMS OPERATIONAL READINESS EXAMINATION (CSORE)**

The Combat Systems Operational Readiness Examination (CSORE) is an evaluation conducted in three phases by the ship's IUC to determine the material readiness, personnel training level, and logistic support of the installed combat system.

## **COMBAT SYSTEMS POST-OVERHAUL EXAMINATION (CSPOE)**

The Combat Systems Post-Overhaul Examination (CSPOE) is an evaluation of the combat system readiness and training of the ship. It provides prerequisite testing and preparation for CSSQT, WSAT, and RFT; evaluates equipment readiness and the ability of the ship's force to light-off, operate and maintain equipment; and assesses the combat system technical training.

## **COMBAT SYSTEMS SHIP QUALIFICATION TRIALS (CSSQT)**

The Combat Systems Ship Qualification Trials (CSSQT) is a series of comprehensive tests and trials designed to show that the equipment and systems included in the CSSQT program meet combat system requirements. It also provides training and familiarization to ship personnel in maintaining and operating installed equipment, identifies design problems, and determines deficiencies in support elements (for example, documentation, logistics, test equipment, or training).

## **OVERALL COMBAT SYSTEMS OPERABILITY TEST (OCSOT)**

The Overall Combat Systems Operability Test (OCSOT) is a Level 1 PMS test designed to provide the commanding officer with an operational assessment of the total combat system.

## **COMBAT SYSTEMS IMPROVEMENT PROGRAM ADVISORIES (CSIPs)**

The Combat Systems Improvement Program advisories (CSIPs) are numbered advisories used by the type commander to pass on to units lessons learned, recommendations, and specific guidance about combat systems requirements.

## **COMBAT SYSTEMS INTEGRATED TEST PLAN (CSITP)**

The Combat Systems Integrated Test Plan (CSITP) consists of detailed procedures for conducting all combat system tests through the systems level during overhaul (*Combat Systems Test and Certification Manual*, NAVSEA T9073-AB-TRQ-010).

## **COMBAT SYSTEM TEST TASK GROUP (CSTTG)**

The Combat System Test Task Group (CSTTG) is made up of representatives from the ship's force, the shipyard, SUPSHIP, and other commands, as appropriate. This group monitors the CSITP (NAVSEA T9073-AB-TRQ-010).

## **COMBAT SYSTEMS TEST COORDINATOR (CSTC)**

The Combat Systems Test Coordinator (CSTC) is the ship's representative to the Combat System Test Task Group. The CSTC is responsible for coordinating all testing with the shipyard and for making sure that all testing is completed and involves the full ship's force (NAVSEA T9073-AB-TRQ-010).

## **COMBAT SYSTEMS TRAINING REQUIREMENTS MANUAL (CSTRM)**

The Combat Systems Training Requirements Manual (CSTRM) is a manual, developed for each class of ships in the force, that specifies the standards of technical and operational training expected for all operators and technicians.

## **COMBAT SYSTEMS TRAINING TEAM (CSTT)**

The Combat Systems Training Team (CSTT) consists of the most experienced shipboard personnel. It is responsible for training combat systems personnel in operating and maintaining installed equipment, and for supervising combat systems related exercises.

## **COMBAT SYSTEMS TROUBLED EQUIPMENT ACTION PROGRAM (CSTEAP)**

The Combat Systems Troubled Equipment Action Program (CSTEAP) is used by the TYCOM staff to identify, investigate, improve, and monitor combat systems equipment installed on TYCOM units that causes chronic problems.

## **ORDNANCE HANDLING SAFETY ASSIST TEAM (OHSAT)**

The Ordnance Handling Safety Assist Team (OHSAT) is a group of ordnance handling experts that visits the ship periodically to monitor the security of arms, ammunition, and explosives (AA&E). The team also audits safety practices and material conditions associated with the handling, storage, and use of conventional weapons.

## **WEAPON SYSTEM ACCURACY TRIALS (WSATs)**

Weapon System Accuracy Trials (WSATs) are tests and trials designed to prove the accuracy of the ship's antisubmarine warfare (ASW) system.

The previous portion of this chapter has basically described the various subsystems of one ship class combat system. As you can see, all subsystems are very important to the readiness of the overall combat system. As a senior technician and supervisor, you must work with your fellow combat systems technicians, supervisors, and operators to ensure a high state of combat system readiness.

## **COMBAT SYSTEM TECHNICAL OPERATIONS MANUAL (CSTOM)**

Sophisticated combat system integration is rapidly replacing single-systems operations on ships. To help ships adopt and maintain the new concept, the CNO has directed that all ships with tactical data systems be provided with a Combat System Technical Operations Manual (CSTOM). The CSTOM provides the crew with all aspects of integrated combat systems.

The Class-of-Ship CSTOM contains and organizes the technical data that shipboard personnel need to (1) operate and maintain the integrated combat system; (2) maintain material and personnel readiness; and (3) define significant capabilities and limitations of the combat system.

The CSTOM also performs the following functions:

1. Specifies and explains how systems and subsystems are integrated
2. Defines the readiness requirements for operational and maintenance personnel
3. Establishes the Ship Electronic Readiness Team (SERT) to maintain on-line combat system readiness
4. Provides text and graphic materials to be used for both classroom training and self-instruction. Pictorial diagrams, rather than conventional block diagrams provide more realistic training. Data are presented in levels ranging from elementary to detailed, allowing presentations to be made at the appropriate educational level.

To give you an idea of what is contained in a CSTOM, we will use the FFG-7 class CSTOM as

an example. The CSTOM is organized into volumes and chapters as shown below:

**VOLUME 1-COMBAT SYSTEM DESCRIPTION**

- Chapter 1-Introduction
- Chapter 2-Combat System Descriptions
- Chapter 3-Combat System Operational Description

**VOLUME 2-OPERATIONAL PROCEDURES**

- Chapter 4-Operational Procedures

**VOLUME 3-COMBAT SYSTEM READINESS**

- Chapter 5-Readiness Assessment
- Chapter 6-Fault Detection and Impact Evaluation
- Chapter 7-Fault Isolation

**VOLUME 4-CAPABILITIES AND LIMITATIONS**

- Chapter 8-Ship Mission Capabilities and Limitations
- Chapter 9-Detection Capabilities and Limitations

Chapter 10-Threat Processing Capabilities and Limitations

Chapter 11-Threat Evaluation and Weapon Assignment Capabilities and Limitations

Chapter 12-Engagement and Engagement Assessment Capabilities and Limitations

Chapter 13-Cover, Deception, and Emission Control Capabilities and Limitations

Chapter 14-Communications Capabilities and Limitations

Chapter 15-Introduction to Navigation Capabilities and Limitations

Chapter 16-Introduction to Underway Replenishment Capabilities and Limitations

**SHIP ELECTRONICS READINESS TEAM (SERT)**

Recall that the CSTOM assigns to the SERT the responsibility for maintaining on-line combat system readiness. Administratively, the SERT reports to the system testing officer (STO). The STO, in turn, reports to the combat system officer (CSO) as shown in figure 4-5. In the following paragraphs, we will discuss the SERT somewhat in detail, both what it is and what it does. If your ship has a SERT, the discussion will help

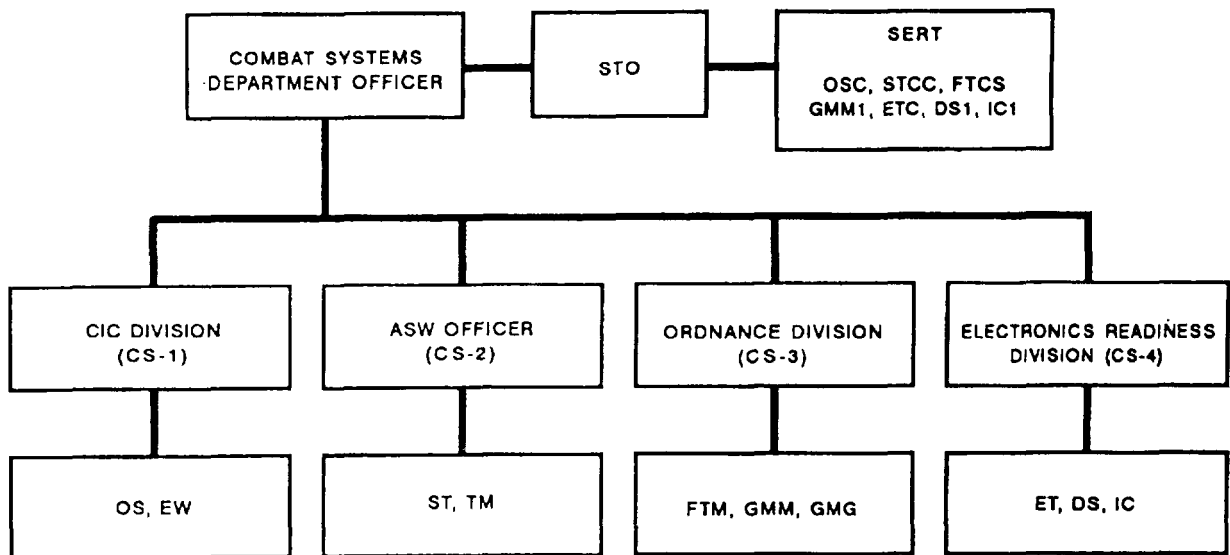


Figure 4-5.-Combat system department organization.

you understand its purpose. If your ship does not yet have a SERT, you may want to use some of the SERTs procedures within your area of responsibility.

### SERT Training

The SERT is trained as a unit in the combat system's operation, preventive and corrective maintenance, maintenance management, and training using the combat system technical operations manual (CSTOM) as the basic reference.

The SERT members should have knowledge in the following areas, either by previous formal training or by a rigorous shipboard training program (may be accomplished within the SERT):

- PMS philosophy
- PMS scheduled and corrective maintenance
- Planned maintenance during overhaul
- Maintenance data system
- Combat system, subsystem, and equipment operation
- Ship alteration, ordnance alteration, and field change configuration levels
- Combat system, subsystem, and equipment maintenance; and maintenance scheduling
- Ordnance pamphlets, ordnance data, and NAVSEA manuals
- Combat system, subsystem, and equipment tests
- Logistic support

Members of the SERT (fig. 4-6) are senior petty officers who have extensive experience in subsystem and equipment maintenance. Each must be an expert on at least one subsystem. Since the SERT is an official part of the ship's organization, the duties of the members are primary, not collateral.

### SERT Operations

For the SERT to coordinate preventive and corrective maintenance efforts effectively, there must be extensive coordination and cooperation between the major branches of the combat system department. The SERT should have direct access to the leading petty officers of each subsystem group within the combat system department. Additionally, because the combat system does not include all maintenance and

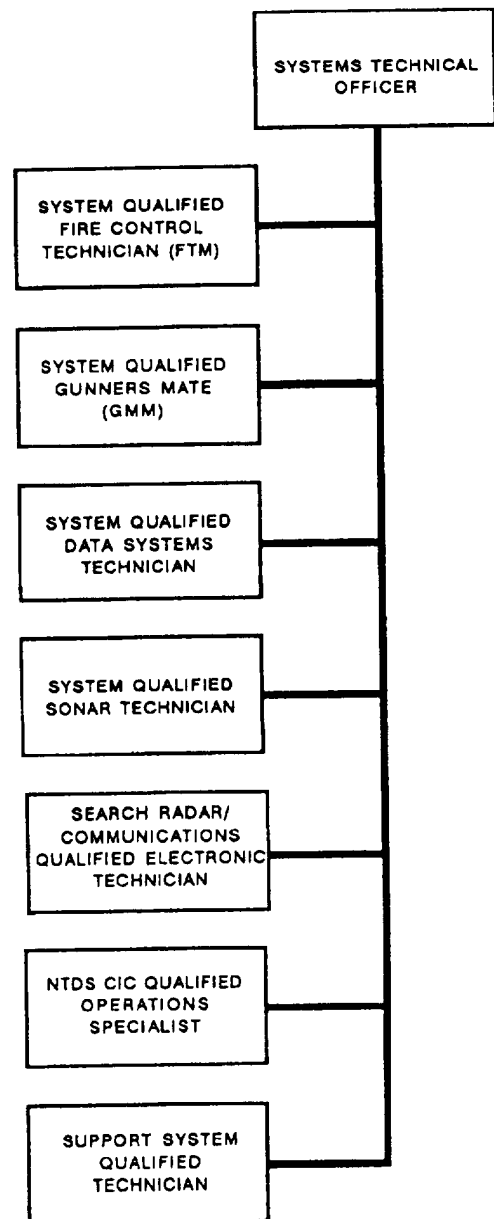


Figure 4-6.-Ship electronic readiness team organization.

operational departments of the ship and because the combat system cannot operate without the support of the other departments, all departments should be involved in implementing a system-level maintenance program. **Both** officers and enlisted personnel should participate in the scheduling process for the plan.

For the SERT to be held responsible for combat system readiness, it must have clearly defined responsibilities and authority. This is best done by a specific shipboard instruction.

SERT authority should be in the area of organization, as well as in material and personnel readiness.

So all personnel can quickly understand combat system availability during condition I, condition III, and in port, the SERT should establish the following lines of communication:

1. During **Condition I** (general quarters), the STO should be assigned a general quarters station in the combat information center (CIC). He should be able to inform the tactical control officer (TCO) of the present and changing status of combat system availability (on a threat basis). The rest of the SERT should be assigned as roving evaluators for subsystems with which they are most familiar. If possible, the roving evaluators' duties should be rotated so SERT members become familiar with all areas without affecting the overall operation of the combat system.
2. During **Condition III**, at least one SERT member should be on watch in the CIC, with the responsibility of reporting combat system status to the TAO. The rest of the SERT should do their regular duties of testing, instructing, and evaluating maintenance activities.
3. **In port**, at least one SERT member should be assigned to each duty section so the command duty officer will know the actual system status at all times. The knowledge SERT personnel have must not be confined to a particular subsystem if the organization is to function properly during condition III and in port.

### **SERT Responsibilities**

Responsibilities of the SERT are broadly defined as maintenance management, readiness assessment, and operational training guidance required to ensure high-level combat system readiness. Specific responsibilities of SERT include:

- Integrating and managing PMS for the combat system
- Determining mission-related materiel readiness
- Managing the corrective maintenance effort for the combat system including fault isolation, and data collection and analysis

- Monitoring operational performance during condition watch exercises and ship or fleet operational exercises
- Evaluating both materiel and operational readiness of the combat system, and providing internal or external reports as necessary

### **PMS Management**

PMS management, one of the major functions of the SERT, includes supervision of actual maintenance actions and all other efforts required to plan and support maintenance events. Therefore, the management task involves controlling all combat system PMS activities, including PMS tasks for the combat system, subsystems, and equipment. The SERT provides the foundation for maintenance through proper planning and execution.

Certain PMS procedures at the combat system level are more oriented toward operator proficiency, with summary observation of combat system performance. The management guidance in the PMS manual and the Cycle and Quarterly Schedules are primarily equipment- and department-oriented. This guidance provides minimum maintenance requirements for the subsystems and equipment covered under PMS. The SERT must manage within such factors as the interdependence of equipment and subsystems within the combat system, the variations of available manpower, and the dedication of subsystems to operations during conditions I and III.

The scheduling and performance of PMS (supported by documentation and maintenance training) leads to fault detection, which provides a basis for readiness assessment. Maintenance management ensures that detected faults are isolated and followed by corrective action. Effective corrective maintenance includes logistic control and the determination of how important each corrective maintenance requirement is, based on parts availability and readiness assessment. Follow-up action, including verification or retesting, and complete shipboard and maintenance data collection reporting for the subsystems close the loop.

### **MATERIEL READINESS ASSESSMENT**

Materiel readiness assessment involves performing tests and operational checks on the system to identify equipment that is either degraded or nonoperational. The results of the tests and operational checks are then used to determine how well the system can perform its

mission requirements. Readiness assessment is probably the most difficult task facing the SERT because it requires the ability to provide an up-to-the-minute status of the combat system capabilities and limitations. It also requires the ability to recommend alternate combinations of equipment to meet mission needs. The SERT must know the results of all tests and, in addition, the minute-to-minute availability of the combat system, its subsystems, equipment, and all support functions, such as primary power, chilled water, dry air, and sound-powered telephones. Readiness assessment is directed toward four major missions: anti-air warfare, antisubmarine warfare (ASW), antisurface ship warfare, and amphibious warfare.

Although all problems with equipment are important, the existing tactical environment can modify their impact on a mission capability. For example, loss of moving target indicator capability can be more important when the ship operates close to land masses than when it operates in the open sea.

Materiel readiness assessment should be approached from the functional readiness aspect (how well it works) rather than the equipment up or down status aspect (whether or not it works) for the following reasons:

- Complex, multifunction electronic equipment is seldom completely down and less frequently completely up. Normally, one or more functions are in various states of degradation.
- The impact of a functional fault may be different for each mission's capability.
- The combat system's complex design includes some functional redundancy.
- The test results and operational fault directories relate problems to their effect on system functions rather than to the basic operation of the affected equipment.

Readiness assessment uses two basic types of techniques, quantitative and qualitative. Quantitative techniques involve the extensive use of mathematics and reports based on graphs and numbers. Past shipboard experience has shown that without computer support, quantitative assessment is not easily managed. Its numerical reporting lacks meaning or requires extensive explanation. Qualitative assessment (an application of engineering analysis) is based on system knowledge, experience, and judgment; and normally is reported verbally.

Qualitative assessments depend on the personal experience level of the users; therefore written guidance and report forms are needed. The impact of no-go conditions, revealed by PMS results, must be determined for each mission capability.

After an assessment is made, each major function is assigned one of the following readiness criteria:

1. Fully combat-ready
2. Substantially combat-ready
3. Marginally combat-ready
4. Not combat-ready

Fully combat-ready status indicates that all equipments associated with that function are in the highest state of readiness with respect to that function.

Substantially combat-ready indicates that, although all equipments may not be fully operational, redundancy permits the mission to be continued, with a high probability of success.

Marginally combat-ready indicates a function that can be performed, but with a much reduced probability of success.

Not combat-ready indicates complete loss of function.

These readiness criteria provide the basis for a summary report of readiness in each mission capability. The mission summary report (fig. 4-7) should be supported by a combat system daily fault report (fig. 4-8) listing the subfunction faults of the day, their individual impact, alternative recommendations, and expected time of repair.

Materiel readiness does not end with successful completion of tests and scheduled maintenance. In addition to testing, other actions such as visual inspection for cleanliness, corrective maintenance, quality control, and complete integrity are a necessary part of SERT responsibilities. Also, having the commanding officer conduct materiel inspections, assigning SERT personnel to inspection teams, and conducting random equipment inspections without prior notice can provide excellent results. Such inspections should be for electronic and mechanical materiel readiness and preservation. The SERT representatives should also provide results of such inspections to appropriate authorities and provide follow up inspections to ensure that corrective action is taken.

FUNCTION	DETECTION & ENTRY	TRACKING & IDENTIFICATION	THREAT EVALUATION & WEAPON PAIRING	ENGAGEMENT & ENGAGEMENT ASSESSMENT						
				EW	MISSILE	GUN	UBPCS	CIWS	HARPOON	LAMPS
STATUS	SCR	FCR	FCR	FCR	MCR	FCR	NA	FCR	FCR	FCR
REMARKS	INACCURATE TARGET INFO				STIR ANTENNA NEEDS SERVO ALIGNMENT					

LEGEND:  
 FCR FULL COMBAT READY  
 SCR SUBSTANTIALLY COMBAT READY  
 MCR MARGINALLY COMBAT READY  
 NCR NOT COMBAT READY

Figure 4-7.-Mission Summary Report.

COMBAT SYSTEM DAILY FAULT REPORT								
MAINTENANCE STATUS	FAULT	IMPACT				ALTERNATIVE	ETR	NOTE
		AAW	ASW	ASU	CDS			
D	SPS 49 NEEDS RANGE ALIGNMENT	INACCURATE TARGET INFO	NA	NA	NA	NONE	1630	
M	STIR ANTENNA SERVO ALIGNMENT	REDUCED MISSILE FIRE POWER	NA	NA	NA	NONE	2145	

LEGEND: D - DEFERRED  
 M - MANDATORY

Figure 4-8.-Combat System Daily Fault Report.



## **CORRECTIVE MAINTENANCE MANAGEMENT**

Corrective maintenance consists of two basic categories, fault isolation and corrective action. The SERT is responsible for directing fault isolation at the combat system level, managing corrective maintenance at all combat subsystem levels, and coordinating corrective maintenance in related support subsystems. The SERT responsibility for corrective maintenance also includes coordinating fault isolation efforts and evaluating the impact of faults to determine the priority of each corrective maintenance requirement. Another responsibility includes follow-up action of verification or retesting, and complete shipboard and maintenance data collection subsystem reporting.

Effective corrective maintenance management first requires the consideration of combat system readiness, then efficient use of manpower. These factors closely relate to the ship's employment and the tactical environment. There will be times when more corrective maintenance requirements exist than can be simultaneously handled by the available manpower. In addition, sometimes parallel faults exist that require the same personnel or the same system setup for fault isolation. When these conditions occur the setting of repair priorities is based on management's requirements for readiness and manpower available to make the repairs. As the SERT collects and evaluates PMS results, it should continually base its recommendations for correcting faults on the tactical situation, complexity of fault isolation, and available manpower. Some faults may be designated for correction; others may be deferred. However, faults that are deferred, if left to accumulate, tend to degrade overall system readiness. Therefore, as soon as the situation permits, deferred faults should be repaired.

Faults detected within the combat system must be isolated to a subunit that can be replaced or repaired or to an alignment that can be made before actual corrective action can be taken. This requires technicians to have a thorough knowledge of the system and access to complete system and equipment documentation. Most subsystem and equipment maintenance publications provide fault isolation support in one or two formats. The first format consists of symptoms presented in preselected, logical steps and in reference tables, a logic chart, or logic diagram format. The second format consists of flow diagrams and relay ladders. The CSTOM provides amplifying information on fault isolation.

After a repair priority has been set and the faults isolated, the managers of corrective maintenance must ensure corrective action is taken, verification is made by retest, and required reports are completed. Since some faults tend to be repetitive, the SERT should keep records of fault symptoms, identification, and corrective measures.

## **MONITORING OPERATIONAL READINESS**

Since overall readiness assurance is a function of operational readiness (personnel proficiency) and materiel readiness, the SERT responsibility for operational training is very important. The goal of operational readiness is to achieve maximum combat system capability for each mission under constant y changing conditions of materiel readiness. The measurement of personnel readiness is based on the three following techniques:

1. The use of PMS tests
2. The use of simulators or computer programs
3. The monitoring of ship or fleet exercises

In each case, the hardware must be operating properly. Otherwise, the capabilities of the personnel cannot be determined accurately.

The video signal simulator with computer programs provides a means to assess the skill of the console operator. However, the computer programs are limited in assessing the capabilities of combat system operators.

One way to evaluate the capability of all combat system personnel is to actually monitor ship or fleet exercises (described in COMTAC publications FXP-1, -2, and -3). These exercises include:

- Electronic warfare exercises
- Gunnery exercises (anti air [AA], surface, and shore)
- Missile exercises (AA and surface)
- CIC exercises (aircraft, tracking and control)
- Antiship cruise missile exercises
- ASW exercises

When the SERT finds personnel deficiencies, it must provide operational training and guidance. Since the SERT has the knowledge and training capability, it is uniquely qualified to assist the ship's training officer in identifying the topics and content of necessary training for both officers and enlisted personnel.

Whenever you evaluate the operational readiness of your personnel, you should ensure that they are familiar with the following topics:

- Intended purpose of all switches, indicators, controls, and the impact each has on other subsystems or combat system equipments
- Communication links available at the station and with the other stations
- Knowledge of and compliance with specified communication disciplines
- Knowledge that the lack of communication discipline is an internal hazard to the combat system or to the ship

## **TEST SELECTION AND SCHEDULING**

With the coming of PMS, an integrated approach to testing was developed. This approach is based on defining all functional test requirements and subjecting them to a critical examination. The examination involves an engineering analysis in which each function, parameter, and characteristic is examined for its (1) importance to mission or mode performance, (2) reliability based on the circuit elements that affect the function and (3) expected mean time between failures. This places a test periodicity (daily, weekly, monthly, quarterly, semiannually, annually, and cyclically) on the functions. Critical functions are assigned a high periodicity, regardless of reliability; while less critical functions may be assigned a lower periodicity based on their reliability. Related functions are grouped by periodicity and functional interdependency so that they may be tested by appropriate periods. This integrated testing concept results in a management problem that is a SERT responsibility.

The tactical situation governs how and when maintenance is scheduled. Scheduling is a critical element of preventive maintenance management and requires a thorough knowledge of the intent and conditions of each maintenance requirement card (MRC). Important conditions include in-port and at-sea requirements, outside service requirements, navigational support requirements, combat system operational usage, ship control requirements, emission control conditions, computer program requirements, subsystem interdependency, impact on computer program capability, adverse weather conditions, time requirements, and manpower requirements. From these conditions, the quarterly schedule can be developed based on the ship's employment schedule. Heavy

maintenance is usually scheduled during in-port periods and independent ship exercises during nonthreat conditions (particularly for those procedures requiring long periods of operational equipment downtime). If the employment schedule changes, the PMS schedule may require modification. Daily and weekly schedules are based on the ship's readiness condition and operational situation. Subsystem interdependence and manpower usage are also critical in scheduling.

Preventive maintenance management includes the following requirements:

1. Ensuring that events take place as scheduled
2. Coordinating manning and equipment availability for interdependent testing
3. Providing adequate safety measures
4. Ensuring the availability of required supporting systems
5. Coordinating the actions of command and tactical operation personnel
6. Ensuring fault isolation and corrective maintenance follow-up
7. Ensuring the completion of required reports

The ship's CSTOM contains readiness assessment and fault isolation diagrams indicating the test that requires the fewest ship resources, verifies each combat system interface function, and aids the SERT in preventive maintenance management.

## **READINESS ASSESSMENT REPORTING**

After readiness assessment is completed, readiness status must be reported in a form that is brief and easily understood and that presents a clear picture of the combat system effectiveness. This is done most effectively by addressing the status of a major function as it relates to a mission capability. Figure 4-7 shows a sample method of presenting a mission summary report of a four-state qualitative functional readiness assessment. This summary report sample also provides a brief description of the effect each subfunction fault has on the major fictional. Supporting information on specific subfunction faults related to the summary report sample can be provided in a combat system daily fault report form. Figure 4-8 shows a sample method of presenting daily fault information. Report forms of this type (or a similar type) should be developed by the SERT to fit the ship's requirements. The combat system daily fault report is the responsibility of the SERT and should

provide enough information for the CSO to develop the mission summary reports.

The SERT must evaluate, monitor, and report system status during competitive and fleet exercises. This includes organizing and instructing observers, preparing recording forms, defining data requirements, collecting and evaluating data, and preparing a composite internal report. These reports should be limited to an evaluation of combat system materiel and personnel readiness during the exercise.

