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By enrolling in this self-study course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program.

**THE COURSE:** This self-study course is organized into subject matter areas, each containing learning objectives to help you determine what you should learn along with text and illustrations to help you understand the information. The subject matter reflects day-to-day requirements and experiences of personnel in the rating or skill area. It also reflects guidance provided by Enlisted Community Managers (ECMs) and other senior personnel, technical references, instructions, etc., and either the occupational or naval standards, which are listed in the *Manual of Navy Enlisted Manpower Personnel Classifications and Occupational Standards*, NAVPERS 18068.

**THE QUESTIONS:** The questions that appear in this course are designed to help you understand the material in the text.

**VALUE:** In completing this course, you will improve your military and professional knowledge. Importantly, it can also help you study for the Navy-wide advancement in rate examination. If you are studying and discover a reference in the text to another publication for further information, look it up.

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Sailor’s Creed

“I am a United States Sailor.

I will support and defend the Constitution of the United States of America and I will obey the orders of those appointed over me.

I represent the fighting spirit of the Navy and those who have gone before me to defend freedom and democracy around the world.

I proudly serve my country’s Navy combat team with honor, courage and commitment.

I am committed to excellence and the fair treatment of all.”
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STUDENT FEEDBACK AND QUESTIONS

We value your suggestions, questions, and criticisms on our courses. If you would like to communicate with us regarding this course, we encourage you, if possible, to use e-mail or to post your comments on the Community of Practice (COP) page located at https://wwwa.nko.navy.mil/portal/home/. If you write or fax, please use a copy of the Student Comment form that follows this page.

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Course Title: *Electronics Technician Volume 1 – Safety and Administration*

NAVEDTRA: 14086A Date: ______________

We need some information about you:

Rate/Rank and Name: ______________ Command/Unit: _______________________

Street Address: ______________ City: ______________ State/FPO: _____ Zip _____

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1 NAVAL SAFETY

1.1 HISTORY OF NAVAL SAFETY

As your employer, the Navy is obligated by law to provide you with a safe and healthy work environment. Shipboard life, shipyard industrial activities, and aviation maintenance areas, especially, are inherently dangerous. We must keep our crewmembers, as well as civilian workers, healthy and ready to perform their missions.

The Navy has conducted safety and occupational health programs for many years. Historically, general and off-duty safety has been an element of the overall Navy safety program managed by Navy line functions. The Bureau of Medicine and Surgery (BUMED) conducts the occupational health program element.

Safety awareness in the Navy can be traced back to 1818. The old saying “hindsight is 20/20” probably came from a gunner who, in 1817, lit a candle in the powder magazine. His action not only sent him and his crew into orbit, but also helped introduce the first naval safety regulation. That regulation dealt with fire and the handling of black powder aboard ships. Since then, experience has played the major role in developing the safety programs of today’s Navy. Here is a brief listing of some major milestones in the history of naval safety:

- 1917 - Safety engineers were assigned to each major naval shipyard.
- 1922 - Safety programs for civilian employees were introduced at all naval activities.
- 1929 - Enlisted personnel on shore duty were included in safety programs.
- 1947 - The Navy Department Safety Council was organized under the Director of Safety of the Office of Industrial Relations (OIR). Its original mission was to coordinate safety procedures and to provide communications between the bureau safety engineers and the technical staff of the OIR safety branch. In 1957, the council’s mission was expanded to include the development and maintenance of the U.S. Navy Safety Precautions Manual, OPNAV 34P1 (superseded by OPNAVINST 5100.23, Navy Occupational Safety and Health [NAVOSH] Program Manual).
- 1951 - The transition from propeller to jet aircraft helped the Secretary of the Navy (SECNAV) to establish the Naval Aviation Safety Council. In 1955, the title was changed to Naval Aviation Safety Center.
• 1963 - The Navy was shaken by the loss of the USS *THRESHER* (SSN-593), in which 129 sailors were lost. A court inquiry was convened to examine the circumstances leading to and surrounding the incident. The court’s findings resulted in the creation of the Submarine Safety Program (SUBSAFE). Its purpose was to impose high standards of quality control on submarine construction and operations. In 1964 the Chief of Naval Operations (CNO) established the Submarine Safety Center at the Submarine Base in New London, Connecticut, to examine and coordinate all matters of submarine safety.

• 1966-1967 - The SECNAV tasked CNO to review the entire Navy Safety Program after a series of fires, collisions, and other mishaps involving surface ships resulted in over 200 deaths and more than 100 million dollars in damage. On 3 May 1968, as a result of CNO’s findings, the SECNAV established the Naval Safety Center.