## **ALIGNMENT LOGS**

During PMS activities and exercises, the SERT is responsible for determining the mechanical and electrical alignment of interrelated combat system functions. The SERT must also assess the impact of a misalignment on the mission. When SERT members brief subsystem and equipment personnel before an exercise or mission, they must emphasize the need for caution when making adjustments to equipment subsystems that may in turn affect the total combat system alignment. Alignment tests and efforts to reestablish reference standards are complex and time-consuming. They frequently require shore facilities, ideal environmental conditions, and extensive data collection. Technicians should avoid making realignments that, because of incomplete or inaccurate reference data, result in inefficient use of manpower and resources. Experience has shown that unnecessary alignment efforts can be avoided if reference data are kept current, accessible, and in a form that can be interpreted by all team members. Therefore, a combat system alignment smooth log (if not already in effect) must be maintained and kept current and accurate. A total combat system alignment manual for the class of ship (with combat system) should be available (separate from CSTOM). The manual should explain the purpose of total combat system alignment, provide management data needed for the analysis and troubleshooting of alignment problems, and provide step-by-step procedures needed for combat system alignment.

## **INTEGRATED MAINTENANCE CONCEPTS**

This section of the chapter describes the planned maintenance system (PMS) as it relates to the maintenance documentation of a typical integrated combat system.

## **PLANNED MAINTENANCE SYSTEM**

Combat system readiness requires efficient maintenance. The key to this capability is an organized system of planned maintenance that is designed to ensure the maximum operational readiness of the combat system. The OPNAVINST 4790.4, *Ships' Maintenance and Material Management (3-M) Systems*, sets forth an effective PMS and assigns PMS management responsibility.

The PMS provides regularly scheduled tests to detect degraded performance and prevent failures (preventive maintenance) during tactical operations. When failures occur during combat system operations, the PMS provides a formal step-by-step fault isolation and repair procedure (corrective maintenance). Complete technical documentation, including combat system, subsystem, and individual equipment manuals, is an integral part of the PMS. These manuals provide the necessary information for understanding, operating, and maintaining the combat system.

Shipboard maintenance falls into the three following categories:

1. Maintenance within the capability of ship personnel (organizational level)
2. Maintenance requiring assistance from outside the ship (intermediate level) such as a tender or mobile technical unit
3. Maintenance requiring port facilities (depot level) such as shipyard maintenance

Since the goal of PMS is to perform maintenance on the organizational or intermediate level, depot level maintenance is not reflected in PMS.

The PMS is a planning and control system that prescribes a logical and efficient approach to complex mechanical, electrical, and electronic maintenance. The PMS was developed to provide supervisors at each maintenance level with methods for effectively planning, scheduling, and controlling shipboard maintenance. It includes a maintenance data collection system used to record important scheduled and corrective maintenance information, and electronic data processing capabilities used to retrieve this information for maintenance analysis.

You should already be familiar with the 3-M Systems at this point in your career as an ET; however, we will summarize the planned maintenance system and will then add information on the integrated combat system concept.

As you well know, the goal of PMS is maximum operational efficiency of all equipments and the reduction of equipment downtime, maintenance manhours, and maintenance costs. Even though the PMS provides methods and resources to accomplish each goal, it is not self-sufficient and does not replace the initiative of maintenance supervisors nor reduce the need for technically competent personnel. Recording and feedback of maintenance and personnel data allow continuing management analysis and improvement of maintenance methods and personnel use. If the ship's force accepts the PMS program and makes full use of its planning methods, the maintenance system will promote confidence and reliability, and will be capable of ensuring that the combat system will be available when it is needed.

Data gathered from the fleet show conclusively that ships that adhere to their PMS schedule maintain a significantly higher state of materiel readiness with no greater maintenance manpower usage than ships that do not. The SERT concept is designed to ensure that the combat system PMS is properly scheduled, managed, and used.

### **PMS PROGRAM (COMBAT SYSTEMS)**

The primary ingredients of the PMS program areas follows:

- Comprehensive procedures for planned maintenance of the combat system, subsystems, and equipments
- System fault isolation procedures
- Scheduling and control of maintenance task performance
- Description of the methods, materials, tools, and personnel required for maintenance

Adherence to the PMS program will provide the following results:

- Improved confidence in system maintenance
- Reduced testing time
- Elimination of redundant testing resulting from lack of coordination
- Detection of most malfunctions during scheduled maintenance events

### **MAINTENANCE SCHEDULING**

The normal flow of events and requirements the SERT will use in developing an integrated maintenance schedule is illustrated in figure 4-9. This figure shows maintenance management responsibilities and the sequence of events that flows from the departmental master and work center PMS record books (containing the Maintenance Index Pages [MIP]), through the scheduling tools (Cycle, Quarterly, and Weekly Schedules), to test actions, unscheduled (corrective) maintenance, and reporting. The figure does not show the variants and constraints the SERT must consider in the quarterly, weekly, and daily scheduling due to the shipboard environment. These considerations were discussed earlier in this chapter in the description of SERT.

#### **Maintenance Index Page (MIP)**

The MIP contains a brief description of the requirements on the maintenance requirement card for each item of equipment, including the periodicity code, the manhours involved, the minimum required skill level, and (if applicable) the related maintenance requirements. The MIPs for all equipments in a department are contained in the department master PMS record. The department master PMS record is used by the department head to schedule maintenance on the PMS schedule forms. Each work center has a PMS record that contains the MIPs that apply to that work center.

#### **Cycle Schedule**

The Cycle Schedule is used by the combat system officer (CSO) to plan quarterly, monthly, and other requirements. It is a visual display of preventive maintenance requirements based on the ship's overhaul cycle.

#### **Quarterly Schedule**

The Quarterly Schedule, planned from the Cycle Schedule, is a visual display of the ship's employment schedule. This schedule is prepared by the CSO in cooperation with division officers, maintenance group supervisors, the system testing officer, and SERT members, and shows the current status of preventive maintenance for each group. The Quarterly Schedule assigns specific requirements in conjunction with the ship's operational schedule.

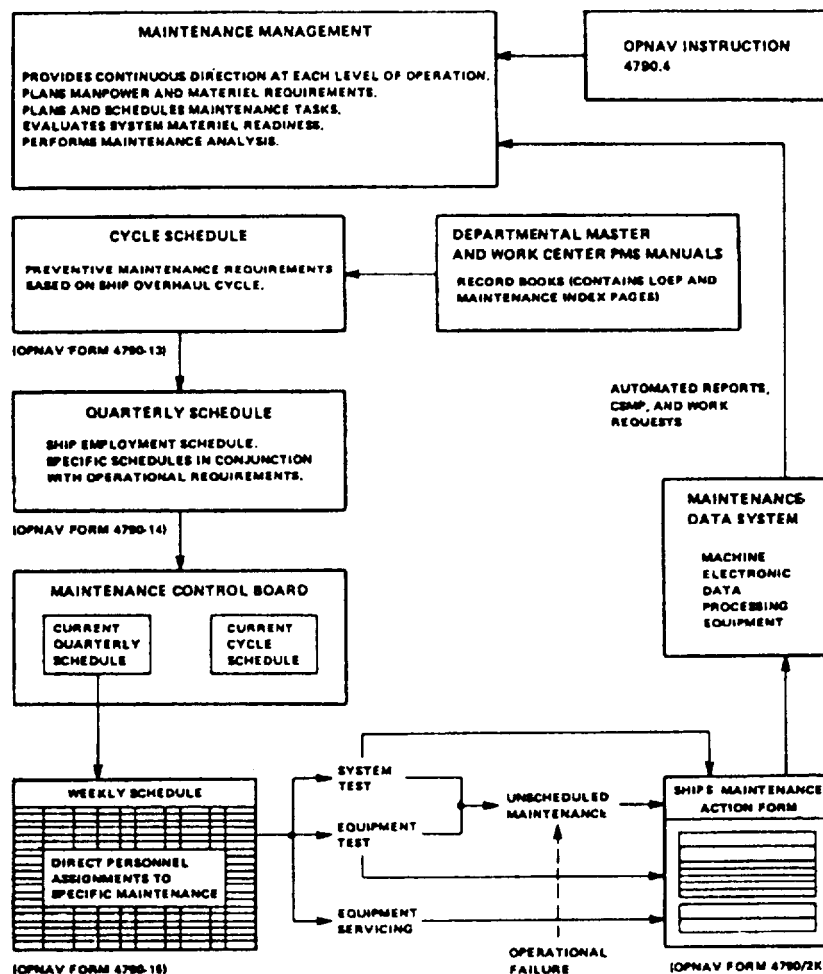


Figure 4-9.-Planned maintenance system.

## Maintenance Control Board

The maintenance control board contains the Cycle Schedule and the current and subsequent Quarterly Schedules. The board summarizes the status of current and planned combat system preventive maintenance.

## Weekly Schedule

The Weekly Schedule is a visual display that is posted in the working area of each maintenance group. The maintenance group supervisor uses the Weekly Schedule to assign specific personnel to perform maintenance on specific equipment. Assignments include system and equipment tests and servicing procedures.

## MAINTENANCE DATA SYSTEM

The Maintenance Data System (MDS) provides a means of recording maintenance actions, processing the recorded data to define important facts about maintenance and equipment, and retrieving information for analysis. Significant data identified by the system include the reason the malfunction occurred, how it was discovered, manhours used in correcting the problem, exact equipment affected, delays in repair and reasons for delays, and types of maintenance personnel required.

## Recording

Maintenance personnel document certain shipboard maintenance actions and corrective maintenance on specific categories of equipment at the time they actually perform or defer the maintenance action. Information is recorded and put into the MDS using OPNAV Form 4790/2K, Ship's Maintenance Action.

## Data Processing

The MDS data processing facilities collect, store, and analyze maintenance information inputs into the system to yield data concerning equipment maintainability and reliability, manhours usage, equipment alteration status, material usage and costs, and fleet materiel condition. Various automated reports are produced periodically for the ship, repair activities, unit commanders, and type commanders. These automated reports include a current ship's maintenance project file, work requests, and preinspection and survey deficiency listings.

## INTEGRATED MAINTENANCE

Combat system maintenance is based on a comprehensive schedule of tests performed at three mutually supporting levels: (1) **combat system**, (2) **subsystem**, and (3) **equipment**. These integrated tests are designed to test all combat system functions, parameters, and characteristics periodically against specified tolerances. Successful equipment performance during the tests usually indicates that the system is combat ready.

Integrated maintenance requirements are developed through engineering analysis, based on a study of all factors that significantly affect maintenance. The analysis defines system and equipment functions, and sets tolerances (in terms of system parameters) that allow operators and technicians to determine whether or not the system is operating properly.

Integrated maintenance procedures provide minimum preventive maintenance coverage of the combat system and are designed to test specific functions under specific conditions. Sometimes equipment operators and technicians may not understand the purposes of the tests. However, they must still follow the procedural sequence explicitly. Improvising or shortcutting procedural sequences often leads to incorrect troubleshooting or masking of actual faults.

The integrated maintenance concept follows PMS principles and is the most effective way to achieve PMS goals. Adhering to this concept enables the SERT to manage the combat system maintenance effort and achieve an optimum level of readiness with the most effective use of available manpower.

## COMBAT SYSTEM TESTING

Combat system testing is conducted at three levels: (1) combat system, (2) subsystem, and (3) equipment. Integrated maintenance tests must be scheduled to reduce redundancy wherever possible. The three levels of testing are described in the following paragraphs.

### SYSTEM TESTING

Combat system testing exercises the entire combat system. It is the highest level of testing that can be done on board ship. Combat system tests are usually automated and monitored in the combat direction system (CDS) subsystem.

While these tests provide an overview of system performance, they usually do not test the full capability of the combat system. It is impractical, from an instrumentation and manpower standpoint, to test all of the functional requirements at the system level. Therefore, confidence in operability or materiel readiness is mainly dependent on integrated testing at the subsystem or equipment level.

System-level tests provide a verification of the alignment between sensors; on-line, real-time monitoring of combat system interfaces; and an overall test of the 3-D search radar and its interface with the CDS. These tests are described in the synoptic test descriptions in the CSTOM.

### SUBSYSTEM TESTING

Subsystem testing exercises two or more pieces of equipment functionally contained within the same subsystem. The intent of subsystem testing is to test intrasubsystem (within the subsystem); but with the need for integrated testing, some functions are tested intersubsystem (outside of the subsystem).

The **subsystem operability/readiness test** is the keystone of integrated subsystem testing. The subsystem operability/readiness test consists of a rigidly controlled sequence of steps designed to test all critical functions during a primary mode of operation. The subsystem operability/readiness test and a supporting family of system tests use the concept of end-point testing in which functions are stimulated at their terminal point, thereby verifying all operations within the function. Subsystem tests are functionally grouped and mode-oriented so related functions may be tested using the same setup, procedures, and stimuli.

## EQUIPMENT-LEVEL TESTING

Equipment-level testing generally concerns power levels, frequencies, servos, special features, and output functions. The equipment PMS may require special external stimulating equipment and special- or general-purpose test equipment for test measurements. These test measurements are often time-consuming and difficult to complete, but are always checked by the SERT in their effort to ensure optimum readiness.

## FAULT ISOLATION

The goal of fault isolation is to determine systematically the part or condition responsible for a fault or degraded operation during testing or tactical operation. The process often involves impact evaluation. Impact evaluation requires considering whether to (1) ignore the problem for the time being; (2) switch to alternate equipment; or (3) perform corrective maintenance right away. Impact evaluation information is provided in the CSTOM.

The CSTOM provides fault isolation procedures both for faults that were detected during operations and for faults that were known before the operations. After a fault has been isolated to a specific unit or interface, corrective action in the form of repair, replacement, or alignment must be taken. In the integrated maintenance concept, alignment is considered as corrective maintenance only and, like other corrective action, should be performed only when a fault is indicated.

## VERIFICATION

Fault isolation leads to corrective maintenance. The corrective maintenance performed may or may not bring the system back to an operable condition. There may have been more than one fault contributing to the out-of-tolerance condition that started the fault isolation process. The possibility of faulty replacement parts and incorrect adjustment or alignment also exists. Corrective maintenance may not have solved the problem, and may even have added to it. Therefore, each corrective action must be followed by verification. Verification normally is done by re-creating the test environment and rechallenging the function. Where alignments are concerned, the verification process is complicated by a requirement that the effect of the maintenance upon other elements of the combat system be determined.

## REFERENCES

- Combat System Technical Operations Manual (CSTOM) for FFG-7 Class Ships with Lamps Mk III, S9FFG-BC-CSM-(010, 020, 040)/FFG-7, Naval Ship Weapon Systems Engineering Station, Port Hueneme, Calif., 1983.*
- COMNAVSURFLANT Combat Systems Officers Manual Instruction 9093.3, Naval Surface Force, U.S. Atlantic Fleet, Norfolk, Va. 1986.*
- COMNAVSURFPAC Maintenance Manual, Instruction 4700. 1A, Naval Surface Force, U.S. Pacific Fleet, San Diego, Calif. 1986.*





# CASUALTY CONTROL AND REPORTING

### ELECTRONICS CASUALTY CONTROL ORGANIZATION

As a senior technician, you will assist the electronics material officer (EMO) or the electronics repair officer (ERO) in ensuring that all electronics division personnel are properly trained in electronics casualty control (ECC) procedures. These procedures must be outlined in the electronics doctrine and exercised frequently. A properly organized and trained electronics division will enable your ECC organization to successfully perform electronics casualty control and, more importantly, be ready to sustain all electronic battle damage.

### ELECTRONICS CASUALTY CONTROL CENTER

A center, or point of control, is needed for efficient management of any organization. For electronics casualties, the Electronics Casualty Control Center (ECC), or Repair 8, is the primary casualty control point. (ECC may mean either *electronics casualty control* or *electronics casualty control center*, depending on how it is used in the sentence.)

The ECC organization will consist of an ECC, a secondary ECC, casualty investigation teams, and electronic equipment space assignments. The Navy Manpower Engineering Center (NAVMEC) requires that all combatant and CV ship manpower documents list Repair 8 as the central focal point for ECC, with the same functions as the ECC. The following ECC structure and basic responsibilities are typical of those found aboard larger ships.

#### Primary ECC or Repair 8

Personnel assigned to the ECC center consist of the EMO, at least one senior CPO or petty officer, a status board plotter and phone talker, and, preferably, at least one investigation team. The investigation team consists of at least two experienced personnel. The EMO and the senior CPO or petty officer must be able to hear all incoming messages on the ECC circuit, usually the X6J-either by use of a sound-powered phone amplifier or by use of sound-powered phones.

Electronics casualty control responsibilities start before the ship goes to sea and continue through and after battle readiness. These responsibilities include ensuring that the following things are accomplished:

1. The electronics organization is prepared. The following is a list of the major readiness factors that indicate a well prepared organization:

- All personnel have been properly assigned to their battle stations and properly trained (or are in the process of being trained).

- All electronic equipment and systems are operating at peaked, maximum performance.

- All spaces have been cleared of missile and fire hazards.

- Tools and test equipment are distributed throughout prime spaces.

- Technical manuals are on station and are readily available.

- All voice communications circuits associated with ECC have been checked out and are usable.

- All casualty control kits are complete and have been stowed correctly.

- All spaces are completely damage-control ready; for example, fire bottles, compartment lists, and battle lanterns are properly stowed and ready for use.

- All spaces have an ECC manual or folder tailored for their particular requirements.

- Actual drills instead of simulations are conducted as frequently as is practical, with the commanding officer's permission.

2. Direct and positive control is established at the beginning of every electronics casualty control situation. When general quarters is sounded, the ECC and all stations must be promptly reamed and personnel must don proper battle dress. The primary ECC should

take control immediately. The following basic actions are normally part of the ECC center's responsibilities:

- Establishing immediate communications with all assigned stations.
- Ensuring that all personnel are accounted for and ready for battle.
- Maintaining positive communication with applicable electronics spaces. This requires making a communication check (phone check) every 3 minutes if no other traffic exists. Using a predetermined sequence of answering, the phone talker calls and records (checks off) results. The ECC supervisor should track this procedure closely to be sure communication is maintained.
- After a hit (simulated or actual), running an immediate phone check. After the phone check, all electronic spaces (manned and unmanned) must be checked thoroughly for damage. ECC will dispatch a minimum of two investigators to check known damaged spaces (including manned spaces that fail to respond to phone check). Unmanned spaces are checked by personnel in manned spaces, usually by a prearranged assignment. Checks of unmanned spaces will be made only by, or as directed by, ECC.
- Maintaining precise monitoring of equipment, personnel, and casualties on a status board using standard damage-control symbols.
- Dispatching investigative teams, technical assistance, and parts assistance as applicable. All teams must use preestablished routes. This requires coordinating with damage control central (DCC) when the opening or closing of damage-control fittings is involved. DCC should provide permission for ECC to investigate the main deck and above.
- Providing backup assistance as necessary by assigning personnel within the ECC organization or by coordinating other assistance, such as medical, damage control, and repair teams, through damage control central.

## **Secondary ECC**

The secondary ECC is the first backup to the primary ECC. This alternate is necessary to maintain casualty control if the primary ECC becomes ineffective because of personnel casualties, communication problems, flooding, fire, and such, that result from some type of battle damage.

Personnel assigned to the secondary ECC are usually the assistant EMO or a senior CPO or petty officer, a status board plotter and phone talker, and a casualty investigation team. (If manning does not provide sufficient personnel to have teams in the secondary ECC, casualty investigation teams will be pulled from undamaged spaces.)

When the secondary ECC takes control, its responsibilities are the same as those of the primary ECC. The secondary ECC must maintain the precise status of equipment, systems, personnel, and casualties, matching the status indicated by the primary ECC. This means that the secondary ECC must closely monitor and record all status passed over the electronics casualty control communication circuits and the ship's announcing system MCs.

## **PERSONNEL ASSIGNMENTS**

Suppose an extremely bad casualty occurs that "knocks out" the primary ECC and the secondary ECC. What happens in this situation? Your electronics casualty control organization must have a descending order of control that coincides with the order of reporting-in during phone checks or casualty hits. In any situation involving loss of both the primary and secondary ECC centers, casualty control responsibilities pass to the next lower level in the ECC chain of command. The personnel in each manned station of electronics casualty control should monitor and record all status passed over the communications circuit to the best of their ability.

You must carefully consider a variety of factors when you assign personnel to the various reamed battle stations. You must take into account each person's effectiveness, versatility, and other possible assets to have the most suitable and efficient electronics casualty control organization. If you think carefully about these factors and make your assignments accordingly, the watch, quarter and station bills will contain the best combinations of personnel and duties.

## **INVESTIGATIVE TEAMS AND ASSISTANCE**

Casualties happen during both actual battles and simulated casualty control exercises. This means that casualties to electronic equipment or systems, spaces, and personnel must be expected and that some means of backup and casualty investigation must be assigned. For example, a battle hit is taken, and a phone check yields one or more spaces not answering; therefore, a casualty

exists. An investigation team must be dispatched immediately to identify, investigate, and correct (if possible) the casualty. Assigned investigators should be trained to handle all casualties within a space either by repairing the casualty themselves or by requesting whatever assistance they need.

Assistance may be from either within or outside of the ECC organization. Personnel within the ECC organization will be dispatched by ECC as necessary. The ECC will request and coordinate external assistance through damage control central. ECC must ensure that damage control central is kept aware of arrivals and departures, the applicable assistance team requested, and the status of the casualty.

## **ELECTRONICS CASUALTY CONTROL MANUAL**

Effective electronics casualty control depends on the proper preparation and training of the personnel involved in both operating and maintaining the ship's equipment. To establish an effective electronics casualty control program, each ship must have a comprehensive ECC manual. The following paragraphs describe a typical ECC manual and its basic contents.

### **Purpose of the Manual**

The casualty control manual (1) serves as a ready and rapid reference for technical details of the ship's electronics system installation and spaces and (2) provides data on available repair support material. For the manual to serve its purpose properly, you and your fellow senior personnel must ensure that all appropriate information concerning electronic systems, electrical power, spaces, distributions, damage control related items, and such, is documented in a format that will allow rapid retrieval of needed information.

Damage control manuals must also be distributed properly if they are to contribute to effective casualty control. You should give careful thought to where the manuals should be located. They should be quickly accessible to personnel entering any space. The primary ECC, secondary ECC, and each space determined to be an ECC center alternate must have a complete (master) ECC manual that covers all spaces. All other electronics spaces must have an ECC folder containing the pages that pertain to that space and are identical to the master ECC manual.

## **Content of the Manual**

Most information in a casualty control manual is common knowledge to some of the personnel of your division; so collecting this information will not require a great deal of research unless a major overhaul or alteration to equipments, systems, or spaces has occurred. Often when "common knowledge" information is critically required, those who have it are not available. Then someone must spend time locating data when the time should be spent on corrective action. Plan to prepare and update your casualty control manual during slack work periods, or task the duty sections to provide inputs. This will result in an up-to-date, well-organized reference that will be a great asset to your ECC program. Figure 5-1 shows a typical table of contents of an ECC manual.

The ECC folder must contain the following information:

- Fire-fighting equipment location
- First-aid equipment location
- Emergency destruction equipment location
- Ventilation controller location
- Escape routes (on large ships)
- Electronics emergency access routes
- Internal communications
- Technical manual locations and indexes
- Power distribution diagrams
- Signal distribution diagrams
- Gyro signal distribution diagrams
- Equipment air system diagrams
- Equipment coding system diagrams
- Antenna details

Each technician (or operator) must be able to find any item in the folder within a reasonable time (approximately 2 minutes) and must be able to physically locate anything listed in the folder for which he or she is responsible.

## **TRAINING**

Electronics casualty control training is essential in the achievement of battle readiness. This training is usually accomplished through casualty control

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**Figure 5-1.-Typical ECC manual table of contents.**

exercises (application of casualty control techniques). Most of the training will be done during the ship's regular underway time, underway training, and refresher training. The key to ECC training is frequent drills. This will keep the old-timers refreshed and will train new personnel.

As a senior technician, you must ensure that personnel working for you and within the electronics division receive the proper training, guidance, and support to achieve combat readiness. While such training may appear to be boring to subordinates, you and your seniors can and should make it interesting by using and mastering different simulated situations each time you have electronics casualty control training. Try to get your shipmates involved so they develop a positive attitude and feel that they are a part of an important ship function.

As you prepare ECC training for your personnel, be sure to cover at least the topics in the list below.

1. Preparations for getting underway.–This should include energizing and checking electronic equipment and systems for proper operation (in most situations, you and the operator will complete this together) and checking electronic spaces for missile hazards and fire hazards.

2. Investigation and reporting.–Conducting investigations for possible damage after any incident that may have caused damage to equipment or spaces.

3. Reports of electronic casualties.–Using the proper procedures for reporting equipment and personnel casualties.

4. Assistance to remote spaces.–Providing technical assistance to a remote station which has no technician, in which the technician has become a casualty, or in which the assigned technician needs assistance.

5. First aid for electrical shock–Administering first aid for electrical shock under all conditions.

6. Combatting class C fires.–Reporting, controlling, and extinguishing class C fires.

7. Equipment casualty repair.–Handling casualties under battle conditions.

8. Use of electronic test equipment.–Using test equipment safely.

9. Equipment casualty repair during loss of lighting.–Investigating casualties to equipment and making repairs during periods when normal lighting is lost.

10. Use of spare fuses.–Using spare fuses to repair casualties that result from momentary overloads.

11. Use of the casualty control manual and folders.–Using the casualty control folder and checking the completeness of the folder in all spaces.

12. Drawing emergency spare parts.–Using the proper procedure for drawing emergency repair parts under the coordination of damage control central and the supply department.

13. Use of alternate or emergency power.–Using alternate or emergency power properly.

14. Sound-powered phone casualty.–Reacting and using message slips if the phone system is knocked out.

15. Secondary and alternate ECC.–Transferring responsibility for electronics casualty control during general quarters.

16. Performance of primary and secondary ECCs.–Maintaining an efficient casualty control system in the primary and secondary ECCs.

17. Cleaning procedures for broken radioactive tubes.–correctly cleaning up broken radioactive tubes.

Type commanders and fleet training groups have refresher training exercise information. Get this information and read it so that you understand the simulated situations, procedures, and exercise grading for each of the areas listed.

Casualty control is the active onboard management of all the elements (such as personnel, parts, manuals, and equipment) to keep your electronics division functioning as it should under battle conditions. This is your responsibility aboard your ship; and while practice and planning are a constant concern, it is combat that makes casualty control a reality.

We will now discuss a different aspect of electronics casualties–casualty reporting. Formal casualty reports must be made on a continuing basis, and only your conscientious attention will allow fleet management to provide proper support.

## **CASUALTY REPORTING**

The preceding section covered electronics casualty control from the preparation standpoint. This section discusses casualty reporting, an important and continuing part of the casualty report (CASREP) system.

The Navy is a large part of our nation's defense, so we must be ready to serve it well during peacetime or

wartime. Our electronic equipment and systems sometimes do not “cooperate” with us, resulting in a down or reduced status that decreases our ability to complete our mission. Electronic equipment and systems are vast, with different types, configurations, and quantities of equipment, using a tremendous number of different components, modules, and other items. Because the equipment and systems are so numerous and complex, you sometimes will not have enough present or properly trained personnel or the required parts on board to repair a casualty; or you may need technical assistance to correct the casualty. These situations are some of the many reasons the Navy has developed a system of casualty reporting (CASREP) and monitoring. With this system, you as a supervisor and technician, can let the Navy managers know where you need help (such as parts or assistance) so you can have your equipment or system on line and combat ready.

## **THE CASREP SYSTEM**

The casualty report (CASREP) has been designed to support the Chief of Naval Operations (CNO) and fleet commanders in the management of assigned forces. The effective use and support of U.S. Navy units and organizations require an up-to-date, accurate operational status for each unit. An important part of operational status is equipment casualty information. When casualties are reported, operational commanders and support personnel are made aware of significant equipment malfunctions that may degrade a unit’s readiness. The CASREP also identifies the unit’s need for technical assistance or replacement parts to correct the casualty. Once a CASREP is reported, the CNO, fleet commanders in chief (FLTCINCs), and the Ship’s Parts Control Center (SPCC) receive a hard copy of the CASREP message. Additionally, the CASREP message is automatically entered into the Navy status of forces database at each FLTCINC site, and corrected messages are forwarded to the CNO’s database.

As initial, update, correction, and cancellation CASREPs are submitted, managers are able to monitor the current status of each outstanding casualty. Through the use of high-speed computers, managers are able to collect data concerning the history of malfunctions and effects on readiness. This data is essential to the maintenance and support of units dispersed throughout the world.

Unit commanders must be aware that alerting seniors to their unit’s operational limitations, brought about by equipment casualties, is as important as

expediting the receipt of replacement parts and obtaining technical assistance. Both of these CASREP functions are needed to provide the information required to command and control U.S. Navy forces and to maintain the units in a truly combat ready status. Support from every level, including intermediate and unit commanders, is essential to maintaining the highest level of combat readiness throughout the Navy.

## **GENERAL RULES AND PROCEDURES FOR CASREPs**

A casualty is defined as an equipment malfunction or deficiency that cannot be corrected within 48 hours and that fits any of the following categories:

- Reduces the unit’s ability to perform a primary mission.
- Reduces the unit’s ability to perform a secondary mission.
- Reduces a training command’s ability to perform its mission, or a significant segment of its mission, and cannot be corrected or adequately accommodated locally by rescheduling or double-shifting lessons or classes.

## **TYPES OF CASREPS**

The CASREP system contains four different types of reports: INITIAL, UPDATE, CORRECT, and CANCEL. These reports are submitted using a combination of two or more messages, depending on the situation and contributing factors. The four types of reports are described as follows:

1. The INITIAL CASREP identifies, to an appropriate level of detail, the status of the casualty and parts or assistance requirements. Operational staff authorities need this information to set proper priorities for the use of resources.
2. The UPDATE CASREP contains information similar to that submitted in the Initial report and is used to submit changes to previously submitted information.
3. The CORRECT CASREP is submitted when equipment that has been the subject of casualty reporting is repaired and back in operational condition.
4. The CANCEL CASREP is submitted at the beginning of an availability period when equipment that has been previously reported is scheduled to be repaired during the availability. Outstanding casualties that will not be repaired during the availability will not be

canceled and will be subject to normal follow-up casualty reporting procedures.

## CASUALTY CATEGORIES

A casualty category (2, 3, or 4) is associated with each reported equipment casualty to reflect the urgency or priority of the casualty. The casualty category, although not a readiness rating, is directly related to the unit's Equipment Status Resource-Specific Categories [explained in chapters 5 and 6 of NWP 10-1-11, Status of Resources and Training System (SORTS)] in primary and secondary missions that are affected by the casualty. NAVEDTRACOM activities use four casualty categories (1, 2, 3, or 4). In this chapter we discuss only non-NAVEDTRACOM activities.

The casualty category (2, 3, or 4) is based upon the specific casualty situation being reported and may not necessarily agree with the unit's overall readiness status. The casualty category is reported in the CASUALTY set (section of the CASREP) and is required in all CASREPs.

Figure 5-2 shows a decision logic tree that provides a logical approach in determining the casualty category and whether or not a CASREP is required. Figure 5-3 shows the criteria for determining the casualty category.

## MESSAGE FORMAT

A CASREP message consists of one or more sets that contain the information required to report the particular casualty. These data sets are preceded by a standard Navy message header consisting of precedence, addresses, and classification. Specific guidelines for both the message header and data sets to be used are contained in chapter 4 of NWP 10-1-10, Operational Reports. Detailed information for typing each type of casualty report (INITIAL, UPDATE, CORRECT, and CANCEL), with examples of CASREP situations for each type, is also provided.

The CASREP message is always serialized with the MSGID (message identification) set, that appears immediately after the message classification line. The serial numbers are sequential from 1 through 999 for each CASREP originated by a unit. These serial numbers are not repeated until a new sequence of numbers 1 through 999 has begun. A new sequence of numbers starts after the unit has submitted CASREP message number 999.

The date-time group (DTG) of the CASREP message transmission is the effective time ("as of time")

of CASREP. Follow-up CASREP messages (UPDATE, CORRECT, or CANCEL) will reference the INITIAL CASREP message DTG.

Because of the importance and priority of CASREP message transmission, your CASREP messages must be transmitted even under MINIMIZE conditions. Use standard naval telecommunications systems (NTS) service procedures in correcting any messages having transmission errors.

## CASREP REPORTING CRITERIA

Each type of CASREP has own its reporting criteria, which we have described below.

### INITIAL CASREP

Any time you prepare an INITIAL CASREP, remember the following criteria:

1. Submit only one initial casualty in the INITIAL CASREP; if some of the required data is not available at reporting time, use your best estimate in the INITIAL CASREP and correct your estimate as soon as possible in an UPDATE CASREP.

2. In an Initial CASREP, identify, to the appropriate level of detail, the status of the equipment, parts, and assistance requirements. This is essential to allow operational and staff authorities to apply the proper priority to necessary resources.

3. You may also submit an Initial CASREP if you only need outside assistance; i.e., no parts are required to correct the equipment casualty.

4. When a casualty results from inadequate general-purpose electronic test equipment (GPETE) or preventive maintenance (PMS), list the affected system as the subject of the INITIAL CASREP, and report GPETE or PMS as the cause in an AMPN (Amplification) data set.

5. Use an ASSIST data set to report whether or not you need outside assistance to repair an equipment casualty.

6. When you need assistance or parts to repair a casualty, report schedule information in the RMKS set for a full 30-day period, beginning on the earliest date that you can receive the assistance or parts. You may also report any effect the casualty is expected to have on your unit's employment during the 30-day period.

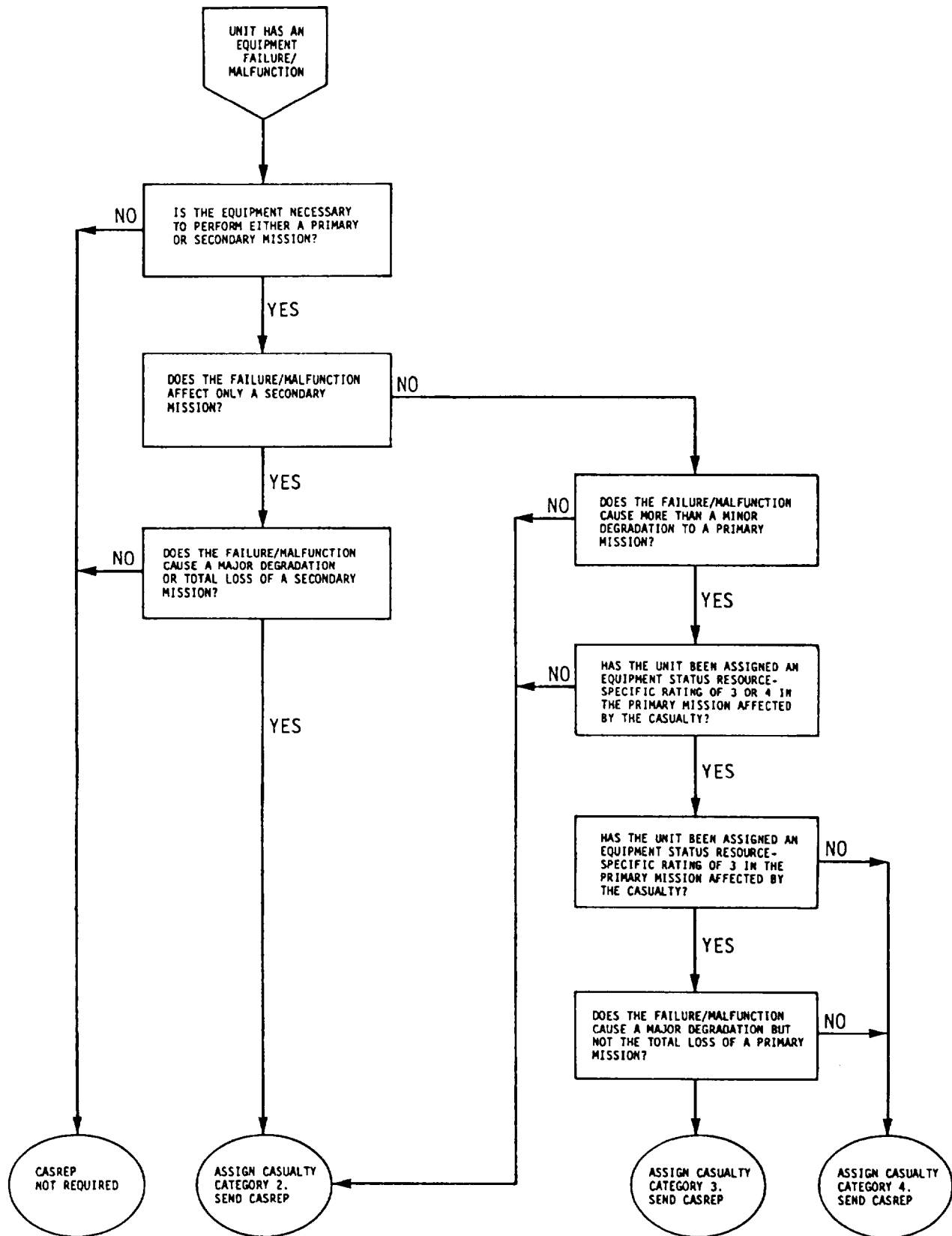


Figure 5-2.-Casualty category decision tree.



## UPDATE CASREP

With the exception of the CASUALTY and ESTIMATE sets, you need to report in the UPDATE CASREP only previously unreported casualty information or information that has changed (or was reported in error). In most cases, you may change information in a previously reported data set by merely submitting the same data set again with the corrected information. You must submit an UPDATE CASREP for a casualty when any of the following criteria apply:

1. There is a need to complete information reporting requirements or to revise previously submitted information.
2. The casualty situation changes; for example, the estimated repair date has changed, parts status has changed significantly, additional assistance is needed, and so on.
3. Additional malfunctions are discovered in the same item of equipment.
4. All parts ordered to repair the equipment are received.
5. Upon receipt of any significant part or equipment, inclusion of the date of receipt is required.

There can only be one outstanding CASREP for each item of equipment. Additional problems or malfunctions on the same item must be reported using an UPDATE CASREP and do not require the submission of a new INITIAL CASREP.

Each casualty being updated in an UPDATE CASREP must begin with a CASUALTY set followed by one or more sets that provide information concerning that casualty.

An AMPN set must be used (immediately following the ESTIMATE set) to report the receipt of parts previously reported as being required to repair a casualty.

## CORRECT CASREP

You must submit a CORRECT CASREP when equipment that has been the subject of a casualty report is repaired and back in operational condition. When you use a CASREP to report the correction of a casualty situation, include the following information in an AMPN set:

1. The delay, expressed in hours, in correcting the casualty because of parts unavailability, caused by the supply system.

CASUALTY CATEGORY	EQUIPMENT CRITERIA
2*	<ol style="list-style-type: none"> <li>a. A deficiency exists in mission essential equipment which causes a minor degradation in any primary mission, or a major degradation or total loss of a secondary mission.*</li> <li>b. The unit must have reported an Equipment Status Resource-Specific Rating of 2, 3, or 4 in primary missions affected by this casualty.</li> </ol>
3	<ol style="list-style-type: none"> <li>a. A deficiency exists in mission essential equipment which causes a major degradation but not the loss of a primary mission.</li> <li>b. The unit must have reported an Equipment Status Resource-Specific Rating of 3 or 4 in primary missions affected by this casualty.</li> </ol>
4	<ol style="list-style-type: none"> <li>a. A deficiency exists in mission essential equipment that is worse than casualty category 3, and causes a loss of at least one primary mission.</li> <li>b. The unit must have reported an Equipment Status Resource-Specific Rating of 4 for a primary mission affected by this casualty.</li> </ol>
*Casualties affecting a secondary mission shall always have a casualty category of 2.	

Figure 5-3.-Casualty categories and criteria.

2. A final parts status, including a list of all parts requests and dates received.

3. The number of man-hours expended in correcting the casualty.

### **CANCEL CASREP**

Your CANCEL CASREPs must include the reason for cancellation. For example, if you cancel the CASREP because an equipment will be repaired during an availability, you must identify the scheduled availability (location and date during which a casualty is expected to be repaired) in an AMPN set immediately following the CASUALTY set.

The addresses listed on CASREP messages are those of commands, activities, and the like, that are concerned with your unit's casualty. One or more may be a command or activity that will expedite the assistance you need. These addresses will vary with major geographical locations, such as Pacific, Atlantic, Caribbean, and Mediterranean. The senior operational commander, immediate operational commander, and cognizant type commander, or designated deputy, must be action addressees on all CASREPs. The appropriate aviation type commander must be included as an information addressee on all CASREPs from naval air stations and facilities. Special addresses, associated with selected equipment types, are given in chapter 4 of NWP 10-1-10.

### **COMMON REPORTING ERRORS**

A lot of time and effort goes into writing a CASREP message. Ensure that the effectiveness of your CASREP message is not degraded by some of the common reporting errors. As a CASREP drafter, you should be alert to these common errors:

1. Not listing the work center and job sequence number (JSN).

2. Incorrect determination of the readiness rating categories.

3. Not listing the specific operational capability that has been degraded.

4. Omitting the estimated time to repair (ETR) or reporting it as "unknown."

5. When parts are required but not on board, leaving out the phrase "Parts plus ( ) hours" when entering the ETR.

6. Not identifying the specific loss of capability in the primary mission area; for example, "loss of one-third of liquid nitrogen production capability."

7. Using incomplete or incorrect message addresses.

8. Not providing UPDATE CASREPs every 30 days when the ETR is past (or known to be invalid), when a significant change in CASREP status occurs, or upon receipt of material required to correct the casualty.

9. Listing multiple pieces of equipment (incorrectly) as a single CASREP; for example, "NRS 12, 18, and 23 SRC20 UHF Transceivers."

10. Submitting multiple CASREPs as the same casualty; for example, three separate CASREPs submitted on the same radar power supply: one for a defective transformer, one for a shorted SCR, and one for a current limiting module.

11. Indicating a relationship with PMS that is not correct; for example, the maintenance index page (MIP) referenced is for different equipment; or the problem is noted as having been discovered in the course of PMS, whereas the circumstances and list of parts indicated that a casualty had already occurred.

### **REFERENCES**

*Information for the Conduct of Electronics Casualty Control Exercises*, J-XX-ET, Fleet Training Group, Guantanamo Bay, Cuba, n.d.

*Combat Systems Electronics Administration Course - LANTFLT*, Course Number A-4B-0019, Fleet Training Center, Norfolk Va., 1987.

*Operational Reports*, NWP 10-1-10, Office of the Chief of Naval Operations, Washington, D.C., 1987.

*Ship Exercises*, FXP-3, Fleet Training Group, Guantanamo Bay, Cuba, n.d.

## CHAPTER 6

# QUALITY ASSURANCE

As you progress up the ladder of responsibility as an Electronics Technician, you will become more involved in the field of quality assurance (QA). As an ET1 or ETC, you will be responsible for ensuring that the work performed by your technicians and by outside help is completed with the highest quality possible. Most of the personnel in the ET rating take pride in the performance of their jobs, and they normally strive for excellence. However, every individual has an occasional off day. For example, your best technician may have had the midwatch the previous night. When an individual is tired and not 100 percent alert, oversights or mistakes are easy to make. One of your many responsibilities as the work group or work center supervisor will be to ensure that all corrective action performed is done correctly and meets prescribed standards. Improper performance of repairs or installations could endanger an expensive piece of equipment or cause another piece of equipment to fail prematurely. A well-organized QA and inspection program will minimize the impact of a moment of carelessness or inattention. In this chapter we will familiarize you with the purpose, basic organization, and mechanics of the quality assurance (QA) program.

You may be assigned as a QA representative or collateral duty inspector from time to time. As a work center supervisor, you will be responsible for the quality control program in your workspaces. It is important that you become quality conscious. To make any program successful, you will have to know and understand the QA program and obtain the cooperation and participation of all your personnel. This requires you to ensure that all tests and repairs conform to their prescribed standards. In addition, you as a supervisor must train all of your personnel in quality control (QC).

### QUALITY ASSURANCE PROGRAM

The QA program was established to provide personnel with information and guidance necessary to administer a uniform policy of maintenance and repair of ships and submarines. The QA program is intended to impart discipline into the repair of equipment, safety

of personnel, and configuration control; thereby enhancing the ship's readiness.

The various QA manuals set forth minimum QA requirements for both the surface fleet and the submarine force. If more stringent requirements are imposed by higher authority, such requirements take precedence. If conflict exists between the QA manual and previously issued letters and transmittals by the appropriate force commander, the QA manual takes precedence. Such conflicts should be reported to the appropriate officials.

The instructions contained in the QA manual apply to every ship and activity of the force. Although the requirements apply primarily to the repair and maintenance done by the force intermediate maintenance activities (IMAs), they also apply to maintenance done aboard ship by the ship's force. In all cases, specifications must be met. If specifications cannot be met, a departure from specifications request must be completed and reported. This will be discussed later in the chapter.

Because of the wide range of ship types and equipment and the varied resources available for maintenance and repair, the instructions set forth in the QA manual are necessarily general in nature. Each activity must implement a QA program to meet the intent of the QA manual. The goal should be to have all repairs conform to QA specifications.

### PROGRAM COMPONENTS

The basic thrust of the QA program is to ensure that you comply with technical specifications during all work on ships of both the surface force and the submarine force. The key elements of the program are as follows:

1. Administration. This includes training and qualifying your personnel, monitoring and auditing programs, and completing the QA forms and records.
2. Job Execution. This includes preparing work procedures, meeting controlled material requirements, requisitioning material, conducting in-process control of fabrication and

repairs, testing and recertifying, and documenting any departure from specifications.

## CONCEPTS OF QUALITY ASSURANCE

The ever-increasing technical complexity of present-day surface ships and submarines has spawned the need for special administrative and technical procedures known collectively as the QA Program. The program's concept is fundamentally the prevention of defects. This encompasses all events from the start of maintenance operations until their completion and is the responsibility of all maintenance personnel. Achievement of QA depends on preventing maintenance problems through your knowledge and special skills. As a supervisor, you must consider QA requirements whenever you plan maintenance. The fundamental rule for you to follow for all maintenance is that **TECHNICAL SPECIFICATIONS MUST BE MET AT ALL TIMES.**

Prevention is concerned with regulating events rather than being regulated by them. It relies on eliminating maintenance failures before they happen. This extends to safety of personnel, maintenance of equipment, and virtually every aspect of the total maintenance effort.

*Knowledge* is obtained from factual information. Quality assurance knowledge is acquired through the proper use of data collection and analysis programs. The maintenance data collection system provides maintenance managers with unlimited quantities of factual information. Their correct use of this information provides them with the knowledge required to achieve maximum readiness of aircraft and weapon systems.

*Special skills*, normally not possessed by production personnel, are required by a staff of trained personnel who analyze data and supervise QA programs.

The QA program provides an efficient method for gathering and maintaining information on the quality characteristics of products and on the source and nature of defects and their impact on the current operation. It permits decisions to be based on facts rather than on intuition or memory. It provides comparative data that will be useful long after the details of particular times or events have been forgotten. Quality assurance requires that certain individuals have both the authority and the responsibility for overseeing QA related actions.

A properly functioning QA program points out problem areas to maintenance managers so they can take appropriate action to accomplish the following:

1. Improve the quality, uniformity, and reliability of the total maintenance effort
2. Improve the work environment, tools, and equipment used in the performance of maintenance
3. Eliminate unnecessary man-hour and dollar expenses
4. Improve the training, work habits, and procedures of maintenance personnel
5. Increase the excellence and value of reports and correspondence originated by the maintenance activity
6. Distribute required technical information more effectively
7. Establish realistic material and equipment requirements in support of the maintenance effort

To obtain full benefits from a QA program, teamwork must be achieved first. Blend QA functions with the interest of the total organization and you produce a more effective program. Allow each worker and supervisor to use an optimum degree of judgment in the course of assigned daily work; a person's judgment plays an important part in the quality of his or her work. Quality assurance techniques supply each person involved with a job with information concerning actual product quality. This information provides a challenge to the person to improve the quality of the work. The resulting knowledge encourages the best efforts of all your maintenance personnel.

Quality assurance is designed to serve both management and production equally. Management is served when QA monitors the complete maintenance effort of the department, furnishes factual feedback of discrepancies and deficiencies, and provides the action necessary to improve the quality, reliability, and safety of maintenance. Production is served by having the benefit of collateral duty inspectors formally trained in inspection procedures; it is also served in receiving technical assistance in resolving production problems. Production personnel are not relieved of their basic responsibility for quality work when you introduce QA to the maintenance function. Instead, you increase their responsibility by adding accountability. This accountability is the essence of QA.

## GOALS

The goals of the QA program are to protect personnel from hazardous conditions, increase the time between equipment failure, and ensure the proper repair of failed equipment. The goals of the QA program are intended to improve equipment reliability, safety of personnel, and configuration control. Achievement of these goals will ultimately enhance the readiness of ship and shore installations. There is a wide range of ship types and classes in the fleet, and there are equipment differences within ship classes. This complicates maintenance support and increases the need for a formalized program that will provide a high degree of confidence that overhaul, installations, repairs, and material will consistently meet conformance standards.

## THE QA LINK TO MAINTENANCE

What does QA have to do with repair work? Accomplishment of repairs and alterations according to technical specifications has been a long-standing requirement in U.S. Navy ships. Ultimate responsibility to ensure this requirement is met rests with the person performing the maintenance. To do the job, a worker must be

1. properly trained,
2. provided with correct tools and parts,
3. familiar with the applicable technical manuals and plans, and
4. adequately supervised.

These elements continue to be the primary means of assuring that maintenance is performed correctly. As a supervisor, you can readily see where you fit in.

Once the need for maintenance is identified, you must consider QA requirements concurrently with the planning and performing of that maintenance. Technical specifications will come from a variety of sources, and determining which specifications apply to the particular job will be the most difficult part of your planning effort. Once you make that determination, the maintenance objective becomes two-fold:

1. Ensure that the maintenance effort meets all specifications.
2. Ensure that the documentation is complete, accurate, and auditable.

If you consider the philosophy of QA, you will find it is unique in that it does not recognize degrees of success. Quality assurance is a pass-fail process! In our

educational system, a student who is 95 percent correct in answering exam questions walks home with straight A's. By contrast, if one of your workers is not 95 percent correct in meeting maintenance standards, he or she has not only failed miserably, but has guaranteed that the work must be redone. This will cost you additional time, effort, and money. It is vital that you approach maintenance planning from the standpoint of first-time quality.

## THE QUALITY ASSURANCE ORGANIZATION

The QA program for naval forces is organized into different levels of responsibility. For example, the COMNAVSURFPAC QA program is organized into the following levels of responsibility: type commander, readiness support group/area maintenance coordinator, and the IMAs. The QA program for the submarine force is organized into four levels of responsibility-type commander, group and squadron commanders, IMA commanding officers, and ship commanding officer/officers in charge. The QA program for Naval Surface Force for the Atlantic Fleet is organized into five levels of responsibility—force commander, audits, squadron commanders, IMAs, and force ships.

The QA program organization (Navy) begins with the **commanders in chief of the fleets**, who provide the basic QA program organization responsibilities and guidelines.

The **type commanders (TYCOMs)** provide instruction, policy, and overall direction for implementation and operation of the force QA program. Type commanders have a force QA officer assigned to administer the force QA program.

The **commanding officers (COs)** are responsible to the force commander for QA in the maintenance and repair of their ships. The CO is responsible for organizing and implementing a QA program within the ship to carry out the provisions of the TYCOM's QA manual. Quality assurance is a collateral duty assignment except where the manpower authorization provides QA billets.

The CO ensures that all repair actions performed by ship's force conform to provisions of the QA manual as well as to other pertinent technical requirements. (Level I certified ships maintain continuity of Level I [nuclear and non-nuclear] certification during the operating cycle and assure that all repair actions performed within Level I boundaries are completed and documented as set forth by the QA manual.)

The CO ensures that all work requests requiring special controls are properly identified and that applicable supporting documentation is provided to the maintenance or repair activity using the applicable QA form.

The CO also ensures that departures from specifications are reported, required audits are conducted, and adequate maintenance is performed for the material condition necessary to support continued unrestricted operations.

The **quality assurance officer (QAO)** is responsible to the commanding officer for the organization, administration, and execution of the ship's QA program according to the QA manual.

The QAO is responsible for the following:

- Coordinating the ship's QA training program.
- Ensuring that QA training becomes an integral part of the ship's training program.
- Maintaining ship's QA records and test and inspection reports.
- Maintaining auditable departure from specifications records, and reviewing procedures and controlled work packages prepared by the ship.
- Conducting QA audits as required, and following up on corrective actions to ensure compliance with the QA program.
- Preparing QA/QC (quality assurance/quality control) reports to higher authority.

The **ship's quality control inspectors (SQCI)**s, usually work center supervisors and two others from the work center, must have a thorough understanding of the QA program. Some of the other responsibilities an SQCI will have are as follows:

- Inspect all work for conformance to specifications.
- Train personnel in QC.
- Maintain ship records to support the QA program.
- Ensure that only calibrated equipment is used in acceptance testing and inspection of work.
- Initiate departure from specification reports (discussed later) when required.

- Ensure that all inspections beyond the capabilities of the shop's QA inspector are performed and accepted by IMA prior to final acceptance and installation of the product by the ship.
- Witness and document all tests.
- Ensure that all materials or test results that fail to meet specifications are recorded and reported.
- Report all deficiencies and discrepancies to the ship's QA coordinator (keeping the division officer informed).
- Develop controlled work packages for all ship repair work requiring QA controls.

More on SQCI duties will be discussed later in this chapter, because this will more than likely be the area you will be associated with.

## **RESPONSIBILITIES FOR QUALITY OF MAINTENANCE**

Although the CO is responsible for the inspection and quality of material within a command, he or she depends on the full cooperation of all hands to meet this responsibility. The responsibility for establishing a successful program to attain high standards of quality workmanship cannot be discharged by merely creating a QA division within a maintenance organization. To operate effectively, this division requires the full support of everyone within the organization. It is not the instruments, instructions, and other facilities for making inspections that determine the success or failure in achieving high standards of quality; it is the frame of mind of all personnel.