• 1970 - The Occupational Safety and Health Act (OSHA) of 1970 became law. Insofar as possible, this law assures safe and healthful working conditions for every working person in the nation.

• 1971 - The Naval Safety Center assumed the responsibility for the Navy’s Defensive Driver Education Program.

• 1972 - The Navy implemented its Motorcycle Training Course.

• 1973 - The Commander, Naval Safety Center, was designated as the CNO Safety Coordinator (OP-09F), reporting directly to the Vice Chief of Naval Operations. This designation made the Naval Safety Center’s mission more specific and all-encompassing.

• 1983 - The first Navy Safety & Occupational Health Program Manual, OPNAVINST 5100.23 Series was implemented.

Safety programs gained special prominence after passage of the Occupational Safety and Health Act on 31 December 1970. The primary thrust of the act was directed at the private-sector employer. However, section 19 of the act and several later Executive orders directed federal agencies to set up and maintain comprehensive and effective occupational safety and health programs.
On 26 July 1971, Executive Order (EO) 11612, the Occupational Safety and Health Programs for Federal Employees, was signed. This EO stated that the federal government, as the nation's largest employer, has a special obligation to set an example for safe and healthful employment. In that regard, the head of each federal department and agency was directed to establish an occupational safety and health program. Over the next 3 years, federal agencies made only moderate progress. Congress received considerable criticism for a perceived double standard in occupational safety and health requirements between the private sector and federal agencies. As a result, EO 11807 replaced EO 11612 in 1974.

This new order more clearly defined the scope, requirements, and responsibilities of federal agency programs. In addition, EO 11807 tasked the Secretary of Labor to issue guidelines designed to help federal agencies in establishing their programs. These "guidelines" were issued on 9 October 1974 as Title 29, Code of Federal Regulations, Part 1960 (29 CFR 1960), Safety and Health Provisions for Federal Employees.

Some critics were still not satisfied by the actions described above. Several federal agencies questioned the regulatory authority of the Department of the Labor guidelines (29 CFR 1960). On 26 February 1980, EO 12196, Occupational Safety and Health programs for Federal Employees, superseded EO 11807. In addition, the Department of Labor guidelines (29 CFR 1960) were revised on 21 October 1980. They were reissued as Basic Program Elements for Federal Employee Occupational Safety and Health Programs. During the past 10 years, the Department of Defense (DOD) has issued many directives and instructions to carry out the federal guidance outlined in the above paragraphs. Prominent among those directives and instructions is the Safety and Occupational Health Policy for the Department of Defense, DOD Directive 1000.3. This directive outlines general DOD policy and procedures for carrying out the Occupational Safety and Health Act and its associated Executive order. Another prominent instruction is DOD Instruction 6055.1, Department of Defense Occupational Safety and Health Program. This instruction provides the guidance needed to carry out the basic occupational safety and health program elements specified in 29 CFR. It also provides for variances in equipment standards that are unique to the military.

DOD Directive 1000.3 designates the Assistant Secretary of the Navy (Installations and Environment) as the safety and occupational health official for the Department of the Navy. He or she establishes, maintains, and modifies safety and occupational health programs. These programs carry out the requirements of DOD policy issuances and provide protection for both civilian employees and military personnel. SECNAVINST 5100.10H, Department of the Navy Policy for Safety, Mishap Prevention and Occupational Health Programs, delegates the authority for the operational aspects of the SOH Program to the Chief of Naval Operations (CNO). The CNO's responsibility includes issuing directives to enact program policies and defining specific safety standards and criteria.
Now refer to the Navy Safety and Occupational Health (NAVOSH) Program Manual (OPNAVINST 5100.23), and the Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat (OPNAVINST 5100.19), chapter A2. Also read the Standard Organization and Regulations of the U.S. Navy (OPNAVINST 3120.32), chapter 7. The information in these chapters will enhance your knowledge of the NAVOSH program organization and responsibilities and the naval safety program. When you have finished these reading assignments, return here and continue with this chapter.

1.2 OVERALL NAVY PROGRAM

The Assistant Secretary of the Navy (Energy, Installations and Environment): The assistant Secretary of the Navy (Installations and Environment) is the designated occupational safety and health (OSH) official for the Department of the Navy (DON) and establishes, maintains, and updates the occupational safety and health program that implements the requirements of the Department of Defense (DoD) OSH policy issuances to provide protection for both civilian employees and the military personnel.