Quality maintenance is the name of the game. You, as a supervisor, must know that high-quality work is vital to the effective operation of any maintenance organization. To achieve this high quality work each of your personnel must know not only a set of specification limits, but also the purpose of those limits.

The person with the most direct concern for quality workmanship is you—the production supervisor. This stems from your responsibility for the proper professional performance of your assigned personnel. You must establish procedures within the work center to ensure that all QA inspection requirements are complied with during all maintenance evolutions. In developing procedures for your work center, keep in mind that

inspections normally fall into one of the three following inspection areas:

1. **RECEIVING OR SCREENING INSPECTIONS.** These inspections apply to material, components, parts, equipment, logs and records, and documents. These inspections determine the condition of the material, proper identification of each item, maintenance requirements, disposition, and correctness of accompanying records and documents.
2. **IN-PROCESS INSPECTIONS.** These inspections are specific QA actions that are required during maintenance or actions in cases where satisfactory task performance cannot be determined after maintenance has been completed. These inspections include witnessing, application of torque, functional testing, adjusting, assembling, servicing, and installation.
3. **FINAL INSPECTIONS.** These inspections comprise specific QA actions performed following the completion of a task or series of tasks. QA inspection of work areas following task completion by several different personnel is an example of a final inspection.

## **SHIP QUALITY CONTROL INSPECTOR (SQCI)**

The inspector is the front line guardian of adherence to quality standards. In the shops and on the deck plates, the SQCIs must constantly remind themselves that they can make a difference in the quality of a product. They must be able to see and be recognized for their contributions in obtaining quality results.

As a work center supervisor, you will be responsible for the QA program in your work spaces. You must realize that QA inspections are essential elements of an effective QA program. You are responsible to your division officer and the QAO for coordinating and administering the QA program with your work center. You are responsible for ensuring that all repaired units are ready for issue. This doesn't mean you have to inspect each item repaired in your shop personally; you should have two reliable, well-trained technicians to assist you in QA inspections. To avoid the many problems caused by poor maintenance repair practices or by replacement of material with faulty or incorrect material, you must take your position as an SQCI very seriously. When you inspect a certain step of an installation, ensure to the utmost of your knowledge and

ability that the performance and product meet the required specifications and that installations are correct.

Most commands that have a QA program will issue you a special card that will identify you as a qualified SQCI for your command. Each of your shop SQCIs will also be assigned a personal serial number by the QAO, as proof of certification. Each of them should use this serial number on all forms and tags that require initials as proof that certified tests and inspections were made. This will provide documented proof and traceability that each item or lot of items meets the material and workmanship for that stage of workmanship. Also, you will be given a QCI stamp so that you can stamp the QCI certification on the forms or tags as a checkoff of a particular progressive step of inspection or final job completion. The stamp will also serve as proof of inspection and acceptance of each satisfactory shop end product. This stamp may have your command identification and a QCI number that is assigned and traceable to you.

As an SQCI, you should be thoroughly familiar with all aspects of the QA program and the QC procedures and requirements of your specialty.

You will be trained and qualified by the QAO according to the requirements set forth by your applicable QA manual and the quality control requirements applicable to your installation. The QAO will interview you to determine your general knowledge of QA and your attitude toward the QA discipline. You will have to pass a written examination and also demonstrate knowledge of records, report completion, and final requirements.

You will report to the appropriate QA supervisors while keeping your division officer informed of matters pertaining to QA work done in the shop. You and your other work center QCIs will be responsible for the following:

1. Developing a thorough understanding of the QA program.
2. Ensuring that all shop work performed by your work center personnel meets the minimum requirements set forth in the latest plans, directives, and specifications of higher authority and that controlled work packages (CWPs) are properly used on repair work.
3. Ensuring that all work center personnel are familiar with applicable QA manuals by conducting work center/division training,

4. Maintaining records and files to support the QA program, following the QA manual.
5. Assuring that your work center and, when applicable, division personnel do not use measuring devices, instruments, inspection tools, gauges, or fixtures for production acceptance and testing that do not have current calibration stickers or records attached or available.
6. Performing quality control inspections of each product manufactured or repaired by your work center.
7. Assisting your division officer and QAO in conducting internal audits as required and taking corrective action on noted discrepancies.

Alternate SQCIs are usually assigned as backups to the regular SQCIs. Their qualifications and responsibilities are the same as those of the regularly assigned SQCI.

#### **WORK CENTER CONTROLLED MATERIAL PETTY OFFICERS (CMPO)**

As a supervisor you must also ensure that procedures governing controlled material are followed. You can do this by having one or more of your work center personnel trained in the procedures for inspecting, segregating, stowing, and issuing controlled material. When they have completed their training, designate them as controlled material petty officers (CMPOs).

#### **SHOP CRAFTSMAN**

As stated earlier, the person doing the work, whether it be manufacturing or repairing, is responsible for following all written guidelines. He or she is responsible to you when questions arise about the work being performed. Ensure that your workers know to stop and seek work instructions or clarification from you when questions or conditions arise which may impede the successful completion of the task or job.

A good lesson to teach over and over to all your workers is to strive to achieve first-time quality on every assigned task. This will not only instill pride and professionalism in their work but will also help ensure a quality product.

#### **QUALITY ASSURANCE REQUIREMENTS, TRAINING AND QUALIFICATION**

A comprehensive training program is the next step in an effective QA program. For inspectors to make a difference, they must be both trained and certified. They must have formal or informal training in inspection methods, maintenance and repair, and certification of QA requirements. Costly mistakes, made either from lack of knowledge or improper training, can be entirely eliminated with a good QA training program at all levels of shop or work group organization. Before personnel can assume the responsibility of coordinating, administering, and executing the QA program, they must meet certain requirements. Personnel assigned to the QA division or quality control personnel you have assigned in your work center, such as SQCIs, CMPOs, or their alternates, should be highly motivated toward the QA program. It is imperative that a qualification and requalification program be established for those personnel participating in the program. Where military standards and NAVSEA technical documents require formal technical training or equivalent, those requirements must be met and personnel qualification vigorously and effectively monitored to ensure that qualifications are updated and maintained. When formal training for a specific skill is not a requirement, the guidelines of the QA manual maybe used as a basis for training to ensure that personnel are provided with the necessary expertise to perform a required skill. Personnel who obtain a QA qualification must undergo periodic QA training and examinations, both oral and written, to maintain the qualification. We will discuss this procedure in the following paragraphs.

#### **QUALITY ASSURANCE OFFICER**

The QAO is an individual whose primary duty, assigned by the commanding officer in writing, is to oversee the QA program. The QAO ensures that personnel assigned to perform QA functions receive continuous training in inspecting, testing, and quality control methods specifically applicable to their area of assignment. The QAO also ensures that SQCIs receive cross training to enable them to perform QA functions outside their assigned areas. This training includes local training courses, on-the-job training (OJT), rotation of assignments, personnel qualification standards (PQS), and formal schools.

Whenever possible, the QAO receives formal training according to the QA manual. He or she is responsible to the repair officer for planning and



executing a QA training program for the various qualifications required for QA. The QAO personally interviews each perspective SQCI to ensure that the person has a thorough understanding of the QA mission.

## **REPAIR OFFICER (RO)**

The RO maintains qualified personnel in all required ratings for the QA program in his or her department. He or she also ensures that personnel assigned to the repair department are indoctrinated and trained in QA practices and requirements.

## **DIVISION OFFICERS**

Division officers ensure that their divisional personnel receive training and are qualified in the QA process and maintain those qualifications. They make sure that all repairs, inspections, and production work requiring a witness are witnessed by division work center QC inspectors and that all test records are completed and signed. Division officers ensure that all test personnel observe all safety precautions pertaining to the specific equipment and wear personal safety equipment at all times while conducting these evolutions. They also make sure that test equipment, if required, is properly calibrated and that adequate overpressure protection is provided during tests in division spaces.

## **QUALITY ASSURANCE SUPERVISORS**

Quality assurance supervisors are senior petty officers who have been properly qualified according to the QA manual. They have a thorough understanding of the QA function and are indoctrinated in all aspects of those coordinating, administering, and auditing processes of the QA program. Quality assurance supervisors train all SQCIs and CMPOs and ensure their recertification upon expiration of qualifications. Quality assurance supervisors also administer written examinations to all perspective SQCIs and to SQCIs who require recertification to ensure a thorough understanding of the QA program.

## **SHIP QUALITY CONTROL INSPECTORS**

SQCIs are trained by the QA supervisors in matters pertaining to the QA program. An inspector must be equally as skilled as the craftsman whose work he or she is required to inspect. Not only should the inspector know the fabrication or repair operation and *what*

*workers are required to do, but also how to go about doing it.*

To recognize a product quality characteristic, the SQCI must be given certain tools and training. Tools of their trade should include measuring devices and documentation. Their training is both formal (documented course of instruction) and informal (OJT). They must pass a written test given by the QA supervisors, as well as an oral examination given by the QAO. The written exam includes general requirements of the QA program and specific requirements related to their particular specialty. Successful completion of the shop qualification program course for QC inspectors will fulfill this requirement. The QA supervisor may also administer a practical examination to perspective SQCIs in which they will have to demonstrate knowledge of records and report completion, and filing requirements. This will ensure that the SQCIs have a general knowledge of and a proper attitude toward the QA program.

## **CONTROLLED MATERIAL PETTY OFFICERS**

CMPOs are normally petty officers, E-4 or E-5, who are thoroughly familiar with controlled material requirements as outlined in the QA manual. They, too, are trained and qualified by a QA supervisor. The QAO will interview them, as he or she did for SQCIs, to see if they have a general knowledge of controlled material requirements.

The QA supervisor will give them a written test to ensure that they have sufficient knowledge of controlled material requirements and procedures to carry out their responsibilities effectively.

## **OPERATION OF A QUALITY ASSURANCE PROGRAM**

Initiating an effective, ongoing QA program is an all-hands effort. It takes the cooperation of all shop personnel to make the program work. As the shop or work group supervisor, you will be responsible for getting the program rolling.

The key elements are a good personnel orientation program, a comprehensive personnel training program, use of the proper repair procedures, and uniform inspection procedures. When you have organized the shop or work center and placed all these elements in practice, your QA program will be underway. These elements are discussed in the following paragraphs.

## PERSONNEL ORIENTATION

The best way to get the support of your personnel is to show them how an effective QA program will benefit them personally. Eliminating or reducing premature failures in repaired units and introducing high-reliability repairs will appreciably reduce their workload, saving them frustration and enhancing the shop's or work group's reputation. This program, as with any new program or change to an existing program, will probably meet with opposition from some shop personnel. By showing your shop personnel the benefits of a QA program, you greatly reduce opposition to the change.

## REPAIR PROCEDURES

Repair procedures may be defined as all of the action required to return an equipment to its proper operating condition after a defect has been discovered. Repair procedures include parts handling, disassembly, component removal or replacement, and assembly. Strictly adhering to the proper repair procedures will almost entirely eliminate premature failures. You, as shop supervisor or work group supervisor, and subordinate work center supervisors are responsible for ensuring that the proper procedures are used in handling all repairable units.

## QUALITY ASSURANCE TERMS AND DEFINITIONS

As a supervisor, you need to be able to talk to your personnel about quality assurance and have them be able to carry out your instructions promptly and properly. You need to promote the use of words and phrases pertaining to quality and related programs, thus improving the clarity in your communication with them about QA. To do this, you need to understand the terms frequently used throughout the QA program. Each TYCOM's QA manuals and MIL-STD-109 have a complete list of these terms, but the most frequently used terms are listed here:

- **Quality assurance.** Quality assurance (QA) is a system that ensures that materials, data, supplies, and services conform to technical requirements and that repaired equipments perform satisfactorily.
- **Quality control.** Quality control (QC) is a management function that attempts to eliminate defective products, whether they are produced or procured.

- **Acceptance.** Acceptance is when an authorized representative approves specific services rendered (such as a repair or manufactured part).
- **Calibration.** This is the comparison of two instruments or measuring devices, one of which is a standard of known accuracy traceable to national standards, to detect, correlate, report, or eliminate by adjustment any discrepancy in accuracy of the instrument or measuring device being compared with the standard.
- **Inspection.** This is the examination and testing of components and services to determine whether they conform to specified requirements.
- **In-process inspection.** This type of inspection is performed during the manufacture and repair cycle to prevent production defects. It is also performed to identify production problems or material defects that are not detectable when the job is complete.
- **Inspection record.** Inspection records contain data resulting from inspection actions.
- **Specifications.** A specification is any technical or administrative directive, such as an instruction, a technical manual, a drawing, a plan, or a publication, that defines repair criteria.
- **Audit.** An audit, as it applies to the QA program, is a periodic or special evaluation of details, plans, policies, procedures, products, directives, and records necessary to determine compliance with existing requirements.
- **Certified (Level I) material.** This is material that has been certified (as to its material and physical properties, as well as traceability to the manufacturer) by a qualified certification activity. This material has a material and identification control (MIC) number assigned along with a certification document.
- **Controlled material.** This is any material that must be accounted for and identified throughout the manufacturing or repair process. (See level of essentiality).
- **Controlled work package.** A controlled work package (CWP) is an assemblage of documents identified by a unique serial number that may contain detailed work procedures, purchase documents, receipt inspection reports, objective quality evidence, local test results, and any tags,

papers, prints, plans, and so on, that bear on the work performed. This will be discussed later in the chapter.

- **Departure from specifications.** This is a lack of compliance with any authoritative document, plan, procedure, or instruction. A detailed discussion will follow later in the chapter.
- **Documentation.** This is the record of objective evidence establishing the requisite quality of the material, component, or work done.
- **Level of essentiality.** A level of essentiality is a certain level of confidence required in the reliability of repairs made. The different levels of essentiality will be discussed later in the chapter.
- **Procedure.** A procedure is a written instruction designed for use in production and repair, delineating all essential elements and guidance necessary to produce acceptable and reliable products.
- **Process.** This is a set of actions written in a special sequential order by which a repair or maintenance action, a test, or an inspection is done using specific guidelines, tools, and equipment.
- **Reliability.** Reliability means the probability that an item will perform its intended function for a specified interval under stated conditions.
- **SUBSAFE.** The acronym SUBSAFE is a shorthand reference to the Submarine Safety Program, which provides a high level of confidence in the material conditions of the hull integrity boundary. SUBSAFE will be discussed later in the chapter.

## THE CONTROLLED WORK PACKAGE

To provide additional assurance that a quality product will result from the in-process fabrication or repair, the controlled work package (CWP) was developed. It provides QC techniques (requirements or procedures) and shows **objective quality evidence** (documentation) of adherence to specified quality standards. These requirements or procedures include both external (type commander) and internal (command-generated) information for work package processing and sign-off. The typical CWP that will arrive at your desk will have QA forms, departure from specifications forms, material deficiency forms, production task control forms, and QC personnel

sign-off requirements. You, and all the other work centers involved in the performance of the task, must review the contents of each package as well. When you review the package, check that the requirements specified for their accomplishment are correct, in a correct sequence, and soon. Each CWP covers the entire scope of the work process and is able to stand on its own. Traceability from the work package to other certification documentation is provided by the job control number (JCN).

You must ensure that the CWP is at the job site during the performance of the task. If the work procedure requires the simultaneous performance of procedure steps and these steps are done in different locations, use the locally developed practices to ensure that you maintain positive control for each step.

Immediately after a job is completed but before the tended unit gets underway, each assigned work center and the QAO will review the work package documentation for completeness and correctness. If you and your workers have been doing the assigned steps as stated, this should not be a problem. Ensure that all the verification signature blocks are signed. Make sure all references, such as tech manuals or drawings, are returned to the appropriate place.

## Enclosures

You will find a lot of documentation inside the CWP when it arrives at your desk. Inside will be process instructions, plans, technical drawings, and instructions pertinent to the production job at hand. Documents listed as references are not included in the CWP but must be available when required. You will also find a copy of applicable portions of references included in the CWT. The 4790/2R, Automated Work Request, is included in the CWP to provide complete documentation and reference back to the originating tended unit. You will use all of the documentation to perform the maintenance action, production task, or process assigned to your work center.

## Revisions

You can make minor corrections to the work procedure (as directed by local instructions) as long as they do not change the scope of the work being performed. However, if you need to change the original scope of the job, such as working on a part not originally intended to be worked on, you must initiate a **revision**. The revision cover sheet gives exact instructions on

adding, deleting, or changing steps in the work sequence.

## Addendums

Depending on the complexity of the task, it may be desirable to have two or more work centers working portions of the task concurrently. If so, Planning and Estimating (P&E) will initiate an addendum to the original CWP. The addendum will include all the headings of the CWP—references, material list, safety requirements, work sequence, and so forth. When you complete the work steps, include the addendum(s) with the CWP.

## LEVELS OF ESSENTIALITY, ASSURANCE, AND CONTROL

To provide your customers both repair quality and quality assurance, you as a supervisor and your maintenance personnel must understand and appreciate them and their operational environment. This will require that you and your personnel give serious thought and consideration to how a system's nonperformance may endanger personnel safety and threaten the ship's mission capability. For example, you are not going to be aboard the submarine as it does its deep dive to test hull integrity (and your hull packing work). You must stress to your workers how system essentiality, in an operation environment, equates with mission capability and personnel safety. In other words, workers must understand how the work they perform in a maintenance or repair environment can seriously affect the operational capabilities of the tended unit as well as the safety of the personnel aboard the unit. This is where the assigned levels of essentiality, assurance, and control come into play. What do we mean by these terms? We will discuss each in the following paragraphs.

## LEVELS OF ESSENTIALITY

A number of early failures in certain submarine and surface ship systems were traced to use of the wrong material. This led to a system for prevention involving levels of essentiality. A level of essentiality is simply a range of controls in two broad categories representing a certain high degree of confidence that procurement specifications have been met. These categories are

1. verification of material, and
2. confirmation of satisfactory completion of tests and inspections required by the ordering data.

Levels of essentiality are codes, assigned by the ship according to the QA manual, that indicate the degree to which the ship's system, subsystem, or components are necessary or indispensable in the performance of the ship's mission. Levels of essentiality also indicate the impact that catastrophic failure of the associated part or equipment would have on the ship's mission capability and personnel safety.

## LEVELS OF ASSURANCE

Quality assurance is divided into three levels: A, B, C. Each level reflects certain quality verification requirements of individual fabrication in process or repair items. Here, verification refers to the total of quality of controls, tests and inspections. **Level A** assurance provides the most stringent or restrictive verification techniques. This normally requires both quality controls and test or inspection methods. **Level B** assurance provides adequate verification techniques. This normally requires limited quality controls and may or may not require tests or inspections. **Level C** assurance provides minimum or "as necessary" verification techniques. This normally requires very little quality control or tests or inspections.

## LEVELS OF CONTROL

Quality control may also be assigned generally to any of the three levels—A, B, or C. Levels of control are the degrees of control measures required to assure reliability of repairs made to a system, subsystem, or component. Furthermore, **levels of control** (quality control techniques) are the means by which we achieve **levels of assurance**.

An additional category, which you will see when you work on periscopes, is Level I. This is reserved for systems that require **maximum confidence** that the composition of installed material is correct.

## CONTROLLED MATERIAL

Some material, as part of a product destined for fleet use, has to be systematically controlled from procurement through receipt, stowage, issue, fabrication, repair, and installation to ensure both quality and material traceability. Controlled material is any material you use that must be accounted for (controlled) and identified throughout the manufacturing and repair process, including installation, to meet the specifications required of the end product. Controlled material must be inspected by your CMPO for required attributes before you can use it in a system or component

and must have inspection documentation maintained on record. You must retain traceability through the repair and installation process. It requires special marking and tagging for identification and separate storage to preclude loss of control. The RO may designate as controlled material any material that requires material traceability.

Under this definition, controlled material has two meanings. The first meaning applies to items considered critical enough to warrant the label of controlled material. Your CMPOs will be responsible for inspecting the material when it is received, stowing it separately from other material, providing custody, and seeing that controlled assembly procedures are used during its installation. The term *controlled material* is used in reference to material either labeled “**SUBSAFE**” or classed in one of the three levels of essentiality. (Strictly speaking, **SUBSAFE** is not a level of essentiality.)

### **SUBSAFE**

To help you understand SUBSAFE, we will discuss a little of the background of the program. The Submarine Safety Program (hence, the SUBSAFE) was established in 1963 as a direct result of the loss of the USS *THRESHER*. The program is two-fold, consisting of both **material** and **operability** requirements. It provides a high level of confidence in the material conditions of the hull integrity boundary and in the ability of the submarines to recover from control surface casualties and flooding.

SUBSAFE requirements are split into five categories, which are devoted to

1. piping systems,
2. flooding control and recovery.
3. documentation,
4. pressure hull boundary, and
5. government-furnished material.

There are three SUBSAFE definitions you need to consider: SUBSAFE system, SUBSAFE boundary, and SUBSAFE material.

### **SUBSAFE System**

This is any submarine system determined by NAVSEA to require the special material or operability requirements of the SUBSAFE program. How does it concern you? After you have installed a system, it must prevent flooding of the submarine, enhance recovery in the event of flooding, and ensure reliable ship control.

### **SUBSAFE Boundary**

A SUBSAFE boundary marks the specific portion of a SUBSAFE system within which the stringent material or operability requirements of SUBSAFE apply.

### **SUBSAFE Material**

Within the SUBSAFE boundary, two different sets of requirements apply-SUBSAFE and Level I. What is the difference between the two? The difference is expressed by two words, *certification* and *verification*. Material certification pertains to the SUBSAFE program. This means that an item certified as SUBSAFE meets a certain testing or fabrication requirement and can be used as intended in a critical hull integrity or pressure-containing role. On the other hand, material verification pertains to the Level I program. An item specified as Level I has had its material composition tested and verified. This testing and verification ensures traceability from the material back to a lot or batch to ensure that its material composition complies with procurement specifications.

### **DEPARTURE FROM SPECIFICATION**

Specifications are engineering requirements such as type of material, dimensional clearances, and physical arrangements, by which ship components are installed, tested, and maintained. All ships, surface and submarine, are designed and constructed to specific technical and physical requirements. As a supervisor, you must ensure that your personnel make every effort to maintain all ship systems and components according to published specifications. What do you do if a specification cannot be met? Don't panic! There are, on occasion, situations in which specifications cannot be met. In such cases, the system or component is controlled with a deviation from specification. To maintain precise control of a ship's technical configuration, any deviation you make must be recorded and approved as a departure from specification.

### **DEFINING A DEPARTURE FROM SPECIFICATION**

Plainly put, a departure from specification is a lack of compliance with an authoritative document, plan, procedure, or instruction. As a minimum, departures are required when the following situations recur:

1. There is a lack of compliance with cognizant technical documents, drawings, or work

procedures during a maintenance action that will not be corrected before the ship gets underway.

2. There is a lack of compliance with specifications for “as found” conditions during maintenance action for which no prior action is held (such as a shipyard waiver), which will not be corrected prior to the ship getting underway.
3. There is a lack of compliance with a specification discovered and no corrective action is planned.

A departure from specification is not required for nonconforming conditions discovered and not caused by maintenance or a maintenance attempt. Specifically, for items that routinely fail and for which corrective action is planned only a CSMP entry is made. A departure from specification should not be generated.

### **A SUPERVISOR'S LINK TO REPORTING PROCEDURES**

Why do we report and ensure that our workers report all departures from specifications? Is it because we need more paperwork? You and your workers who perform maintenance have an obligation to perform every repair according to specifications. When a departure is discovered, it is the responsibility of the person(s) finding it to report it. However, since you cannot be everywhere, how can you make sure your workers report the departure? As you will see, your supervisory role plays a big part in ensuring that workers always comply.

There are several reasons why workers may fail to report departures from specifications. Some workers feel that specifications are only objectives rather than minimum requirements for acceptability. You must stress to all of your workers that any deviation from specifications must be recorded, reviewed, and approved by the proper authority. Another reason, which has a direct link to supervisors, is lack of adequate inspection, quality control, and management of the process for determining compliance with specifications. Sometimes workers simply do not understand the specification requirements. Do they really understand what is expected on the job? Another reason is a lack of training in the skills necessary to meet specifications. Do you have the right person on the job? Was the job a rush job? A lack of time for adequate planning and parts procurement, thereby requiring an emergency temporary repair in lieu of a permanent repair, is another reason why workers may fail to comply with specifications. From this discussion, you can see the role

you as a supervisor must play during this all-important process.

### **TYPES OF DEPARTURES FROM SPECIFICATIONS**

There are two types of departures that affect you and the reporting procedure—major and minor. We will briefly discuss each of them in the following paragraphs.

#### **Major Departures from Specifications**

A major departure from specifications is any departure from specifications that affects the reliability of the ship's control systems, watertight integrity, or personnel safety. Major departures from specifications require approval from **higher authority**. If you have a departure from specifications that falls into any of the following categories, consider it a major departure:

1. Any departure that directly involves the safety of the ship or personnel
2. Any departure that reduces the integrity or operability of equipment essential to the ship's mission (for example, installation of parts that do not meet all applicable material certification requirements)
3. Failure to complete any required retest of a component or subsystem that, if defective, could cause flooding
4. Any nonconformance to plan specifications resulting in a change of configuration considered to be a permanent repair
5. Failure to meet all applicable standards for major repairs unless other alternatives are authorized by the QA manual (in other words, failed strength test)

#### **Minor Departure from Specifications**

This includes all departures that are not determined to be major. Minor departures may be permanent or temporary and are approved by the RO.

### **REPORTING PROCEDURES**

Who reports a departure from specifications? Do you as the supervisor? Only if you are the one finding or causing the departure. As stated in the QA manual, the person **discovering** or **causing** the departure must initiate the departure from specifications. However, does this mean that each time we cause a departure we

immediately start the parer work? No! The originator must ensure that the departure is identified during fabrication, testing, or inspection of the completed work. He or she must make every effort to correct each deficiency **before** initiating the departure request. Work must not continue until the deficiency is corrected or the departure request is approved.

Now that we have identified a departure, what do we do with it? We go back to the originator. He or she must ensure that QA Form 12 is properly filled out and forwarded via the chain of command to the QAO.

The originator must also retain a copy of the prepared departure request until he or she receives the returned copy from the QAO indicating that all actions concerning the departure have been completed (approved or disapproved).

Make sure that the originator has an approved copy of the departure request accompanying the completed work and that the original copy is retained in the CWP.

## **QA FORMS AND RECORDS**

The following are the titles and descriptions of the forms and records you will use the most. A rule to remember when using these forms is that all QA forms must be completed and signed in the proper sequence.

### **QA FORM 1, THE MATERIAL RECEIPT CONTROL RECORD**

This record is used by the CMPO to document the proper receipt and inspection of items that have been designated as controlled materials.

### **QA FORM 2, MATERIAL IN-PROCESS CONTROL TAG**

This tag is attached by supply, QA, or shop personnel to provide traceability of accepted controlled material from receipt inspection through final acceptance.

### **QA FORM 3, MATERIAL REJECT TAG**

Shop personnel, supply, or QA personnel will attach this tag to rejected items. The individuals finding or causing the unacceptable condition attaches the tag to the rejected item. The tag indicates that the material is unacceptable for production work and must be replaced or reinspected before use.

### **QA FORM 4, SHIP-TO-SHOP TAG**

This tag is used to identify and control material to be repaired. You attach the tag to the item to be repaired. It is a good idea to stamp the three sections of the tag with a control number and log it in your shop log.

### **QA FORM 7, CONTROLLED MATERIAL INVENTORY/RECORD**

This form is used by your CMPO to provide a standard inventory record of controlled material received and issued.

### **QA FORM 9, RE-ENTRY CONTROL FORM**

This form is used to document re-entry into a SUBSAFE boundary and is used in a controlled work procedure.

### **QA FORM 17, TEST AND INSPECTION FORM-OTHER THAN NDT**

QA Form 17 lists all the tests and inspections that must be performed at each step. A QA Form 17 must be completed and signed off before any step can be signed off on the QA Form 10.

### **QA FORM 34, TORQUE/CONTROLLED ASSEMBLY REPORT**

This form consists of two enclosures: the torque sequence sketch and a QA Form 17 listing all of the required torque readings.

## **SUMMARY**

The QA concept involves preventing the occurrence of defects. Quality assurance covers all events from the start of a maintenance action to its completion and is the responsibility of all maintenance personnel. In addition, organization of your workspaces, your ways of storing parts, and your relationships with the SKs all affect the quality of your product.

By carefully following the methods and procedures outlined in your QA program manuals and by paying careful attention to the quality of work in your area, you will contribute greatly to the operational effectiveness of both your ship and tended units.

## REFERENCES

- IMA Quality Assurance Manual*, COMNAVSURF-PACINST 4855.1B, Naval Surface Force United States Pacific Fleet, San Diego Calif., 1989.
- Opticalman 1 & C*, NAVEDTRA 12217, Naval Education and Training Program Management Support Activity, Pensacola, Fla, 1991.
- Quality Assurance (QA) Manual*, COMNAVSURF-LANTINST 9090.2, Naval Surface Force United States Atlantic Fleet, Norfolk, Va., 1985.
- Quality Assurance Standards for Submarine Antenna and Mast Materials*, NAVSEA 0900-LP-16-6081, Naval Ship Systems Engineering Station, Philadelphia, Pa., 1983.
- Quality Assurance Terms and Definitions*, MILSTD-109B, Naval Ship Systems Command, Washington D.C., 1969.
- Submarine Force Quality Assurance Manual*, COMSUBLANT/COMSUBPACINST 4855.2, Commander Submarine Force U.S. Atlantic Fleet, Norfolk, Va., 1986.
- Submarine IMA Planner's Handbook*, S9002-HBK-010/IMA Plan, Naval Sea Systems Command, Washington, D.C., 1986.
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# CHAPTER 7

## TEST EQUIPMENT

### YOUR RESPONSIBILITY FOR TEST EQUIPMENT

Throughout this chapter we will refer you to other publications containing information on the topic being covered. You **must read** these references to gain a basic understanding of the material and to enhance your knowledge of the subject matter.

Electronics Technicians maintain a wide variety of electronic equipments and systems in use throughout the fleet today. Therefore, ETs must be familiar with a large variety of test equipment required to properly maintain those systems. As an ET1 or ETC, you will be involved with the administration and upkeep of electronics test equipment. The condition of this test equipment will be your responsibility, either directly or indirectly.

As a senior Electronics Technician, you must be able to supervise and train maintenance personnel in the proper use of test equipment. The Electronics Material Officer (**EMO**) or in some cases the Electronics Readiness Officer (**ERO**), is responsible for all electrical and electronics Test and Monitoring Systems (**TAMS**) assigned to the command (other than avionics). Refer to NAVSEAINST 9082.1 for TAMS definitions. You will find the management of TAMS to be a considerable challenge that requires much of your attention and the attention of each individual who uses TAMS equipment. You will be responsible for assisting the EMO or ERO in the administration of a viable test equipment program. To meet these important obligations, you must have a thorough understanding of Navy test equipment programs. You must also have a working knowledge of the administrative procedures and references pertaining to test equipment.

### COMMAND MANAGEMENT OF TAMS

To manage TAMS properly, a command or unit must have a knowledgeable and cohesive organization that involves all TAMS users.

The organization for managing onboard test equipment may vary from command to command; however, the line of supervision generally flows directly from the EMO or ERO to the ship's Test Equipment Petty Officer (**TEPO**) or through the division leading

CPO/PO. Figure 7-1 shows a typical test equipment chain-of-command organization.

The ship's TEPO is the focal point for all matters relating to TAMS on board the ship. All test equipment matters should be documented through one specifically designated work center, with the ship's TEPO assigned as the work center supervisor. In this way, a complete and composite status of shipboard TAMS can be obtained at anytime through just one person.

There are two categories of electronic test equipment: general-purpose electronic test equipment (**GPETE**) and special-purpose electronic test equipment (**SPETE**). GPETE is electronic test equipment that has the capability, without modification, to test two or more prime equipments or systems of basically different design. All items listed in MIL-STD-1364 are GPETE. SPETE is electronic test equipment specifically designed to test a single prime equipment or system.

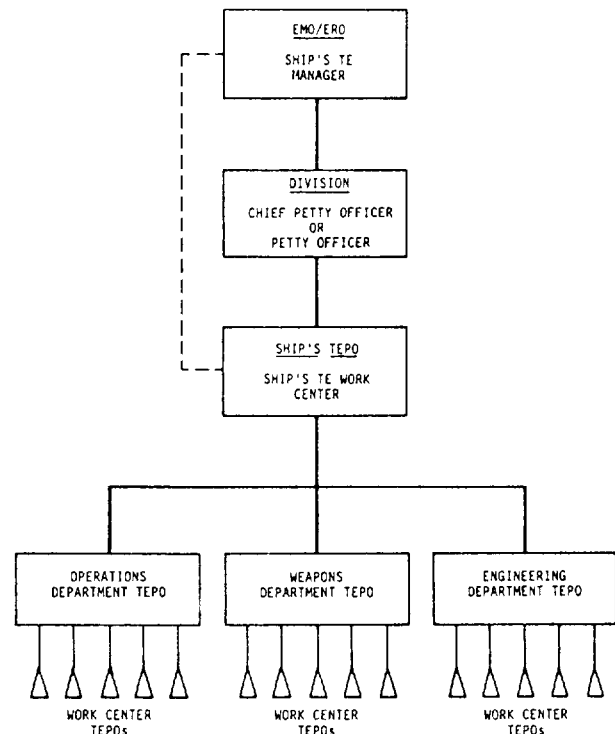


Figure 7-1. Typical shipboard test equipment organization.

## TEST EQUIPMENT ADMINISTRATION

The administration of the test equipment program involves many areas; inventory, procurement, and disposal; calibration and repair; and stowage and handling. As a senior technician, you are expected to be able to manage this program. To do this properly, you must have a working knowledge of the various Navy programs that affect the administration of test equipment. In this chapter, both TAMS and test equipment will be referred to as test equipment.

The Space and Naval Warfare Systems Command, along with Naval Electronic Systems Engineering Activities and Centers, was established to replace the abolished NAVMAT and NAVLEX. However, the references you will use may still bear the names of NAVMAT and NAVLEX. Keep this change in mind as you read this chapter.

## INVENTORY

The inventory of assigned test equipment is directly related to the Ship Configuration and Logistics Support Information System (SCLSIS). The allowance of test equipment for a ship is contained in the Ships Portable Electrical/Electronic Test Equipment Requirements List

(SPETERL). The SPETERL identifies the latest known requirements for Portable Electrical/Electronic Test Equipment (PEETE). New SPETERLs are forwarded to the commands before the start of any shipyard overhaul and before the start of any availability in which major electronic change-outs will occur. A sample page from a SPETERL that covers some test equipment for ET systems is shown in figure 7-2. You can compare SCLSIS documents to the SPETERL and thus identify both excesses and deficiencies. You should also compare the SPETERL and SCLSIS with the *Electrical/Electronic Test Equipment Index*, NAVSEA ST 000-AA-IDX-010/PEETE, for subcategories (SCATs) applicable to installed equipment. We will look more carefully at this index later on.

You need to keep careful inventory and distribution records of test equipment to maintain effective use, maintenance, and calibration status information. You cannot do this with just the SCLSIS and SPETERL inventory listing because test equipment distribution and user location will change between validations; test equipment is transferred between work centers; and test equipment is replaced because of failure, calibration needed, and similar reasons. To maintain a good

SHIPS PORTABLE ELECTRICAL/ELECTRONIC TEST EQUIPMENT REQUIREMENTS LIST													
S P E T E R L													
TEST EQUIPMENT QUANTITIES BASED													
ON WSF DATA OF 11/04/85													
USS (Ship's name) (Ship type & no.)													
SCAT FUNCTIONAL DESCRIPTION OF													
CODE SCAT CODE REQUIREMENT													
MFG	TEST EQUIPMENT	PRIOR	ALLOWANCE	ACC	LTD	OBS	EXC	DEF	TOTAL	P	EQUIPMENT / SYSTEM	PRIME EQUIP	FOOT
SYM	FSOM	MODEL NUMBER	ITY	EQUIPAGE	QTY	QTY	QTY	QTY	QTY	M	APPLICATION	LOCATION	NOTE
				LIST NO.					ROD	S		SHIPALT	
4245 MULTIMETER													
		0-4KVDC, 0-1KVAC											
CSV	55026	260-6XPL	22	7-670052807EQ					1		ASROC PCS		
CSV	55026	260-6P	23	7-670052276EQ					1		BASIC POINT DEFENSE MISSILE SYS		
CSV	55026	260-6PRT	23	7-670052596EQ					1		DEGAUSSING SYS		
		AN/PSM-4B	23	7-670050129EQ	1				9		ELECTRONICS USE-AGFF, FF		
		AN/PSM-4D	23	7-670050136EQ					1		IC SYS GEN USE-AGFF/FF/TFGL-6		
		AN/PSM-4E	23	7-670050115EQ					1		MK 16 ASROC MLS		
		AN/PSM-4F	23	7-670050122EQ					2		MK 68 GUN FIRE CONTROL SYSTEM		
		AN/USM-311	23	7-670050848EQ	5						NC-2 MOD 2/2A PLOTTER		56
		ME-48B/U	23	7-670050220EQ					1		POWER GEN USE-AGFF/FF/TFGL-6		
		ME-48D/U	23	7-670052281EQ					4		SONAR AN/SOS (-) -DEDICATED		
		ME-48E/U	23	7-670052282EQ									
		ME-48F/U	23										
CSV	55026	260-5	24	7-670051026EQ	5								
CSV	55026	260-5P	24	7-670050588EQ	1								
		AN/PSM-4C	24	7-670050143EQ									
		ME-48C	24	7-670050227EQ									
CSV	55026	260	25	7-670050150EQ									
CSV	55026	260-4	37	7-670050164EQ	2								
CSV	55026	270	37	7-670050591EQ									
CSV	55026	270-3	37	7-670052277EQ									
					14				7	21	SCAT	4245	TOTALS
4261 FREQ, DEVIATION METER													
		100KHZ, 1,2,5 and 5 MHz											
CODED	19397	527A	22	7-670051063EQ							AN/URQ-10	1	2-67-2-C
		AN/URM-115	23	7-670051062EQ									50
											SCAT	4261	TOTALS

Figure 7-2.-SPETERL sample page.

inventory and control of test equipment, you should follow the procedures listed below:

1. Inventory all test equipment separately on a Controlled-Equipage Custody Record, NAVSUP Form 306. Figure 7-3 shows an example of a properly

inventoried FM generator. The figure also shows a change of subcustody of this particular generator. Custody signature exchange should take place whenever the item of test equipment changes hands. The reverse side of the NAVSUP Form 306 (not shown)

S/N 0108-LF-500-6503 CONTROLLED-EQUIPAGE CUSTODY RECORD (4442) NAVSUP FORM 306 (Rev 1-83)

NSN 7Z 6625-00-389-7128	NC IN NAME CDVI 6304A	ALLOWANCE 1 (of 3)	UNIT PRICE \$ 1620	SHIP ACTIVITY (UIC CODE)	DEPT. OPS	CARD NO. 001			
ALLOWANCE LIST NO. 7-670053096EQ	ADD'L DESCRIPTION GENERATOR, FM 20 MHZ - 80 MHZ		SCAT CODE: 4369						
SERIAL NO. B-678543-001		FSCM 25778 (AUL INSTRUMENTS)							
O'S REQ'N (NO.)	(QTY)	O'S REQ'N (NO.)	(QTY)	O'S REQ'N (NO.)	(QTY)	O'S REQ'N (NO.)	(QTY)	CUSTODY SIGNATURE REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
TRANSACTION RECORD									
DATE	DOCUMENT NO.	RECEIVED FROM EXPENDED TO	QUANTITY			I ACKNOWLEDGE CUSTODY OF THIS ITEM IN THE QUANTITY SPECIFIED.			
			REC'D	EXPENDED	BALANCE				
85 AUG 04	5186-4021	SUPPLY	01			ET1 Eura Wright (TEA)			
85 AUG 11		OE02		01		ET2 [Signature]			
85 AUG 23		OE08	01			ET1 Eura Wright (TEA)			
85 AG 27		OE03		01		ET2 Johnny B. Wood.			

RECOMMENDED DATA ENTRIES

Stock Number - Enter the cognizance symbol and national stock number (NSN) indicated in the allowance list, PEETE, or latest applicable receipt invoice, whichever is more current.

Noun Name - Enter the JEIDS (Joint Electronics Type Designation System-formerly called the AN System) designator, or if there is none, use the MDS (Manufactures Designating Symbol) and model number of the particular test equipment to be recorded.

Allowance - Enter the allowance quantity as indicated in the allowance list or the allowance listed in the SPETERL.

Unit of issue and Unit Price - Enter the unit of issue and unit price indicated in the Management List-Navy (ML-N) or the latest applicable receipt document, whichever is more current.

Ship/Activity - Enter the UIC for your command.

Department - Enter the controlling department, ie. OPS.

Card No. - Number cards consecutively.

Allowance list No. - Enter the AEL (Allowance Equipage List) number from the SPETERL.

Add'l description - Enter the item description indicated in the AEL listed in the SPETERL, or the description listed in the PEETE index. This is also a convenient place to put the SCAT code (right hand side).

Serial No. - List the serial number of the test equipment being recorded. If the item does not have a serial number, then a locally devised serial number system number should be utilized for control and inventory purposes. This is also a convenient place to list the FSCM (Federal Supply Code to Manufacturer) number.

Transaction Record - All columns of this section should be used to the utmost and custody signature should be required for all the test equipment transactions.

Figure 7-3.-Controlled-Equipage Custody Record, NAVSUP Form 306.

provides an excellent means of documenting a sight inventory of the item. Refer to *Afloat Supply Procedures*, NAVSUP Publication 485, chapter 6, section V, subsection I, 6092, for the procedures on filing out the NAVSUP Form 306.

2. Prepare a second inventory, known as a test equipment status inventory, along with the NAVSUP Form 306. You can prepare this inventory on standard, ruled 5 x 8-inch index cards, as shown in figure 7-4. The example shown is a reference record of "SCAT at allowance." (SCAT codes are explained below.) All items of test equipment for a particular SCAT are listed on this card. The example shown is for SCAT code 4369. When you prepare a card, type in the SCAT code, SCAT description, allowance quantity, and headers (model, serial, subcustody, and remarks). Then use a pencil to write the information under each header, because the information is subject to change. File each card in SCAT number order under one of the following categories:

- SCAT at allowance (the example shown in figure 7-4 falls into this category, with three items allowed and three items listed.)
- Zero SCAT on board, GINO (GPETE initial outfitting) 72 Cog

- Zero SCAT on board, GEIR, (GPETE end-item replacement) 72 Cog
- Zero SCAT on board, Not 72 Cog
- Under Allowance, GINO 72 Cog
- Under Allowance, GEIR 72 Cog
- Under Allowance, Not 72 Cog

Keep this second inventory up-to-date along with the NAVSUP Form 306.

### Subcategory (SCAT) Codes

SCAT codes are four-digit subcategory codes used to identify a range of measurements by functional category. Test equipment is assigned SCAT codes in the 4000 - 4999 series of numbers. SCAT codes are normally used wherever references are made to test equipment. You'll find SCAT codes in the PEETE index and in NAVAIR 16-1-525. They are also listed in the *Shore Test Equipment Index* (STEAP-Shore Test Equipment Allowance Program), which assigns shore family groups (SFGs) and provides a method of grouping shore electronic test equipment of similar measurement capabilities.

4369	GENERATOR, FM	20MHZ	-	80MHZ	ALLOWANCE: 3
<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>SUB-CUSTODY</u>	<u>REMARKS</u>		
CDVI-6304A	B-543678-002	OW01	ISSUED 6197		
CDVI-6304A	A-478-001	OEO2	ISSUED 6274		
CDVI-6304A	B-678543-001	OEO8	RCVD 6249		

Figure 7-4. Example of test equipment status inventory.

The PEETE index (fig. 7-5) is a guide that fleet personnel use to identify portable electrical/electronics test equipment required to support prime electronic, electrical, IC, weapons, and reactor instrumentation systems. This test equipment index **does not**, in anyway, supersede or modify the SPETERL, nor does it authorize procurement of, or requisition of, items listed in the SPETERL.

Figures 7-6 and 7-7 are samples of sections and appendices of the PEETE index. In the example, the GPETE information pertains to a DDG-51 class ship having an AN/PRC-10 with a SCAT code of 4369. Follow the example through each of the sections and appendices. The PEETE index will be one of your important references concerning test equipment.

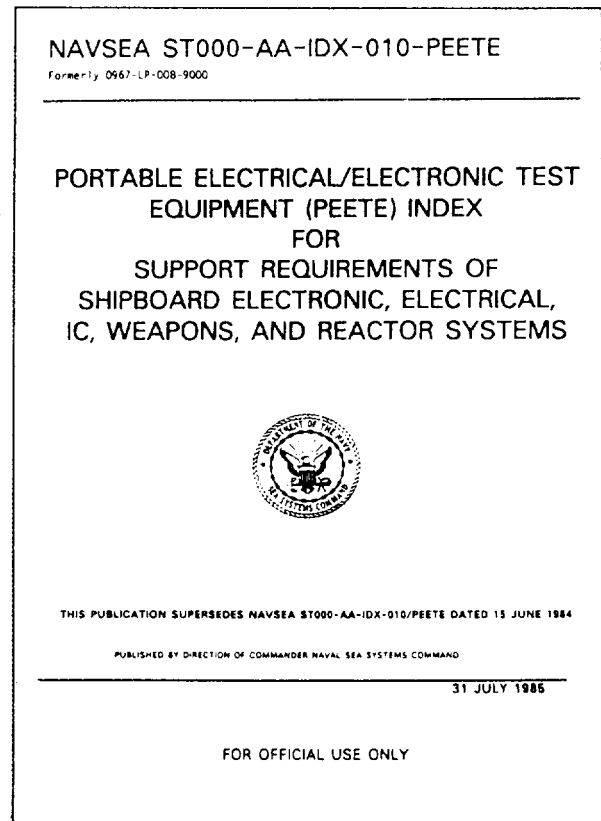
### **Ships Portable Electrical/Electronic Test Equipment Requirements List (SPETERL)**

The SPETERL is your allowance list for PEETE. The quantity of equipment for each SCAT is based upon support requirements of your ship's configuration of prime electronic, electrical, IC, weapon and reactor instrumentation equipment and systems, and depends upon factors such as the following:

- Location of prime equipments and systems
- Number of these prime equipments and systems installed
- Portability of the test equipment
- Number of personnel who use the test equipment
- Frequency of use of test equipment
- Ability to share test equipment among different divisions

Several sources of information are used to develop the SPETERL. First, cognizant naval activities provide information concerning prime equipments/systems and the PEETE required to support them. Next, NAVSEA adds this information to the database used to prepare the SPETERL. The database is then compared to the configuration of the ship as reported by SCLISIS teams and other sources. Finally, from this comparison, the SPETERL is produced, showing allowances of PEETE, quantities on hand, and similar information.

To be of use to you, the SPETERL must be valid. The most critical factor affecting the validity of SPETERL data is the accuracy and completeness of



**Figure 7-5.-Cover of the PEETE index.**

inventory and configuration data maintained in the Weapon Systems File (WSF). This database must be continually updated to reflect configuration changes as they occur. Between validations by SCLISIS, the database is updated with changes reported by ship's force personnel on OPNAV Form 4790/CK submissions. Information on configuration changes reported by ship's force personnel to SCLISIS is provided to NAVSEA, and the SPETERL is updated to reflect current configuration and required test equipment support changes.

SCLISIS is the designated system responsible for maintaining the configuration status reported by the fleet. The SCLISIS data is maintained in a central file-the WSF at Ship's Parts Control Center (SPCC), Mechanicsburg, Pennsylvania. Supply and maintenance support managers depend on this central file for information to provide support to the fleet. Additionally, since the PEETE listed in the COSAL is based upon quantities on board, any quantity changes in PEETE must be reported in the same manner.

SECTION I

SCAT CODE REQUIREMENTS  
by Prime Electronic Equipment

PRIME EQUIPMENT APPLICATION

SCAT CODE	QTY	P	FOOT	SCAT	DESCRIPTION
REQ	M	NOTE	S		

AN/PRC-10

4358	1				OSCILLATOR AUDIO 20H-200K
→ 4369	1				GENERATOR FM 20M- 80M
4552	1				TUBE TESTER ROLL CHART
4611	1				TUBE SOCKET ADAPTER KIT

SECTION II

SCAT CODE REQUIREMENTS  
by Fleet Supplemental Test Equipment Requirements

FSTER	EQUIPMENT/SYSTEM APPLICATION
SCAT CODE	QTY P FOOT SCAT DESCRIPTION
REQ	M NOTE
S	

W55 APPLICATION NOTES-DDG51 CLASS

4367					GENERATOR AM/FM 10M-450M
→ 4369					GENERATOR FM 20M- 80M
4382					GENERATOR FM/AM 10M-400M

SECTION III

SCAT CODE APPLICATIONS  
by Scat Codes

SCAT CODE	SCAT DESCRIPTION	FSTER CODE
	APPLICATION-PRIME EQUIPMENT/SYSTEM	
→ 4369	GENERATOR FM 20M- 80M	
	AN/PRC-10	
	AN/PRC-10A	
	AN/PRC-25	
	AN/PRC-77	
	AN/PRC-97	
	AN/VRC-46	
	GEN PURPOSE USE -NACU 2	ACU

SECTION IV

FLEET SUPPLEMENTAL TEST EQUIPMENT REQUIREMENTS  
by Fleet Activities

SHIP TYPE/HULL/NAME	FSTER CODES
DOG 51 ARLEIGH BURKE	X55 J5G Q5G QMD 32A CFA 99A 116 GYR VLS QPD ORT SPY HAR 15L
	→ W55 PGD PGL PG2 PG3 PG4 PG5 PG6 TMH ECS

SECTION V

TEST EQUIPMENT MODELS  
by Scat Codes

SCAT CODE	MODEL NUMBER	SCAT DESCRIPTION	MODEL DESCRIPTION	PRI	FSCM
→ 4369	GENERATOR FM	20M- 80M .400V-0.2V/50 OHM	20PPM FM DEV 0- 25KHZ		
	→ 6304A		GENERATOR FM 20MHZ- 80MHZ	23	25778
	TF-995A/2M		GENERATOR FM/AM 2MHZ- 220MHZ	36	09553
	8601A		GENERATOR FM/AM 0.1MHZ- 110MHZ	37	28480

SECTION VI

SCAT CODES  
by Test Equipment Models

MODEL NUMBER	FSCM	SCAT	MODEL DESCRIPTION AND AEL	PRI
→ 6304A	25778	4369	GENERATOR FM 20MHZ- 80MHZ	23
631B	09435	4929	CALIBRATOR AC	

Figure 7-6. PEETE Index sections.

APPENDIX A

TEST EQUIPMENT MANUFACTURERS  
by Manufacturers

MDS	FSCM	MANUFACTURERS NAME TO CODE NAME OF MANUFACTURER
→ CDVI	25778	AUL INSTRUMENTS
	47646	AUTOMATED INDUSTRIAL ELECTRONICS
	57646	AUTOMATED INDUSTRIAL ELECTRONICS
	01014	AVTRON, NOW SYMTEL

APPENDIX B

TEST EQUIPMENT MANUFACTURERS  
by Federal Supply Code for Manufacturers

FEDERAL SUPPLY CODE FOR MANUFACTURERS TO NAME

MDS	FSCM	NAME OF MANUFACTURER
→ CDVI	25778	AUL INSTRUMENTS
	25950	EDO COMMERCIAL, NOW REICH ASSOCIATES
CDLX	25965	ELGAR
CBGA	25995	GRAY INSTRUMENT, NOW BIDDLE
	27266	METROLOGY ENGINEERING CENTER (POMONA)
	24732	VISUAL INFORMATION INSTITUTE

APPENDIX C

FOOTNOTES NARRATIVES  
by Footnote Numbers

FOOTNOTES

( Specific individual footnote numbers shown below correspond to the last three digits of the Scat Code that applies for the Test Equipment Models and comments which are provided. )

.....  
 . 50 - This note may be assigned to any SCAT code and indicates .  
 . that the test equipment item is required at an intermediate .  
 . maintenance activity (IMA) for support of the prime equipment or .  
 . system to which the note is assigned. When all applications in an .  
 . individual ship for a particular SCAT are assigned note 50, the .  
 . required test equipment quantity will be blank (zero). In this .  
 . case, the SCAT is not authorized for shipboard level maintenance. .  
 .....

APPENDIX D

STOCK NUMBERS for TEST EQUIPMENT MODELS  
by Scat Codes

STOCK NUMBERS  
FOR SELECTED MODEL NUMBERS  
SORTED BY SCAT CODE

SCAT	COG	STOCK NUMBER	FSCM	MODEL
→ 4369	7Z	6625-00-389-7128	25778	6304A
	4370	7Z 6625-01-018-8583	28480	8640B-001-003
	4370	7Z 6625-01-018-8584	28480	8640B-001-002-003

APPENDIX E

SCAT CODE DESCRIPTIONS  
by Functional Description

SCAT	SCAT CODE DESCRIPTION	SCAT DESCRIPTION
→ 4369	GENERATOR FM	20M- 80M
4370	GENERATOR FM/AM	.5M-51.2M

Figure 7-7.-PEETE Index appendices.

Figure 7-8 is an example of a completed Ship's Configuration Change Form, OPNAV 4790/CK, reporting a PEETE configuration change. Refer to *Ships' 3-M Manual*, OPNAVINST 4790.4B, chapter 9, paragraph 9-9, for instructions on filing out the configuration change form.

To ensure the validity of the SPETERL and to be sure the PEETE listed in the SPETERL as being on board is COSAL-supported, compare the SPETERL against the COSAL on an annual basis. Report any discrepancies in the SPETERL to the applicable NAVSEACENDET on an OPNAV Form 4790/CK.