Chief of Naval Operations (CNO): The CNO is responsible for implementation and management of the NAVOSH Program and, in coordination with the Commandant of the Marine Corps, for mutual concern:

- Provides appropriate NAVOSH policy and standards for all commanders
- Establishes appropriate planning, programming, qualified staffing, and budgeting for the NAVOSH Program
- Issues the requirements for records maintenance
- Conducts research and development to preclude occupational hazards or exposures from causing physical injury or degrading health status or work performance
- Develops a program of periodic formal inspections of workplaces
- Provides for job-related medical support
- Develops procedures for prompt investigation of reports of unsafe or unhealthy working conditions and ensures corrective action is taken within appropriate time periods
- Ensures personnel receive thorough and continuing training on NAVOSH matters
- Adopts, develops, and reviews proposed alternate standards and promulgates NAVOSH standards
Fleet Commanders in Chief: Because safety is an inherent responsibility of command, all aspects of the Navy Occupational Safety and Health Program shall be implemented through the chain of command. Fleet Commanders are responsible for ensuring that their commanders, commanding officers, and officer in charge:

- Conduct and maintain an aggressive and comprehensive NAVOSH program.
- Assign safety responsibilities to qualified personnel as a primary duty billet where feasible, otherwise as a collateral duty billet with appropriate training provided. Where possible, assigned safety officers should remain in these positions for at least 1 year.
- Develop a NAVOSH management evaluation mechanism for afloat commands that is to the extent feasible integrated with the command inspection program and conducted by the chain of command.

Type Commanders: Oversight of subordinate commands’ NAVOSH Programs and coordination of matters of mutual concern are the primary responsibilities of Type Commanders. Accordingly, Type Commanders will:

- Ensure that subordinate afloat commands implement the NAVOSH Afloat Program.
- Conduct periodic NAVOSH inspections of group commands and conduct or assist in NAVOSH inspections of squadrons and afloat commands. Inspectors at a minimum, should complete the Afloat Safety Officer Course (A-4J-0020) at the Surface Warfare Officers School (SWOS) or the Submarine Safety Officer Course (F-4J-0020), as appropriate. Appropriately trained civilian safety specialists may assist in these inspections.
- Coordinate and promote those aspects of the NAVOSH Program of mutual concern to forces afloat.
- Coordinate industrial hygiene support.
Group Commanders will:

- Conduct or assist in the conduct of periodic NAVOSH inspections of subordinate commands. Afloat units with industrial hygiene officers (IHOs) assigned should be inspected by the next higher echelon command having a professional NAVOSH representative.

- Assist afloat commanders and squadrons to ensure that afloat workplace NAVOSH discrepancies beyond shipboard capability are identified in the Workload Availability Package.

- Establish uniform guidance for small ships to implement NAVOSH Program management requirements, as appropriate.

- Ensure that the group safety officer attends the Afloat Safety Officer Course, as appropriate, prior to or within 6 months of assignment.

Squadron Commanders will:

- Conduct or assist in the conduct of periodic NAVOSH inspections of afloat commands. Afloat units with IHOs assigned should be inspected by the next higher echelon command having a professional NAVOSH representative.

- Provide or coordinate NAVOSH assistance for subordinate afloat commands.

- Appoint a collateral duty safety officer.

- Establish uniform guidance for small ships to implement NAVOSH Program management requirements, as appropriate.

- Ensure that the squadron safety officer attends the Afloat Safety Officer Course or Submarine Safety Officer Course, as appropriate, prior to or within 6 months of assignment.

Primary Program and Specified Support Areas: The higher the echelon administration and management of the Occupational Safety and Health Program is divided into primary program areas and specified support areas.

The Commander, Naval Safety Center (COMNAVSAFECEN): Monitors safety and occupational health statistics and provides direct support and assistance to fleet units in safety matters upon request.
1.3 MISHAP CAUSES

Although there are many definitions of a mishap, we chose this one as a starting point: A mishap is any unplanned or unintentional event, no matter how serious, that stops or interrupts your work and results in personnel injury and/or property damage.

There are three basic elements of a mishap:

1. A mishap is an unplanned or unintentional event.
2. A mishap stops or interrupts work.
3. A mishap involves contact that causes injury or property damage.

Here is an example that illustrates the three basic elements of a mishap:

You’re trying to loosen a large nut with a wrench. The nut is rusted tight. As you apply extra pressure to the wrench, the wrench slips. You stagger backward and strike your head on a stanchion behind you.
In this example, there were three distinct unexpected happenings: (1) the wrench slipped; (2) you staggered backward; and (3) you hit your head on a stanchion behind you. The last happening fits the definition of a mishap. It was unexpected; it interrupted your work; and, as you would agree, you made contact that caused personnel injury or property damage.