SHIP'S CONFIGURATION CHANGE FORM		OPNAV 4790/CK(5-84)		CONFID FILE CORR	COMP MA NO DEFL	COMP DEFL
S/N 0107-LF-047-9001						
<b>SECTION I JOB IDENTIFICATION</b>						
JOB CONTROL NUMBER			ALTERATION IDENTIFICATION			
SHIP'S UIC 00001			WORK CENTER OE08	JOB SEQ NR A215	ALTERATIONS (SHIPALT, FLD CHG, ETC.)	
SHIP'S NAME USS NEVERSAAL		HULL NUMBER DD001		WC WC 9A		ACTION 5 B
EQUIPMENT HOUR NAME AN / PSM - 4E			SHIP HOURS EXP 0002	ACTV MAINT TIME 002	COMP DATE 0058	MOR
<b>SECTION II JOB DESCRIPTION/REMARKS</b>						
JOB DESCRIPTION/REMARKS A D D E D M U L T I M E T E R						
<b>SECTION III COMPONENT CONFIGURATION CHANGE IDENTIFICATION</b>						
COMPONENT HOUR NAME AN / PSM - 4E			COMPONENT SERIAL NUMBER A504		QUANTITY 001	
COMPONENT IDENTIFICATION NA			LOCATION (DECK/FRAME/SIDE) OP SUL		WC WC 9A	
COMPONENT APL/AEL 56731015			NEXT HIGHER ASSEMBLY		BAC OC01	
NAMEPLATE DATA						
MIP						
EOMB						
TM						
<b>SECTION IV SPECIAL PURPOSE</b>						
RN		ALBIN		BECAS OFFICE USE		
--INSTRUCTIONS--						
ITEM NUMBER	SECTION I & II DESCRIPTION	PAGE 1	CONT PAGE	LEGEND		
1-3	JOB CONTROL NUMBER	M	M	1A IF AVAILABLE	O OPTIONAL	
4	ALTERATION IDENTIFICATION	IP	IP	IP IF APPLICABLE	NR NOT REQUIRED	
5	EQUIPMENT IDENTIFICATION CODE	M	NR	M MANDATORY		
6	ACTION TAKEN	M	NR			
7	EQUIPMENT HOUR NAME	M	NR			
8	SHIP'S FORCE MANHOURS EXPENDED	M	NR	SECTION I, BLOCK 8 ACTION TAKEN		
9	ACTIVE MAINTENANCE TIME	M	NR	SECTION III, BLOCK 15 COMPONENT ACTION		
10	COMPLETION DATE	M	NR			
11	METER READING	IP	NR			
12	JOB DESCRIPTION (REMARKS)	O	NR			
ITEM NUMBER	SECTION III DESCRIPTION	REMOVE (R/D)	INSTALL (I/A)	MODIFY (M/C)	MAINTENANCE ACTIONS	
13	COMPONENT HOUR NAME	M	M	M	R - REMOVED EQUIPMENT	
14	QUANTITY	M	M	M	I - INSTALLED EQUIPMENT	
15	COMPONENT ACTION	M	M	M	M - MODIFIED EQUIPMENT	
16	COMPONENT IDENTIFICATION	IP	IP	IP	CONFID FILE CORR NO MAINTENANCE ACTION	
17	COMPONENT SERIAL NUMBER	1A	1A	1A	A - ADDITION OF RECORD	
18	COMPONENT APL/AEL	M	1A	1A	D - DELETION OF RECORD	
19	LOCATION	M	M	M	C - CORRECT/CHANGE EXISTING RECORD	
20	EQUIPMENT IDENTIFICATION CODE	NR	1A	NR		
21	NEXT HIGHER ASSEMBLY	IP	IP	IP		
22	SERVICE APPLICATION CODE	1A	1A	1A		
23	WORK CENTER	NR	M	NR		
24	NAMEPLATE DATA	NR	M	NR		
25	MAINTENANCE INDEX PAGE	1A	1A	1A		
26	EOMB	IP	IP	IP		
27	TECH MANUAL NUMBER	1A	1A	1A		
WORK CENTER SUPERVISOR WPE	DIVISION OFF CRE	SUPPLY DEPT JM	3 M COORDINATOR GCM	SHIP SEQUENCE NUMBER	PAGE 1 OF 1	

Figure 7-8.-PEETE configuration change reported on a Form 479/CK.



Report discrepancies in the COSAL support to SPCC according to chapter 5 of the *COSAL use and Maintenance Manual*, SPCCINST 4441.170. Figure 7-9 is a brief SPETERL/COSAL troubleshooting guide that illustrates some of the discrepancies, their possible causes, and what action you should take.

### Determining Excesses and Deficiencies

To properly determine what GPETE excesses or deficiencies exist on your ship, you should ask yourself two questions. First, “What GPETE am I allowed?” Second, “What GPETE is currently on board and physically accountable?”

Let’s look at the first question– “What GPETE am I allowed?” The **current** SPETERL and any approved Allowance Change Request (**ACR**) will indicate your ship’s allowance of GPETE. Just list the applicable SCATs with the allowed quantity as determined by the “Total Required” line. If you do not feel that the current SPETERL allowance is adequate, you may use an ACR, as specified in paragraph 3 of the “General Information” section of the SPETERL, to request that the SPETERL be modified.

Now let’s look at the second question–“What GPETE is currently on board and **physically accountable?**” In this case, “on board” means that the test equipment is actually on board or can easily be traced to a calibration and/or repair facility currently having temporary custody of the item; and “physically accountable” means that the item has been sighted during an inventory. Onboard documents that can assist you in finding those hidden items that must be sighted to give you an accurate inventory are:

- SCLISIS documents (Be sure to use the most current.)
- MEASURE Format 310 (This format will be described later.)
- Custody cards
- Test Equipment Index, Section 6 (Use this to cross model numbers to SCAT codes.)
- SPETERL (Be sure to use the most current.)

Compare all the onboard information against the actual equipment on hand and on board to determine what items are in excess and what deficiencies exist.

CONDITION/PROBLEM	POSSIBLE CAUSE	ACTION REQUIRED
PEETE required for PMS	PMS requirements not reported to NAVSEALOGSUPENGACT	Allowance Change Request (ACR)
PEETE required for PMS listed in SPETERL and on board, but not supported in COSAL	Configuration changes not reported	OPNAV 4790/CK
Quantity of PEETE on board differs from quantity on board in SPETERL	Configuration change not reported	OPNAV 4790/CK
PEETE allowed in SPETERL not on board	Deficiency in allowance	Requisition (Except GINO 7Z Cog. - GINO 7Z Cog. items cannot be requisitioned. Refer to GINO/GPETE guidelines)
PEETE on board not listed in COSAL.	Configuration change not reported	OPNAV 4790/CK
Quantity of PEETE on board differs from COSAL	Change in quantity not reported	OPNAV 4790/CK
Incorrect AEL/APL in COSAL for PEETE	Configuration change not reported	OPNAV 4790/CK

Figure 7-9.-SPETERLJ/COSAL troubleshooting guide.

(Remember, this is for GPETE, not SPETE.) The result is a listing of GPETE excesses and deficiencies.

### Specifying Excesses and Deficiencies

Excess means that the GPETE is not authorized in the SPETERL (or by an approved ACR) and should not be on board. TYCOMs are very explicit about what should be done with excess GPETE. GPETE in excess of the SPETERL or an approved ACR cannot be held on board and must be turned in to the NAVELEX GPETE Assets Screening Program (GASP). (Procedures are listed in the TYCOM maintenance manual. ) Remember, test equipment is usually at a premium; so if an item is excess, turn it in so that another command deficient in that item can obtain it.

Now let's tackle the GPETE deficiency (shortage) problem. Deficiencies may fall into any one of the following three types:

- Deficiency caused by **new or increased allowances**- New or increased allowances of cognizance symbol 7Z GPETE equipments are not to be requisitioned by the requiring activity. These requirements will be determined, budgeted, and automatically shipped to the designated end users as equipments become available. If you have such a deficiency, you should anticipate delayed delivery on certain equipment in critically short supply.
- Deficiency caused by **missing or unserviceable equipment**- If an allowance item of GPETE is missing or unserviceable, you must prepare a Report of Survey (DD Form 200). Submit a DD Form 1348 (supply requisition) to supply for a replacement item. This requisition will then be forwarded to SPCC, Mechanicsburg, for action.
- Deficiency caused by **obsolete equipment**- If you have items designated as obsolete equipment, do not requisition replacements for them. Replacements will be handled the same way as items described earlier in "Deficiency caused by new or increased allowances."

### PROCUREMENT

There are two methods for obtaining needed GPETE. The first is by either receiving or ordering the items through the supply system. The second is by requesting them through the fleet's GPETE Assets Screening Program (GASP). Both are discussed briefly below.

### Issue Through Supply

You may obtain GPETE through the supply system by determining for each deficiency, by SCAT, the NSN of the GPETE. Then base your next actions on the situation listed below that pertains to your required equipment.

1. If the Cog is 7 and the item is a new requirement or an increase to allowance, it is a GPETE Initial Outfitting (GINO) item. No action is required by your ship for these GINO, 7Z cog items, as they will be pushed through the supply system to you.
2. If the Cog is 7Z and this is a replacement for another item of GPETE that is or once was on board, it is classified as GPETE End-Item Replacement (GEIR). You must requisition GIER, 7Z cog items through supply on a DD Form 1348. To replace SCAT items that are GEIR, select the preferred models of GPETE as listed in the latest *Test Equipment Index* or MIL-STD-1346.
3. If you need other odd cog items, you must requisition them. If you are replacing items previously on board, your ship's OPTAR funds will be charged. If your ship is in overhaul and

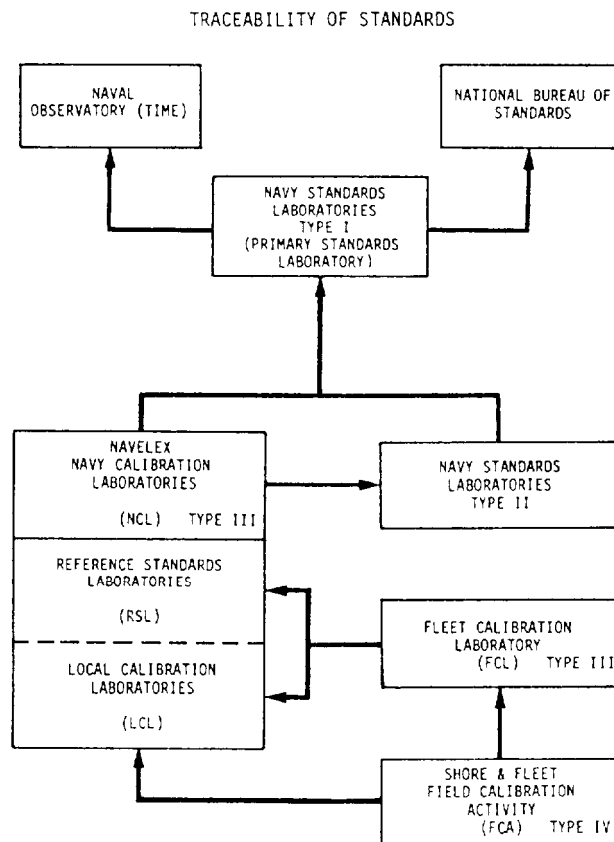


Figure 7-10.-METCAL program structure.

these other odd cog items are new requirements or an increase to allowance, NAVSEA COSAL funds will be charged. Again, you requisition these items through supply on a DD Form 1348.

**GPETE Assets Screening Program (GASP)**

The GASP deals with the excesses and deficiencies of the fleet. When a ship has excess GPETE, it should turn the excess into the redistribution center for possible reissue. In turn, ships that have a deficiency of GPETE should first check with GASP via the TYCOM to fill that deficiency. The redistribution center has the equipment calibrated, repaired, and made ready for issue. (Any equipment not economically repairable is turned into supply for disposition.)

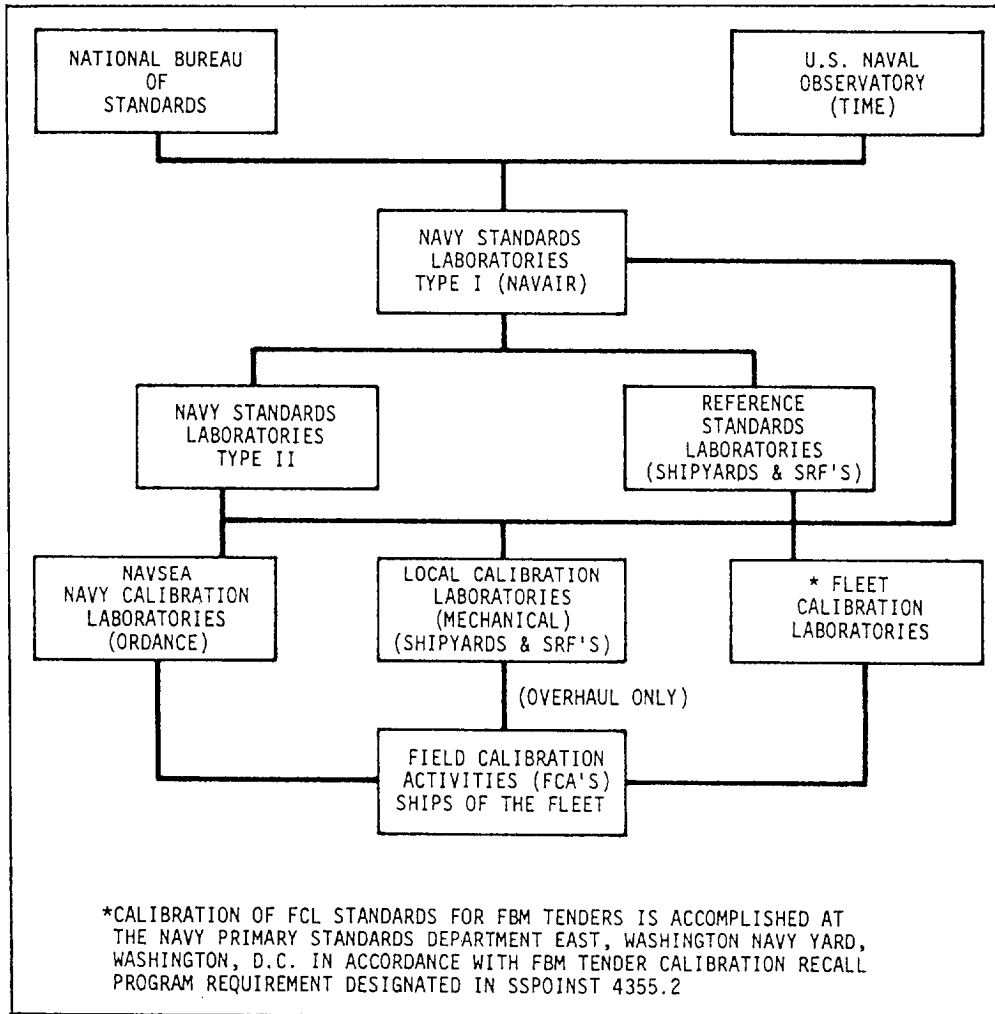
**CALIBRATION**

Now that we have discussed how to maintain an accurate inventory of allowed test equipment, we will

present the somewhat complex *Test Equipment Calibration Program*. As a senior Electronics Technician, you will be required (both directly and indirectly) to ensure that the test equipment package is maintained in good working order and is properly calibrated. The Navy Metrology and Calibration (METCAL) Program was instituted to help provide calibration facilities so that sophisticated equipment, precise standards, and laboratory conditions would be available.

**Calibration Activities**

Various echelons of calibration activities were established to ensure that both operational and test equipments meet their calibration requirements. These echelons are integrated so that each level activity has traceable standards tied to the highest standards available for calibration. Figures 7-10 and 7-11 show the



**Figure 7-11. Hierarchy of calibration standards facilities.**

METCAL program structure and the hierarchy of calibration standards facilities.

Refer to *Electronics Installation and Maintenance Book, Test Equipment*, NAVSEA SE000-00-EIM-040, chapter 1, for explanations of the calibration echelons shown in figures 7-10 and 7-11.

## Calibration Services

Now let's take a look at an important calibration program called the *Metrology Automated System for Uniform Recall and Reporting (MEASURE)* program.

The MEASURE program is an automated data processing system designed to provide a standardized system for the recall and scheduling of test equipment into calibration facilities. It was developed to support the Department of the Navy METCAL Program in an effort to ensure that all equipment requiring calibration and servicing is submitted to a calibration activity on a timely basis and, thus, is maintained to maximum dependability. In addition, the system provides documentation of actions performed by the calibration activity.

The initial cycle of MEASURE begins with the completion of the inventory forms for equipment held by an activity. Refer to the *Metrology Automated System for Uniform Recall and Reporting (MEASURE) Users Manual*, OPNAV 43P6A, Appendix A, for completion instructions on the MEASURE TMDE inventory form. These forms are forwarded to the cognizant MEASURE data processing facility (DPF) to establish the database. The activity holding the test equipment is then provided a printed inventory and a set of preprinted Metrology Equipment Recall and Report (METER) cards. Refer to the *Metrology Automated System for Uniform Recall and Reporting (MEASURE) Users Manual*, OP 43P6A, Appendix B, for an explanation on the use and information contained on the METER card. The MEASURE cycle is completed when the cognizant METCAL representative provides recall schedules to the activity holding the test equipment and to the calibration activities. As equipment is gained or lost, more inventory forms and METER cards are processed or deleted, the database is kept current, and the system continues to cycle.

Through the submission of METER cards, each activity must promptly update its recorded inventory; that is, the inventory data maintained in the computer database by the MEASURE Operational Control Center (MOCC), and the Control Database Facility (CDBF),

Concord, California. In this way, calibration requirements can be projected in enough time to permit their incorporation into the next recall schedule. If the inventory is not updated promptly, new activity items will have to be rescheduled or be submitted to a calibration activity for unscheduled calibration by the cognizant METCAL representative.

The MEASURE program provides management personnel with a wide variety of valuable information on fleet readiness, calibration problems, budget and funding, and many other topics.

MEASURE products and formats have been designed to meet the information requirements of several levels of management. Many MEASURE formats are forwarded automatically by the MOCC or CDBF to the activities on a regular basis. Such distribution is based upon the type and level of those activities and upon established requirements. Others, however, are available only upon the receipt of an approved request from the cognizant METCAL representative. Accordingly, activities needing a particular format that they do not receive automatically should forward the requirement to the cognizant METCAL representative for approval. Any such request should include a justification of the need for the format and a statement indicating the frequency at which the format is required.

Refer to the *Metrology Automated System for Uniform Recall and Reporting (MEASURE) Users Manual*, OP 43P6A, Appendix J, for information on MEASURE formats and their distribution intervals.

Format 310 (fig. 7-1 2) is, by far, the MEASURE program's best management tool for the test equipment coordinator's use in managing the commands test equipment inventory.

To make the best use of this tool, your unit should take the following actions:

1. Have the test equipment coordinator thoroughly review the Format 310 each month.
2. Annotate the Format 310 as status changes occur for equipments that have been calibrated, deleted, are in repair, have been added to inventory, delayed, surveyed, inactivated, and so on, during the month.
3. Carry these annotations forward to the next monthly Format 310, until the change is reflected on a new Format 310.

MEASURE FORMAT 310

TEST EQUIPMENT INVENTORY  
SEQUENCED BY CUSTOMER ACTIVITY, MODEL NUMBER AND SERIAL NUMBER.

CUSTOMER ACTIVITY (DDG37E)

MODEL PART NO. PLANT CODE MFR SERIAL NO.	NOMENCLATURE PLANT ACCT NO.	PART OF	MC TY	RENT DUR	DATE LAST	STD SERV	Q HRS	Q LAE	SCH CUST	SUB DE21	E S T	TD/ICN ORLSTA/DATE	UNI NUMBER
0-1107SRC16 4996UNA 13499 F35	FREQUENCY STANDARD	ANSRC23	11	072185	082184	000.0	N	NKX	DE21	1	375121	EST1976064	
0-1107SRC16 4996UNA 13499 F36	FREQUENCY STANDARD	ANSRC23	12	*041583	121582	000.0	N	NKX	DE21	1	114328	EST1976065	
0-1107SRC16 4996UNA 13499 F7	FREQ STANDARD		03	*022383	122182	000.0	N	NKX	DE21	1	056042	EST1068202	
D-1293210 4487 A132	GENERATOR TIME MARK		11	*022385	032384	000.0	N	NKX	DE31	1	779781	EST4223609	
0874-9099 4604 24655 FAR11	ADAPTER COAXIAL SET		NR	N C R	000000	000.0	N	FGQ	DE31	4	FP8213	EST1976066	
081908MM12 4996UNA 20181 883	OSCILLOSCOPE	ANSRMM12	NR	N C R	020802	042.1	N	NKX	DE23	4	FP8214	EST1976067	
10100B 4598 28480 9	LOGIC PROBE	MK76	NR	N C R	031185	000.0	N	FGQ	WM22	4	209934	EST4419539	
10100B 4658 28480 WM22-002	TERMINATION COAXIAL		NR	N C R	052384	000.0	N	FGQ	WM22	4	109876	EST8288030	
10100B 4598 28480 WM22003	LOGIC PROBE		NR	N C R	000000	000.0	N	FGQ	WM22	4	FP8216	EST1976069	
10100B 4598 28480 WM22004	LOGIC PROBE		NR	N C R	000000	000.0	N	FGQ	WM22	4	FP8217	EST1976070	
1026-01 4385 58900 284807	GENERATOR SIG UWAVE		09	090685	120684	000.0	N	NKX	GASP	2	B37959	EST4276776	

Figure 7-12.-MEASURE Format 310.

4. If changes in equipment status are not reflected on the new monthly Format 310 within 60 days of the transaction date, resubmit necessary MEASURE METER cards (hand scribed) to correct the discrepancy, or contact the Readiness Support Group (RSG) (Atlantic Fleet) or the Maintenance Coordinating Center (MCC) MEASURE coordinator for assistance.

**Requesting Calibration**

If you know and follow the detailed procedures outlined by your TYCOM, METCAL group, and area MOCC for calibration of test equipment, you will have serviced and calibrated test equipment available when you need it. You can find flow charts and area charts for calibration requests of the Atlantic and Pacific Fleets in the *Electronic Test Equipment Calibration Program Indoctrination Handbook*, NAVMAT P-9491.

The following steps for requesting calibration are general, but they should apply in most cases:

1. Read and familiarize yourself with the instructions concerning test equipment

calibration procedures set forth in your TYCOM maintenance manual, and the *MEASURE Users Manual*.

2. Use MEASURE products to determine the calibration due dates.
3. For items scheduled for calibration or items to be calibrated, perform MIP T-1, MRC R-1.
4. If an item does not checkout with T-1 and R-1, tag the equipment and note the malfunction. Either repair the inoperable equipment yourself or have your technicians repair it. Calibration activities are not required to accept equipment that is not in an operable condition. If you are unable to repair the equipment, send it to a repair facility accompanied by a job order or work request specifying exactly what is wrong.
5. If your ship has a field calibration activity (FCA) on board, perform calibration on equipment within your calibration package capability. Type commanders stress that calibration must be done at the lowest level and that it be closely monitored.

6. Prepare the necessary paperwork to request repair and/or calibration. Examples of required documentation are:

a. OPNAV 4790/2K—Repair and calibration (fig. 7-13).

b. OPNAV 4790/2K—Used for requesting calibration of a large quantity of test equipment with 2L attached (fig. 7-14).  
(Note: It is permissible to staple a copy of

OPNAV 4790/2K (Rev. 6-75) S/N 0107-LF-047-9011												SHIP'S MAINTENANCE ACTION FORM (2-KILO)												COMP	DNK																																																										
SECTION I. IDENTIFICATION												JOB CONTROL NUMBER																																																																							
1. SHIP'S UIC			2. WORK CENTER			3. JOB SEQ. NO.			4. APL/AEL			5. WNO			6. STA			7. CAB			8. OPR			9. DPN			10. PFI			11. PFI			12. PFI																																																		
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SECTION III. COMPLETED ACTION												29. ACT. TN												30. S/F HRS.												31. COMPLETION DATE												32. ACT. MAINT. TIME												33. YR												34. METER READING											
SECTION IV. REMARKS/DESCRIPTION												35. REMARKS/DESCRIPTION												36. CONT. SHEET																																																											
												M A I N P O W E R F U S E B L O W S U P O N T U R N I N G T H E O S C O P E P O W E R S W I T C H T O O N X X X R E Q U E S T R E P A I R A N D C A L I B R A T E																																																																							
												( INCLUDE MODEL/PART NUMBER IN EITHER BLOCK 5 OR BLOCK 35 )																																																																							
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37. CSMP SUMMARY												O A C R E P / C A L U S M 1 1 7 O S C O P E																																																																							
38. FIRST CONTACT/MAINT. MAN (Print)						39. RATE						40. SECOND CONTACT/SUPERVISOR (Print)						41. PREL						42. 1/2						43. INTEGRATED PRIORITY																																																					
NAME						X X X X						NAME						RATE						X X																																																											
C. DIV. INIT.			D. DEPT. INIT.			E. COMMANDING OFFICER'S SIGNATURE			F. TYCOM AUTHORIZATION			44. LOG			45. TYCOM																																																																				
XX			XX			XX						X			X																																																																				
44. SPECIAL PURPOSE												46. PREARRIVAL/ARRIVAL CONFERENCE ACTION/REMARKS																																																																							
												X X																																																																							
SECTION V. SUPPLEMENTARY INFORMATION												47. BLUEPRINTS, TECH. MANUALS, PLANS, ETC.												48. AVAILABLE ON BOARD																																																											
												X X												YES NO																																																											
SECTION VI. REPAIR ACTIVITY PLANNING/ACTION												49. REPAIR W/C												50. EST. HRS.												51. ASST. REPAIR W/C												52. ASST. EST. HRS.												53. SCHED. START DATE												54. SCHED. COMP. DATE											
55. REPAIR ACTIVITY UIC												56. WORK REQ. ROUTINE												57. EST. WARDAYS												58. EST. WARDAY COST \$												59. EST. MATERIAL COSTS \$																																			
60. EST. TOTAL COST \$												61. JOB ORDER NUMBER												62. LEAD P&C CODE												63. DATE OF EST. DAY																																															
64. FINAL ACT.			65. HRS. EXPENDED			66. DATE COMPLETED DAY			G. COMPLETED BY (Signature - Rate)			H. ACCEPTED BY (Signature - Rate/Rank)																																																																							

Figure 7-13. OPNAV 4790/2K for repair and calibration.

SHIP'S MAINTENANCE ACTION FORM (2-K110)									
SECTION I IDENTIFICATION									
SHIP'S NAME USS NEVERSAIL		JOB CONTROL NUMBER DD-140		SHIP'S USE H 0 0 0 1 O E 0 8 A 0 0 9 N A		WORK CENTER H 0 0 0 1 O E 0 8 A 0 0 9		JOB SHEL NO.	
SECTION II REMARKS/SKETCHES									
REQUEST CALIBRATION SERVICES FOR THE FOLLOWING TEST EQUIPMENT ( ELECTRONIC )									
WC/JSN					MJC				
OE01-01000					N0000-OXCA-0001				
LIST									
ITEM	NOMENCLATURE	MODEL NR	SERIAL NR	SCAT					
*****OR*****									
ATTACH COPY OF MEASURE FORMAT 310, 350 or 801/802 (ANNOTATED)									
( NOTE: AREAS WITH "X" MUST BE FILLED IN )									
SECTION III DEFERRAL ACTION									
SECTION IV COMPLETED ACTION									
SECTION V REMARKS/DESCRIPTION									
R E Q U E S T C A L I B R A T I O N S E R V I C E S F O R E L E C T R O N I C T E S T E Q U I P M E N T A S L I S T E D O N A T T A C H E D 2 L									
( NOTE: AREAS WITH "X" MUST BE FILLED IN )									
SECTION VI CHIEF'S SIGNATURE									
Q A C C A L I B R A T I O N O F G P E T E									
SECTION VII SUPPLEMENTARY INFORMATION									
SECTION VIII REPAIR ACTIVITY PLANNING/ACTION									
SECTION IX AUTHENTICATION									
NAME RATE					NAME RATE				
X X X X					X X X X				

Figure 7-14.-OPNAV 4790/2K with 2L attached for electronic test equipment calibration (quantitative).

the 802 Recall List to the 2L instead of hand scribing it.)

need to keep your systems and equipment in optimum condition.

c. Maintenance Document Transmittal Form (MDTF) (fig. 7-15)

**Calibration Status Indication**

Note: The type of request documents and procedures may differ depending on TYCOMs' guidelines.

The Navy calibration program has a series of distinctive labels and tags for indicating the calibration or serviceability status of all Navy test and measuring equipment. All calibration personnel and equipment users should be familiar with each label and tag and its meaning. Labels of different nomenclature, color combinations, and shapes have been designed to help users identify the calibration status. These labels and tags are used by all participants in the Navy METCAL program and must be affixed to all Navy standards and test and measuring equipment. NAVAIR 17-35MTL-1, *Metrology Requirements List (METRL)*, lists Navy calibration procedures and intervals for all standards and test and measuring equipment. Only equipment actually used for quantitative measurements requires calibration.

7. Submit the paperwork to the appropriate activity for items to be calibrated.
8. When you are notified of the activity or activities designated to repair and/or calibrate your test equipment, prepare the equipment for shipment. Be sure to take adequate precautions (including shock and environmental protection) to prevent damage in transit. All test equipment will require a METER card before it will be accepted at the calibration or repair lab.
9. Remember to pickup the equipment when the work has been completed. Do your part in the coordinating of requests, deliveries, provision of requested materials, follow-up, and pickup. If you do your part and complete paper work accurately, you should have the excellent test equipment calibration package and service you

**MAINTENANCE**

Test equipment requires the same two types of maintenance (preventive and corrective) you are

**MAINTENANCE DOCUMENT TRANSMITTAL FORM**

FROM COMMANDING OFFICER USE NEVERSAIL UIC 00001 PAGE 1 OF 1  
 TO COMMANDING OFFICER RSG NORFOLK VA DATE 5 JUN 80

VIC DATE  
 1 2 3 4 5 6 7 8 9 0  
 0 0 0 0 0 1 7 4 T B

CSMP ONLY  IMAV  SUPPLEMENT TO IMAV  CONCURRENT IMAV  SUPPLEMENTAL IMAV  RSG EMERGENCY

FOR MJC USE ONLY

UIC	W/C	JSM	CLOSING DEF.	CORRECTION	COM/MAINT	RE SUBMITTED	CSMP ONLY	MJC UIC	MJC W/C	MJC JSM	MJC NOUN NAME	MJC SERIAL NUMBER	MJC APL/AEL	T.C.	INITIALS	DATE
00001	0E01	0100	X	X	X	X	X	00000	0XCAB001		ELECTRONIC					
00001	0E01	0101	X					00000	0XCAB003		ELECTRICAL					
00001	EM03	0105	X					00000	0XCAB002		MECHANICAL					
00001	0E01	0106	X								U.S.M. 117	A281	7-670050316			

Figure 7-15. Maintenance Document Transmittal Form.



familiar with in electronic equipment and systems. Preventive maintenance consists of checks to determine if the equipment is functioning properly, visual inspection for damage, lubrication, and the like. Corrective maintenance includes the isolation of trouble, the replacement of defective components, the realignment and readjustment of equipment, and such, to bring the item to a satisfactory operating level.

### **Preventive Maintenance**

A sound preventive maintenance program for test equipment is the key to the reliable operation of test and measuring devices needed for proper preventive maintenance of our equipments and systems.

In many ships, test equipment preventive maintenance has been neglected. People often say that neither the time nor the personnel are available for an effective preventive maintenance program. However, if **preventive** maintenance is neglected, the requirement for **corrective** maintenance will grow; it may grow to the point that a critical situation may exist because test equipment needed for preventive or corrective maintenance of electronic equipments and systems is broken or improperly adjusted.

The Electronics Technician is responsible for ensuring that all test equipment is scheduled for preventive maintenance. Preventive Maintenance MIP T-1, MRC R-1 applies to ALL test equipment on board. Equipment tech manuals can be used for operational tests and test indications. Take care to ensure that all units of each equipment are checked according to the MRC. Checks in addition to those required by MIP T-1, MRC R-1 maybe annotated on the EGLs that should be completed with MRC R-1. The preventive maintenance schedules must be prepared according to the preventive maintenance instructions of each ship's type commander.

Test equipment is an important factor in the preventive and corrective maintenance of electronic and systems; therefore, a properly established (and carried out) preventive maintenance program for test equipment will yield a higher availability of operable and calibrated equipment.

### **Corrective Maintenance**

Test equipment corrective maintenance is the correction of test equipment troubles. This includes the repair of an item after a complete breakdown, the finding of faults during preventive maintenance, or the tuning

and adjustment of an item to restore it to operating condition.

Many activities and ETs in the fleet are reluctant to repair electronics test equipment; however, the NAVY expects our ETs to perform a certain amount of maintenance and repair of their own test equipment whenever possible. The repair parts needed to make repairs may already be aboard ship. It will often be your responsibility to decide when a piece of test equipment should be repaired and who should repair it. You will need to consider the following factors.

1. Much of the test equipment now being used by naval activities is expensive and is built and calibrated to a high degree of precision. Repair often requires special laboratory facilities and skill. Although each activity should make all repairs within its capabilities, the lack of qualified personnel or adequate facilities may limit the kinds of repairs an activity should attempt. Repairs attempted by unqualified maintenance personnel or personnel working in inadequate facilities could result in extensive damage to equipment. Therefore, you should evaluate each piece of test equipment to determine if your personnel should make the repairs, especially when maintenance of test equipment requires repair of critical calibration or frequency-determining circuits. When repairs are made locally, technical manual procedures should be followed carefully; **the repair and assembly of parts must be meticulous**. When your personnel cannot make the repairs, or when the necessary post-verification is beyond the capabilities and facilities of repair personnel, forward the equipment to the nearest maintenance activity that has the proper facilities.
2. Calibration laboratories are authorized to make only incidental repairs, defined as those found necessary during calibration to bring the item within specified tolerances. Before submitting an inoperative item of test equipment for repair to a maintenance activity, you should note on an OPNAV Form 4790/2K all faults, symptoms, and other malfunction characteristics and submit the 2K through the proper channels for repair-action screening.

## STOWAGE AND HANDLING

Before leaving this chapter, we need to discuss the important topic of test equipment stowage and handling. Electronic test equipments are delicate, precision, and calibrated items of equipment that are usually expensive and in high demand. Improper stowage, rough handling, heat, moisture, dust, and such, affect the availability and life of test equipment. Bumping or dropping an item may destroy the calibration of a meter, or short-circuit or break electronic elements inside the case. Bends, creases, cuts, or dents in coaxial test cables or test attenuators can alter the attenuating effect, causing false meter readings or measurements. Some items of test equipment use forced-air cooling, dust filters, and heaters. These require clean air filters for proper ventilation and a warm-up period to permit units in the test equipment to hold calibrated standards.

Board of inspection and survey (INSURV) inspections have documented time and time again that the problem of inadequate stowage facilities for portable test equipment continues to exist on ships. Degradation of equipment often results from both the unofficial rearrangement of test equipment stowage facilities by fleet personnel and inadequate provision for proper stowage facilities following ship alteration installations. As a senior technician, your job is to ensure that "your" test equipment is stowed and used properly and that your ship is not one of the ships with documented test equipment stowage problems.

Proper stowage for test equipment is detailed in the *Stowage Guide for Portable Test Equipment*, NAVSEA ST000-AB-GYD-0010/PEETE. This publication provides guidance on the use and availability of tie-down straps, shelving, shock-absorbent materials, work benches, brackets, cabinets, and other such items required for the construction of shipboard stowage facilities. In addition, the Stowage Guide's physical data and design guidance for portable electrical and electronic test equipment in use aboard ship can be helpful to ship installation and design activities as they determine adequate shipboard stowage facilities.

Take the time to read the *Stowage Guide for Portable Test Equipment* if you are not already familiar with its content. It will be of great help to you in determining how to stow your test equipment correctly.

In this chapter we have discussed the importance of test equipment to your mission and the procedures for ensuring that such equipment will be available and in

ready condition when you need to use it. Remember, your personnel are only as good as their tools. Teach them to treat test equipment carefully and with respect. This will contribute much to the success of your electronics division.

## REFERENCES

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## CHAPTER 8

# MAINTENANCE/COSAL

Throughout this chapter, you will be referred to other publications for additional information on the topic being discussed. To receive the best training possible and to improve your knowledge, you must read the publications and become familiar with the information they contain.

*Electronics Installation and Maintenance Book (EIMB), General Maintenance, NAVSEA SE000-00-EIM-160*, is an excellent handbook to use to review maintenance organization and to increase your knowledge of electronics maintenance. You should also refer your junior technicians to this manual. As a training aid, it will benefit both you and your command.

Shipboard electronics maintenance consists of the following duties:

1. Performing operational tests to establish readiness.
2. Performing power tests, calibration, nonoperational adjustments, and other prescribed qualitative and quantitative performance measurements to establish functional evaluations on systems and equipments.
3. Restoring or replacing deteriorated or defective parts, and replenishing lubricants, coolants, falters, and other consumable items.
4. Correcting failures and damage during operations.
5. Protecting insulation, insulators, and conductors by removing rust, lint, and conductive and nonconductive deposits of fluid, and protecting equipment from the accumulation of these substances and from man-made hazards.

In short, shipboard electronic maintenance consists of preventative and corrective maintenance on all electronic systems, subsystems, equipments, and test equipment.

Because of the complexity of the electronic equipment and systems we now have on our ships, it is most important that electronics personnel be *properly trained, supervised, and available for maintenance* of these equipments and systems at any given time. This means that as the LPO or LCPO, you must assign your

people *wisely, train* them well, and *establish effective schedules* for routine checks and tests. You also need to ensure that all of your allowed parts, test equipment, and tools are maintained, and that all pertinent forms and publications are available. In this chapter we will discuss the various aspects of supervisory maintenance.

### LEVELS OF EQUIPMENT MAINTENANCE

There are three levels of maintenance performed by the Navy: **organizational, intermediate, and depot**.

#### ORGANIZATIONAL MAINTENANCE

Organizational maintenance is performed by and is the responsibility of, you guessed it, you and your technicians, and is performed on your assigned equipment. The phases of organizational maintenance are normally inspecting, servicing, lubricating, adjusting, and the replacing of parts, minor assemblies, and subassemblies.

#### INTERMEDIATE MAINTENANCE

Intermediate maintenance is the responsibility of and is performed by designated maintenance activities for direct support of using organizations. The phases of intermediate maintenance are (1) the calibration, repair or replacement of damaged or unserviceable parts, components, or assemblies; (2) the emergency manufacture of nonavailable parts; and (3) the providing of technical assistance to using organizations. This includes maintenance performed by aircraft carriers, tenders in support of other ships' public works departments, and officially designated shore activities.

#### DEPOT LEVEL MAINTENANCE

Depot maintenance is performed on material requiring major overhaul or a complete rebuilding of parts, assemblies, subassemblies, and end items, including the manufacture of parts, modifications,

testing, and reclamation as required. Depot maintenance supports lower categories of maintenance by providing technical assistance and by performing maintenance that is beyond their responsibility or capability. Depot maintenance provides stocks of serviceable equipment by using more extensive facilities for repair than are available in lower-level maintenance activities. This maintenance is normally performed by naval air rework facilities, depot field teams, naval ammunition depots, naval ordnance stations, naval weapons stations, and naval construction battalion centers. It may be performed at contractor depot level work activities, at commercial facilities, or Navy shipyards during availabilities designated as “voyage repairs,” “restricted,” “technical,” “regular overhaul,” and the like.

### **CATEGORIES OF MAINTENANCE AT THE ORGANIZATIONAL LEVEL**

Maintenance actions are subdivided into groups or categories in several different ways; for example, operational/technical, preventive/corrective, and overhaul/repair. The operational/technical and overhaul/repair categories can be bound together according to the technical knowledge and skill needed to do the work.

#### **OPERATIONAL MAINTENANCE**

Operational maintenance is the care and minor maintenance of equipment **using procedures that do not require** detailed technical knowledge of equipment's or system's function and design. This category of operational maintenance normally consists of inspecting, cleaning, servicing, preserving, lubricating, and adjusting, as required. Such maintenance may also include minor parts replacement that does not require the person performing the work to have highly technical skills or to perform internal alignment.

As the term implies, *operational maintenance*, is performed by the operator of the equipment. Its purpose is threefold: (1) to make the operator aware of the state of readiness of the equipment; (2) to reduce the delays that would occur if a qualified technician had to be called every time a simple adjustment were needed; and (3) to release technicians for more complicated work.

You need to talk with the operators and instill in them your willingness to work with them, as a team, to ensure that all equipment will be maintained in operational readiness. They should report all equipment defects and irregularities to the ET shop promptly, so

that all defects can be corrected as soon as possible, before they become worse.

#### **TECHNICAL MAINTENANCE**

Technical maintenance is the restoration of an equipment or system to its normal operating condition through the elimination of electrical and mechanical faults; replacement of unserviceable parts, subassemblies, or assemblies; and aligning, testing, and adjusting affected equipment. This type of maintenance **requires skill and detailed technical knowledge of the equipment.**

The knowledge required for this maintenance can be acquired through experience, individual study, formal naval schooling, observation of the work of skilled personnel, and in-service training (OJT).

Details of technical maintenance (usually referred to in technical manuals as *corrective maintenance*) are given in equipment technical manuals, maintenance manuals, letters, directives, and periodicals.

#### **PREVENTIVE MAINTENANCE**

We can reasonably assume that many equipment breakdowns were once minor faults. Some of these minor faults are detectable in their early stages. The ultimate objective of preventive maintenance is to detect and correct these faults early so they will not later result in equipment failure.

Equipment failures are governed in general, by the complexity of the equipment, the demands placed on it, and the abuse to which it is subjected. **Abusing** equipment means failing to follow proper operational procedures and failing to ensure adequate preventive maintenance. As an ET1 or ETC, you must ensure that your personnel are thoroughly familiar with the contents of the MRCs and maintenance publications that apply to the equipment or system on which they are assigned to work. This information will help to prevent equipment abuse and to reduce equipment failures.

#### **ELECTRONIC EQUIPMENT AND SYSTEM MAINTENANCE**

At this point in your electronics career, you are probably a proficient maintenance technician for certain equipments and systems, and have developed a positive attitude and confidence concerning these particular equipments and systems. As you advance to ET1 and ETC, your “equipment and systems” responsibilities will increase because you will probably be in a work

center or work group supervisory position. Your positive attitude and confidence will be an asset, and in time, you will become more proficient in managing the maintenance for the additional equipment and systems.

It is almost impossible to become a proficient technician in all electronic equipments and systems; however, as a supervisor, you should have adequate knowledge of all the electronic equipments and systems for which you are responsible. Additionally, you should have at least a functional knowledge (as a minimum) of all peripheral, ancillary, and supporting equipment and systems.

As a supervisor, you should know where all equipments are located, their designations, and their position numbers. Your casualty control folder should help you find equipment locations. With time, as you apply yourself as a conscientious supervisor, identifying and explaining locations, functions, and system operation will become second nature for you.

A good background knowledge of all equipments and systems combined with your maintenance experience and positive and confident attitude will be assets as you work in the following areas:

- Training your technicians (and yourself)
- Minimizing equipment and system downtime
- Providing support to the ship's overall mission

In addition, you will also earn the confidence and support of your subordinates and the confidence and support of your seniors.

## **ELECTROMAGNETIC INTERFERENCE (EMI)**

EMI is an electromagnetic or electrostatic disturbance that causes electronic equipment to malfunction or to produce undesirable responses or conditions that do not meet the requirements of interference tests. The dramatic increase in the types of electronic and electrical equipment since the beginning of World War II has brought about a problem that was given little consideration in previous years-EMI. EMI has become a problem because naval ships and aircraft now contain a large number of complex, sensitive devices that are not always compatible with one another.

As an ETL or ETC, you must be aware of the problems caused by EMI and of the solutions to these problems. No magic is involved in reducing or eliminating EMI; instead, problems are resolved by

using everyday, commonsense approaches to maintaining equipment.

## **SOURCES OF EMI**

There are three types (or sources) of electromagnetic interference: natural, inherent, and man-made.

### **Natural EMI**

Natural interference is caused by natural events, such as snow storms, electrical storms, rain particles, and solar radiation. This type of interference is commonly called static or atmospheric noise. It can cause problems with rf communications and older data links between shore, ship, and air; however, it does not cause many problems with modern digital data equipment.

### **Inherent EMI**

Inherent interference is noise within a piece of electronic equipment, caused by thermal agitation of electrons flowing through circuit resistance. (This noise is usually noticed as the background noise heard in a radio receiver when it is tuned to a frequency between stations.)

### **Man-Made EMI**

Man-made EMI is produced by a number of different classes of electrical and electronic equipment. They include, but are not limited to: transmitters, welders, power lines, motors and generators, lighting, engines and igniters, and electrical controllers. These devices can cause severe EMI, which can degrade the operation of shipboard or shorebased data processing equipment.

The discussion of EMI will be directed to the recognition and elimination of the man-made EMI that you are apt to encounter ashore or afloat.

## **TYPES OF EMI**

EMI can be classified by its spectrum distribution. EMI can be either narrowband or broadband interference. These terms refer to the frequency spectrum the interference covers.

## **Narrowband EMI**

Narrowband EMI consists of a single frequency or a narrowband of interference frequencies. Narrowband EMI usually has a minor effect on communications or electronic equipment. It can be tuned out or faltered out.

## **Broadband EMI**

Broadband EMI is not a discrete frequency. It occupies a relatively large part of the electromagnetic spectrum. This type of EMI is usually caused by arcing or corona and causes most EMI problems in digital data equipment. It will be especially noticeable when you are receiving data on digital data links. It is caused by the worn or improperly installed brushes of motors or generators, defective fluorescent lights, arcing of contacts in electrical controllers or stepping switches, ignition systems of motor vehicles, igniters for jet engines, and defective power lines or power transformers.

Improperly bonded lifelines, rigging, jackstays, ladders, and stanchions also produce a significant amount of EMI in a shipboard environment. They act as nonlinear mixing devices and antennas. They receive a number of different transmitted frequencies, mix them, and reradiate them over a broad spectrum.

## **CONTROL OF EMI**

EMI can be controlled or eliminated if some simple procedures are followed and good installation practices are adhered to. We will divide the discussion of EMI control and reduction into two categories: shipboard and shorebased. Many of the problems and procedures for reduction are the same for both types of installations.

### **Shipboard EMI Control**

Shipboard EMI control is greatly simplified for typical electronic and digital-data installation. Because of the ship's steel hull and construction, much shielding and isolation are provided for typical shipboard equipment spaces. This blocks out most broadband interference generated both internally and externally. Five major factors must be considered in shipboard computer and digital equipment installations. They are as follows:

1. Equipment location
2. Equipment shielding
3. System and equipment grounding

4. Interconnection cabling

5. Source of power

**EQUIPMENT LOCATION.-** Digital and computer equipment should be located in spaces that are free of EMI sources. It should not be located in spaces that contain radars, radio transmitters, or generators or other rotating machinery. Simple attention to the location of digital equipment can reduce or eliminate many sources of EMI.

**EQUIPMENT SHIELDING.-** Electronic and digital equipment should never be operated with drawers extended, cover plates removed, or doors open. Modern equipment contains EMI reducing gaskets and shields that enclose the equipment. Defeating this shielding can lead to serious problems. Always reinstall cover plates with all fasteners in place. If a cover plate or shield must be removed in the course of corrective maintenance, ensure that the EMI reducing contacts or wire gaskets on the equipment opening are in good condition before the cover or shield is replaced. If the contacts or gaskets are bad, replace them.

**SYSTEM AND EQUIPMENT GROUNDS.-** System and equipment grounds are extremely important in equipment installations. All cabinets should be grounded together on a common system-ground bus. Normally a main system-ground bus of about 70,000 circular mills (1.5 inches in diameter) or more is run through all spaces. Each equipment cabinet is connected to the system ground by a heavy ground cable. The system ground is securely attached to the hull of the ship and provides a good ground reference for the system. In addition, all equipment cabinets have ground straps bypassing the shock mounts attached to the metal decks or mounting racks. A poor electrical connection will result from paint on ground straps or on the metal decks where the ground straps are mechanically attached. All terminal lugs or ground straps used to bond the equipment to the hull or the system ground should be bright, clean, and free of any foreign material. This is also true of grounding studs and the system ground cable. This clean surface ensures a good electrical connection. The grounded cabinets provide a shield at ground potential. This keeps in any signal that might cause a problem somewhere else in the system. It also keeps out stray interference that might cause a problem in a particular piece of equipment.

**INTERCONNECTING CABLES.-** All interconnecting cables used in shipboard electronic and digital systems should be shielded cables. They should be assembled correctly according to installation

drawings. The shield and connector shell should be electrically connected and properly secured at either end interconnecting cables may have to be routed through spaces where a potential for EMI exists (such as radar rooms). Cables for digital equipments and audio should never be run in the same cableways as cables carrying rf signals or high-power-pulse cables. The shielding protects the data and voice cables from EMI to a great extent. (This is only true if the cable is properly assembled and carefully routed to avoid strong EMI fields.)

**POWER SOURCE.**— Power lines for electronic and digital equipment can provide a transmission path for EMI from machinery spaces. Most input power passes through noise elimination filters as it enters the equipment. Failure of power line filters (actually bandpass/band reject filters) is rare but happens on occasion. Unusual random problems in equipment can sometimes be traced to defective line filters. Unusually large transient voltages on power lines may also cause EMI. The easiest way to check this type of problem is with an oscilloscope, an isolation capacitor, and a 10:1 probe. Connect the probe and capacitor in series with the main power deenergized. Apply power and check the scope to determine if excessive noise or “hash” is riding on the input voltage.

**CAUTION: Always observe all safety precautions while checking equipment input power.**

### **Shorebased EMI Control**

Control of EMI at a shorebased installation requires the consideration of the same factors as for a shipboard system, with two additional factors: site location and soil quality.

These two factors may contribute to the generation of additional EMI. They are discussed in the following paragraphs.

**SITE LOCATION.**— Shorebased electronic and digital data equipment sites are sometimes built where the need dictates or where a convenient building is available. Such sites often are not ideal. A site built near a large industrial complex, such as a shipyard or a naval aviation depot, may be subject to severe EMI. There can also be power line fluctuations if the shore site and the industrial complex have the same power source. In addition, a large amount of EMI is generated by any welding that may take place in the nearby facility.

Special precautions may be needed if sensitive electronic and digital data equipment are located at sites

near a high-noise industrial facility. For example, shielding may be needed around an especially sensitive piece of equipment to ensure its proper operation.

Additional line filters and regulators for power lines may be needed to reduce EMI and provide line power within the limits prescribed by equipment manufacturers.

**SOIL QUALITY.**— At shorebased installations, a system-ground bus is normally attached to a grounding rod driven into the soil. If the soil is dry, sandy, rocky soil, such as that found in the Southwestern United States and some places overseas, the ground will be poor. (Soil that is not ordinarily a good conductor must be chemically treated to increase its conductivity.) In some cases, a poor ground may act like an antenna. The ground cable can, under these conditions, provide an EMI potential in excess of 5 volts between itself and the power ground. You can check a suspect system ground with an oscilloscope and a 1:1 probe. Using power-line ground as a reference, connect the tip of the probe to the system ground, and the shield of the probe to the power ground. An excessive amount of noise displayed on the oscilloscope may indicate a system-ground problem.

### **EMI SURVEYS**

EMI surveys are conducted to distinguish which equipment is affected and to determine the extent of interference. An EMI survey is required for new construction ships and for ships receiving overhauls or other major repair work that changes the electromagnetic configuration. As a senior ET, you should also request that an EMI survey be conducted if you experience interference on your equipments that you and others are unable to trace to a malfunction in your own equipment.

The EMI survey must be well planned and coordinated to ensure optimum use of dockside and underway test time. Refer to MIL-STD-1605, *Military Standard-Procedures for Conducting a Shipboard Electromagnetic Interference (EMI) Survey (Surface Ships)* for more detailed information on EMI surveys and reports.

### **2M PROGRAM**

Increased equipment complexity, miniaturization, microminiaturization, and the current high tempo of operational requirements have placed an increasing burden on maintenance personnel and facilities. These

problems have been further aggravated by the varied manufacturing methods and techniques used by equipment manufacturers. Maintenance personnel must be properly trained and certified to make high-quality, reliable repairs to a wide variety of state-of-the-art electronic printed circuit boards and modules. For these reasons and others the Miniature/Microminiature (2M) Electronic Repair Program was developed to provide the following support:

- Proper training in the art of miniature and microminiature repair
- Authorization to procure the tools and equipment to carry out the goals of the program
- Personnel and activity certification conducted by fleet and type commanders

## **PROGRAM SCOPE**

The 2M program objective is to provide the fleet with a **miniature** electronic repair capability at all maintenance levels, afloat and ashore. The 2M program also provides a **microminiature** repair capability on selected ships, intermediate maintenance activities (IMAs), and shore facilities. At each activity, repairs are made to those components that are Source Maintenance and Recoverability (SM&R) coded on the Allowance Parts List (APL) for that maintenance level. The 2M program is also intended to provide organizational and intermediate level maintenance activities with the capability to repair, on an emergency basis only, components coded for discard or depot level maintenance.

## **CERTIFICATION**

The primary way QA is ensured in the 2M program is through annual certification of personnel and repair sites. Inspectors (2M trained) from Mobile Technical Units (MOTUs) are designated by NAVSEA to inspect and recertify 2M sites and technicians annually. To be certified, a site must have onboard two 2M technicians certified at the appropriate skill level for each 2M repair station installed.

For station and technician certification requirements, refer to *Certification Plan for 2M/ATE Program*, TE000-AA-PLN-010/2M. This publication is available from the publications stock point in Philadelphia, Pa.

## **Issuance of Identification Cards**

When the student/technician has successfully completed the performance tests, the 2M inspector (i.e., MOTU, 2M school) will issue the appropriate ID card, record its issuance, and forward a completed NAVSEA 2M Program Certification/Recertification card to NAVSEA.

## **2M Inspector Recertification Requirements**

Each 2M inspector must qualify for recertification annually by returning to a MOTU. An evaluation/update is conducted at these sites to discuss any changes to training course content, AELs, or techniques in the repair area. The MOTU then makes a recertification recommendation to NAVSEA. Inspector recertification then is provided by NAVSEA or its designated representative.

## **TRAINING**

The 2M training courses are conducted at NAVSEA-sponsored schools at the following locations: FTC Norfolk, Va.; FTC Charleston, S.C.; FTC Mayport, Fla.; FTG Pearl Harbor, Hawaii; and Advanced Electronics School at SSC San Diego, Calif.

## **SUPPLY SUPPORT**

Initial outfitting for ships (excluding new construction) is provided by NAVSEA. Other ships, such as new construction, should obtain their initial outfitting of equipment through NAVSEA, 2M Acquisition Engineering Agent, Naval Underseas Warfare Engineering Station, Keyport, Wash. Consumable items for 2M repair stations are obtained via MILSTRIP by the requesting activity.

Additional documents providing information on the 2M Program include the following:

- *Miniature/Microminiature 2M Electronic Repair Program*, NAVSEAINST 4790.17,
- *2M Repair Handbook*, NAVSEA TE000-AA-HBK-010,
- *2M Workmanship Standards*, NAVSEA TE000-AA-HBK-020
- *2M Reference Data*, NAVSEA TE000-AA-HBK-030



## QUALITY ASSURANCE

Basically, 2M QA is preventing the occurrence of defects. QA covers all events from the start of a maintenance action to its completion and is the responsibility of all maintenance personnel. For additional discussion on this topic, refer to the chapter on quality assurance in this manual.

To this point we have discussed the areas of maintenance with which you will be especially concerned as an ET1 or ETC. Keep in mind that as your career progresses, you will be more and more involved with the “big picture.”

Now let's discuss another area of concern to you as you move up into areas of more responsibilities: supply.

### SUPPLY PROCEDURES

You have probably already had many dealings with supply matters; but as you advance to ET1 and ETC, your dealings with supply will become more frequent. Your careful concern will be required. You will become more involved with supply support problems, such as—Why is the part requisitioned not onboard?—Is the equipment supported by COSAL?—and so on. As a senior technician, your understanding of supply procedures and the system will benefit you and, ultimately, will be an asset to your division's maintenance accomplishments.

If your ship's COSAL is not up-to-date, your ship's supply support will be inadequate; and when you requisition repair parts, you will often encounter NIS (not in stock) or NC (not carried) items. Therefore, you must understand how the COSAL “system” operates, so you can have repair parts on board that are justifiable and allowable for actual equipments on board. Your knowledge of the COSAL and your careful coordination with supply will help the supply department maintain an up-to-date COSAL, which in turn will allow your shop to accomplish efficient equipment repairs.



At this point go to supply and ask to use the COSAL *Use and Maintenance Manual*, SPCCINST 4441.170, Read chapters 1 through 4; chapter 5, through section C; and chapter 7, sections B, D, and E. Then return to this manual.

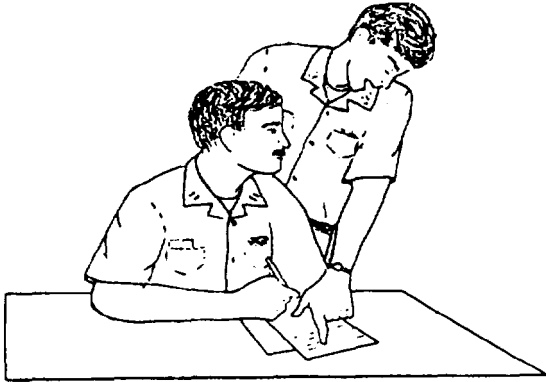
Now that you have completed reading the *COSAL Use and Maintenance Manual*, you should have a basic understanding of how the COSAL is organized and maintained, and how it can help you in your role as a supervisor. Remember to refer to this manual whenever you train your technicians in supply procedures.

### SUPPLY AND YOUR MAINTENANCE DIVISION

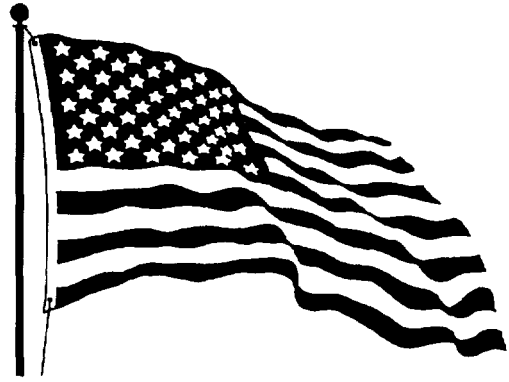
The following paragraphs are based on a senior technician's thoughts toward supply. To best use your supply system, keep these thoughts in mind:

- Take great care in selecting your supply petty officer. Choose someone whom you believe will be accountable and will keep good records; someone who will ask for guidance from you or your supply department should he or she run into any supply-related troubles. This individual should not be someone who has just checked on board from A school, but someone who has some experience in the rating.
- Know how the supply system operates and understand the COSAL, at least as it applies to your electronics maintenance actions.
- Use the supply system as it is set up and designed to function.
- Stay away from bulk ordering of parts, because one order of 20 of an item has the same supply “hit rate” as one order of 1 of that same item. One of supply's bases for stocking an item is the number of “hits” (orders) within a certain time frame. To ensure that supply maintains a sufficient stock of the parts you need, order a few parts several times rather than many parts a few times.
- At least three months before deployment, assist the EMO with a listing of parts (with stock numbers) that you know or feel will be used or needed to support your systems and equipments. This list of parts will be checked with supply to

ensure availability of these items for your upcoming deployment.



Finally, remember that **SKILL** and **TEAMWORK** in the **FLEET** will produce, high moral, good working conditions, and a Strong Naval Force for our country.



For the items not shown in stock, you or the EMO should ensure the items are ordered for stock. For critical items, conduct a storeroom sight verification to ensure that each part is actually there. You can do this if you have a good relationship with supply.

- Ensure that all paperwork associated with maintenance and supply is well managed and is completed and submitted on time. These documents concerning maintenance and parts used will ultimately assist you in parts support.
- Finally, and this is very important, develop a good working relationship with supply personnel and maintain cooperation. This effort will ultimately be to your benefit in dealing with supply for your repair parts.



## REFERENCES

- Certification Plan for 2M/ATE Program*, NAVSEAPUB TE000-AA-PLN-010/2M, Naval Sea Systems Command, Washington, D. C., 1991.
- Coordinated Shipboard Allowance List (COSAL) Users Manual*, SPCCINST 4441.170 with ch 3, Navy Ship's Parts Control Center, Mechanicsburg, Pa., 1984.
- Electronics Technician 1 & C*, NAVEDTRA 10192-F, Naval Education and Training Program Support Activity, Pensacola, Fla., 1987.
- Electronics Installation and Maintenance Book, General Maintenance*, NAVSEA SE000-00 EIM-160, Naval Sea System Command, Washington, D.C., 1981.
- Electronics Installation and Maintenance Book EMI Reduction*, NAVSEA SE000-00-EIM-150, Naval Sea System Command, Washington, DC., 1972.
- Electronics Installation and Maintenance Book, General*, NAVSEA SE000-00-EIM-100, Naval Sea System Command, Washington, D. C., 1983.
- Procedures for Conducting a Shipboard Electromagnetic Interference (EMI) Survey (Surface Ships)*, MIL-STD-1605(SHIPS), Naval Ships Systems Commands, Washington, D.C., 1973.

# APPENDIX I

## PERSONNEL ADMINISTRATION REFERENCE INDEX

This appendix shows a sample of the topics and associated references listed in the Personnel Administration Reference Index, published annually in the *Navy Leader Planning Guide*, NAVPERS 15255R. The actual index consists of approximately six pages of topics and references that may be of interest or use to you. Most of the reference numbers will remain the same over time; however, they are subject to change. Therefore, be sure to check the current *Department of the Navy Directives Assurance System Consolidated Subject Index, NAVPUBINST 5215.1, for the latest edition or change to any reference you may need to use.*

\*SYMBOL DENOTES NAVY PUBLICATION/HANDOUT

<u>SUBJECT</u>	<u>REFERENCE</u>	<u>SUBJECT</u>	<u>REFERENCE</u>
ABBREVIATIONS	NMPCINST 2340.1D	AVIATION OFFICER CANDIDATE (AOC) PROGRAM	MILPERSMAN 6610360
"A" SCHOOLS	ENLTRANSMAN 7		OPNAVINST 1120.2A
	BUMEDINST 1510.31		NMPCINST 1120.35
ABSENTEES	MILPERSMAN 3430100	AWARDS	MILPERSMAN 3410200
	through		SECNAVINST 1650.1
	MILPERSMAN 3430300		
ACCIDENTS	MILPERSMAN 4210100	BALLOTS (Absentee)	MILPERSMAN 6210220
	OPNAVINST 3750.6	BACHELOR QUARTERS	OPNAVINST 11103.1
	OPNAVINST 5100.8		OPNAVINST 11103.2A
	OPNAVINST 5100.12		OPNAVINST 11103.3
ACTIVE DUTY AGREEMENTS (Reservists and Inductees)	MILPERSMAN 1050200	BASIC ALLOWANCE FOR QUARTERS (BAQ)	MILPERSMAN 2640200
ACTIVE DUTY BASE DATE	MILPERSMAN 3840200		MILPERSMAN 2650140
	MILPERSMAN 5030460		MILPERSMAN 2650160
ADVANCE PAY	MILPERSMAN 2650100		PAYPERSMAN 3-25
	MILPERSMAN 2650120		DODPM 30201
ADVANCED EDUCATION PROGRAM	OPNAVINST 1520.30	BASIC ALLOWANCE FOR SUBSISTENCE (BAS)	MILPERSMAN 2640100
ADVANCED ELECTRONICS FIELD/ADVANCED TECHNICAL FIELD PROGRAMS	MILPERSMAN 1050310		PAYPERSMAN 3-1
ADVANCEMENT IN RATE			DODPM 30101
Active/Inactive	NMPCINST 1420.16	BASIC SKILLS IMPROVEMENT (Enlisted)	
Bibliography	NAVEDTRA 12052	Academic Remedial Training (ART) Program	OPNAVINST 1510.11
List of Courses	NAVEDTRA 12061	Job Oriented Basic Skills (JOBS) Program	OPNAVINST 1510.11
Occupational Standards	*NAVPERS 18068	Fundamental Skills Program	OPNAVINST 1500.45C
Recommendation for	MILPERSMAN 34101.50		OPNAVINST 1510.11
Rating Entry	OPNAVINST 1430.5	Bibliography for Advancement Study	CNETINST 1560.3
Specific Cycle	BUPERSNOTE 1418		NAVEDTRA 10052
After Reduction in rate	MILPERSMAN 2230200	BLOOD BANKS	BU MEDINST 6530.12
AFHPS PROGRAM	SECNAVINST 1520.8	BLOOD PROGRAM	OPNAVINST 6530.2
AGE LIMITATION	MILPERSMAN 1020100	BOARD FOR CORRECTION OF NAVAL RECORDS	MILPERSMAN 5040200
	MILPERSMAN 1030350	BONUS (Reenlistment)	OPNAVINST 1160.6
AIRCREWMAN PROGRAM	ENLTRANSMAN 9.12	Entitlement	DODPM 10911
AIR TRANSPORTATION	NMPCINST 4650.14	Recoupment	DODPM 10941
AIR FORCE APPOINTMENTS	MILPERSMAN 3840320	BRIGS	MILPERSMAN 1850100
	MILPERSMAN 3850220		MILPERSMAN 1850200
	MILPERSMAN 6620120		SECNAVINST 1640.9A
ALIENS		BROADENED OPPORTUNITY FOR OFFICER SELECTION AND TRAINING (BOOST)	OPNAVNOTE 1500
Marriage	MILPERSMAN 6210160		MILPERSMAN 1020360
Naturalization	MILPERSMAN 6210180	BROKEN SERVICE	MILPERSMAN 1020330
ALCOHOLISM/ALCOHOL ABUSE	MILPERSMAN 3820184		MILPERSMAN 1040300
	OPNAVINST 5350.4	BUPERS - SEE NAVAL MILITARY PERSONNEL COMMAND (NMPC)	
Military or DON Civilian Personnel	SECNAVINST 5300.28	CAREER COUNSELOR PROGRAM	
ALLOTMENTS		Assignment	ENLTRANSMAN 9.09
Designation of Recipients	MILPERSMAN 5030240	Career Counseling and Retention Team Manual	*NAVPERS 15878
Guidelines	MILPERSMAN 6210120	CAREER PLANNING (Officer)	*OPNAV 13-P-1
Modification of	MILPERSMAN 4210260	CAREER REENLISTMENT OBJECTIVES PROGRAM (CREO)	OPNAVINST 1160.4
ASSIGNMENT OF OFFICER FOR MEDICAL TREATMENT	MILPERSMAN 1810520	CASUALTIES	
ATTACHE DUTY	ENLTRANSMAN 4, 9.19	Casualty Assistance Calls Program (CACP)	MILPERSMAN 4210160
AUTOMOBILES			NMPCINST 1770.1
Insurance	MILPERSMAN 6230160	CENSORSHIP	OPNAVINST 5530.1
Registration and Marking	OPNAVINST 5560.10	CIVILIAN HEALTH AND MEDICAL PROGRAM OF THE UNIFORMED SERVICES (CHAMPUS)	*NAVPERS 15878
	SECNAVINST 1740.2B		
Shipment	MILPERSMAN 6810110		
Travel under orders	MILPERSMAN 1810320		
AVAILABILITIES	ENLTRANSMAN 20		



## APPENDIX II

# ORGANIZATIONAL AND ADMINISTRATIVE REFERENCE LIST

The following list provides titles of references that are useful for the organizational and administrative areas shown.

### BILLS

Cold Weather Handbook  
Command Administrative Inspection Guide for Ships  
EIMB–Electronics Installation and Maintenance Book  
Electrical Shock, Its Cause and Prevention  
Electronic Test Equipment Calibration Indoctrination Program  
EMO's Guide to Shipboard Electronic Interference Control (SEMCIP)  
List of Training Manuals, Correspondence Course, and Personnel Qualification Standards (PQS)  
Navy Occupational Safety and Health Manual  
PQS Manager's Guide  
Preparation for Overseas Movement (POM) Guide  
Safety Precautions Afloat  
Security Manual for Classified Information  
Shipboard Electronics Material Officer  
Shipboard Non-Tactical ADP Program H (SNAP II) System Management  
Ship Exercises (U) FXP-3  
Standard Organization and Regulations for the U.S. Navy  
TACAN Flight Inspection Manual  
TRALANT/TRAPAC TRE Check List  
U.S. Navy Regulations, 1978  
3-M Inspection Policies, Procedures and Criteria  
3-M Manual, Ships  
XXXX Class Combat Systems Doctrine

### CASUALTY CONTROL MANUAL

Central Dry Air System, Surface Ship  
Combat Systems Training Requirements Manual  
EIMB–Electronics Installation and Maintenance Book

Electronic Radiation Hazards  
Hazardous Material Information System (HMIS)  
List of Items Requiring Special Handling (LIRSH)  
NAVSHIP Technical Manual  
Safety Precautions Afloat  
Shipboard Electronics Material Officer  
Ship Exercises (U) FXP-3  
Ship Safety Bulletin  
Standard Organization and Regulations of the U.S. Navy

#### DIVISION ORGANIZATION MANUAL

Bibliography for Advancement Examination Study  
Combat Systems Training Requirements Manual  
Command Administrative Inspection Guide for Ships  
Consolidated List of Recurring Reports  
Master Training Plan  
SCLSIS Manual  
Security Manual for Classified Information  
Shipboard Electronics Material Officer  
Standard Organization and Regulations of the U.S. Navy  
3-M Manual, Ships  
3-M Notes/Memoranda

#### ELECTRONICS ORGANIZATION MANUAL

Combat Systems Technical Operating Manual (CSTOM)  
Combat Systems Training Requirements Manual (CSTRM)  
Command Administration Inspection Guide for Ships  
EIMB-Electronics Installation and Maintenance Books  
Electrical Shock, Its Cause and Prevention  
Electromagnetic Radiation Hazards  
NAVSHIPS Technical Manuals  
Safety Precautions Afloat  
Security Manual for Classified Information  
Ship Exercises (U) FXP-3  
SPETERL  
Standard Organization and Regulations of the U.S. Navy  
TRALANT/TRAPAC TRE Check List

3-M Manual, Ships

3-M Notes/Memoranda

XXXX Class Combat Systems Doctrine

EQUIPMENT-COMMUNICATIONS/RADAR/NAVIGATION/  
ELECTRONICS WARFARE/NAVAL TACTICAL DATA SYSTEM

DECCA Navigation System, Policy for Installation Approval

EIC-Equipment Identification Code Master Index

EIMB-Electronics Installation and Maintenance Books

Federal Supply Code for Manufacturer's (FSCM)

Individual Equipment Technical Manuals

MIAPL-Master Index of Allowance Parts List

Nomenclature Assigned to Naval Electronics Equipments

Security Classification and Cognizant Activity of Electronic Equipment

SCLISIS

Shipboard Electronics Material Officer

Shipboard Non-Tactical ADP Program II (SNAP II) System Management

Standard General Purpose Electronic Test Equipment

Test Equipment Index

TACAN Flight Inspection Manual

3-M Notes/Memoranda

INSPECTION/REVIEWS

Atlantic Fleet Mobile Technical Units (MOTUs)

Combat Systems Readiness Review (CSRR)

Combat Systems Ship Qualification Trials (CSSQT)

Command Administrative Inspection Guide for Ships

Installation Criteria for Shipboard Secure Information Processing

NAVSHIPS Technical Manuals

Shipboard Electronics Material Officer

Ship Exercises (U) FXP-3

Recurring INSURV Deficiencies Catalog (RIDCAT)

Standard Organization and Regulations of the U.S. Navy

TACAN Flight Inspection Manual

TRALANT/TRAPAC TRE Check List

Trials and Associated Inspections of Surface Ships

3-M Inspection Policies, Procedures and Criteria  
3-M Maintenance, Material, Management Reports

#### NOMENCLATURE

EIC-Equipment Identification Code Master Index  
EIMB-Electronics Installation and Maintenance Books  
Federal Supply Code for Manufacturer's (FSCM)  
Index to Electronic Equipment Installation Control Drawings  
MIAPL-Master Index of Allowance Parts List  
Nomenclature Assigned to Naval Electronic Equipment  
Publications Applicability List (PAL)  
Security Classification and Cognizant Activity of Electronic Equipment  
Test Equipment Index

#### PERSONNEL RECORDS

Bibliography for Advancement Examination Study  
CANTRAC-Catalog of Navy Training Courses  
Command Inspection Guide for Ships  
Enlisted Distribution and Verification Report (EDVR)  
LINK  
List of Training Manuals, Correspondence Courses, and Personnel Qualification Standards (PQS), Section II (NEC Manual)  
PQS Managers Guide  
Publications Applicability List (PAL)  
Security Manual for Classified Information  
Shipboard Electronics Material Officer  
Standard Organization and Regulations of the U.S. Navy  
TRALANT/TRAPAC TRE Check List

#### RECORDS

Consolidated List of Recurring Reports  
Disposal of Navy and Marine Corps Records  
Electronics Test Equipment Calibration Indoctrination Program  
EMO's Guide to Shipboard Electromagnetic Interference Control (SEMCIP)  
MEASURE-Metrology Automated System for Uniform Recall and Reporting  
METRL-Metrology Requirements List  
Navy Enlisted Manpower and Personnel Classification and Occupational Standards (Section II NEC Manual)



NAVSHIPS Technical Manuals  
PQS Manager's Guide  
Preparation for Overseas Movement (POM) Guide  
SCLISIS  
Security Manual for Classified Information  
Shipboard Electronics Material Officer  
SPETERL  
Standard Organization and Regulations of the U.S. Navy  
Standard Subject Identification Codes  
3-M Inspections Policies, Procedures and Criteria  
3-M Notes/Memoranda

## REPORTS

Atlantic Fleet Mobile Technical Units (MOTUs)  
CASREP  
Combat Systems Readiness Review (CSRR)  
Combat Systems Ship Qualification Trials (CSSQT)  
Command Administrative Inspection Guide for Ships  
Command Inspection of Ships  
Commanding Officer's Narrative Report (CONAR)  
Consolidated List of Recurring Reports  
Consolidated Subject List  
COSAL Use and Maintenance Manual  
Disposal of Navy and Marine Corps Records  
Electromagnetic Radiation Hazards  
Electronics Examining Board  
Electronics Test Equipment Calibration Indoctrination Handbook  
Enlisted Distribution and Verification Report (EDVR))  
Guide for User Maintenance of NAVSEA Technical Manuals  
Installation Criteria for Shipboard Secure Information Processing  
Master Training Plan  
Miniature/Microminiature (2M) Electronic Repair and Certification Program  
NAVELEXSYSCOM Metrology and Calibration Program  
NAVSHIPS Technical Manuals  
Operations Reports  
Preparation for Overseas Movement (POM) Guide  
Preparation of Deficiency Forms

SCLISIS  
Security Manual for Classified Information  
Shipboard Electronics Material Officer  
Shipboard Non-Tactical ADP Program (SNAP II) System Management  
Ship Material Manual  
Ship's 3-M Manual  
Standard Organization and Regulations of the U.S. Navy  
Standard Subject Identification Codes  
UNITREP and CASREP Readiness Ratings  
3-M Inspection Policies, Procedures and Criteria

## SAFETY

Cold Weather Handbook  
Command Inspection Guide for Ships  
Commanding Officer's Narrative Report (CONAR)  
Consolidated Checklist of Miscellaneous Instructions  
Hazardous Material Information System (HMIS)  
Consolidated Subject List  
DECKPLATE  
DRIVER  
EIB–Engineering Information Bulletins  
EIMB–Electronics Installation and Maintenance Books  
Electrical Shock, Its Cause and Prevention  
Electromagnetic Radiation Hazards  
EMO's Guide to Electromagnetic Interference Control (SEMCIP)  
FATHOM  
LIFELINE  
List of Items Requiring Special Handling (LIRSH)  
List of Training Manuals, Correspondence Courses and Personnel Qualification Standards (PQS)  
NAVSHIPS Technical Manuals  
Navy Occupational Safety and Health Manual  
Navy Stock List of Publications and Forms  
Safety Precautions Afloat  
Shipboard Bonding, Grounding and Other Techniques for Electromagnetic Compatibility and Safety  
Shipboard Electronics Material Officer

Shipboard Exercises (U) FXP-3  
Ship Material Manual  
Ship Safety Bulletin  
Standard Organization and Regulations of the U.S. Navy  
TRALANT/TRAPAC TRE Checklist

### SCLSIS

EIC–Equipment Identification Code, Master Index  
SCLSIS Manual  
Ship's 3-M Manual  
SURFSUP  
Test Equipment Index

### SECURITY

Command Administrative Inspection Guide for Ships  
TEMPEST Instructions, Promulgation of  
Consolidated List of Recurring Reports  
Disposal of Navy and Marine Corps Records  
Installation Criteria for Shipboard Secure Information Processing  
Security Manual for Classified Information  
Shipboard Electronics Material Officer  
Standard Organization and Regulations of the U.S. Navy

### SUPPLY

Afloat Shopping Guide  
Afloat Supply Procedures  
CARGO-Consolidated Afloat Requisitioning Guide, Overseas  
COSAL-Consolidated Shipboard Allowance List  
COSAL Use and Maintenance Manual  
Federal Supply Codes for Manufacturers (FSCM)  
FSC Groups and Classes  
GSA Supply Catalog  
Hazardous Material Information System (HMIS)  
Introduction to Federal Supply Catalog and Related Publications  
LIRSH–List of Items Requiring Special Handling  
Management List Navy-ML-N  
MCRL–Master Cross Reference List]

MIAPL-Master Index of Allowance Parts List  
MILSTRIP/MILSTRAP Desk Guide  
MRIL-Master Repairable Items List  
Navy Stock List of Publications and Forms  
SPETERL-Ships Portable Electrical/Electronic Test Equipment Requirements List  
UNMMIPS-Uniform Material Movement Issue Priority System  
3-M Manual  
Integrated Logistics Overhaul

#### TECHNICAL LIBRARY

\*\*\*\*\* In addition to the required publications listed in TYCOM instructions, the following publications may prove beneficial.

Cold Weather Handbook  
Electromagnetic Radiation Hazards  
EMO's Guide to Shipboard Electromagnetic Interference Control (SEMCIP)  
Guide for User Maintenance of NAVSEA Technical Manuals  
Navy Stock List of Publications and Forms  
NAVELEX TAMS Newsletters  
NAVSHIPS Technical Manuals (Complete Set)  
Publication Applicability List (PAL)  
Security Manual for Classified Information  
Shipboard Antenna Systems  
Shipboard Electronics Material Officer  
Shipboard Non-Tactical ADP Program II (SNAP II) System Management  
Ship Information Book, Volume 4 "Electronics"  
Standard Organization and Regulations of the U.S. Navy  
Enhanced Ship Technical Publication System (E-STEPS) Policies and Distribution List  
TMINS-NAVSEA Standard Technical Manual Identification Numbering System

#### TEST EQUIPMENT

EIC Master Index  
EIMB-Electronics Installation and Maintenance Books  
Electronic Test Equipment Application Guide  
Electronic Test Equipment Calibration Indoctrination Program Handbook  
Federal Supply Codes for Manufacturers

MEASURE

METRL

NAVELEXSYSCOM Metrology and Calibration Program

NAVELEX TAMS Newsletters

Nomenclature Assigned to Naval Electronic Equipment

Portable Test Equipment Stowage Guide

Publications Applicability List

Shipboard Electronics Material Officer

SPETERL

Standard General Purpose Electronic Test Equipment

Test Equipment Index

Test Equipment Management, Electronic

TRAINING

Atlantic Fleet Mobile Technical Units (MOTUs)

Bibliography for Advancement Study

CANTRAC

Cold Weather Handbook

Combat Systems Technical Operating Manual

Combat Systems Training Requirements Manual

EIMB

List of Training Manuals, Correspondence Courses and Personnel Qualification Standards (PQS)

Master Training Plan

Miniature/Microminiature (2M) Electronic Repair and Certification Program

NAVSHIPS Technical Manuals

Navy Enlisted Manpower and Personnel Classification and Occupational Standards (Sections I and II)

PQS Program

Shipboard Electronics Material Officer

Ship Exercises (U) FXP-3

Ship Material Manual

Standard Organization and Regulations of the U.S. Navy

XXXX Class Combat System Doctrine



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