Mishaps are a pain! This is especially true when, after a mishap has occurred, you look back and say “If only I” and finish with a “had,” “had not,” or “did not.” With that in mind, it’s important for you to understand that you are both the number one cause and the number one cure for mishaps.

We know you want to do the best job you can. However, do you associate safest with best? If not, you’d better start right now!

Two facts that form the basis of mishap prevention are (1) mishaps are caused, and (2) the only way to stop them is to prevent or eliminate the causes. The more you know about the causes of mishaps, the better equipped you will be to prevent them.

A practical definition of a mishap cause is anything and everything that contributed to the mishap. The most common causes of mishaps are (1) you, and (2) your environment. They could include:

- Your unsafe actions or the unsafe actions of your coworkers
- An impaired physical or mental condition of the people who caused or influenced the unsafe actions
- Any defective or otherwise unsafe tools, equipment, machines, materials, buildings, compartments, or other aspects of the work environment

Studies reveal that the causes of at least two of every three Navy mishaps are caused by either a worker’s failure to do (or not to do) something or a worker’s taking short cuts when performing a task. We call this “human error.” In other words, YOU cause most of your own mishaps. Armed with that knowledge, it is imperative that you follow procedures as they are written, this is called Procedural Compliance. Failure to adhere to procedural compliance has cost the Navy millions of dollars in assets and even some Sailor's lives. When in doubt about a procedure, ask someone in your Chain of Command to clarify a particular step or procedure you are unsure about.
The following are some of the many factors that can lead you to mishaps:

- Inadequate training and lack of job experience
- Inadequate or outdated procedures in technical publications
- Inadequate posting or listing of the safety precautions you should observe when performing a task
- Behavioral factors, especially negative types of motivation
- Medically related factors that reduce your ability to work safely
- Communication problems caused by a breakdown in passing, receiving, or understanding information
- Poorly designed equipment, such as improperly placed controls

Refer to the Navy Safety Center Supervisor, N14167F (Non-Resident Training Course) Chapter 3, for a brief discussion of the causes and effects of mishaps.

Most mishaps are preventable. However, through ignorance or misunderstanding, there is a common belief that they are the inevitable result of unchangeable circumstances or fate. This belief is untrue because it fails to consider the basic law of “cause and effect” to which accidents are subject. 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 causes as basic as the heredity and early environment of the individual. These causes may be revealed in the form of personal characteristics which permit the individual to perform an unsafe actor permit a hazardous condition to exist; when an accident results, the cause and effect sequence is completed.

One purpose of safety rules is to remind the individual of the dangers inherent in the work. Training in the observance of safety precautions can be instrumental in avoiding preventable accidents and in maintaining a work environment which is conducive to accident-free operation. Operating procedures and work methods adopted with hazard prevention as specific criteria do not expose personnel unnecessarily to injury or occupational health hazards. Accidents which are about to happen can be prevented if the “cause” is detected and appropriate remedial action is taken.
1.3.1 Inadequate Training and Experience

Many mishaps occur because of inadequate training and lack of job experience. You may find yourself assigned a task that is clearly beyond your skill level. This may be because of an operational requirement or an emergency that requires prompt action. Or, your supervisor may not be aware of your limitations.

These situations may cause you to misread instructions, take shortcuts, or make other errors that could result in a mishap. Also, your chances of a mishap increase when you are not aware of the hazards associated with a particular task. It’s this lack of awareness that can keep you from taking the necessary precautions.

In simple English - (1) **DON'T TAKE SHORT CUTS,** and (2) **ASK FOR HELP.** If you think a task is too hazardous, it probably is. And before you attempt to do it, seek guidance and become familiar with its associated hazards.

1.3.2 Inadequate or Outdated Procedures

When a mishap occurs, examine the procedures you followed just before the mishap. They may be in error or they may not provide enough detailed “how-to” information. Or, perhaps the technical manual was not updated when a piece of equipment was upgraded or replaced. As a result, you could inadvertently be using the wrong procedures for a particular task. If this is the case, *take the initiative* to complete the required paperwork to update the technical manual.

1.3.3 Inadequate Safety Precautions

You **must** be aware of the safety precautions associated with the job or task you are performing. They must either be posted in your work area or listed in the technical manual you’re using. If they aren’t available, you could be attempting something hazardous and not even know it. Make sure you read ALL applicable precautions. Even if you performed the task before and are familiar with it, it’s possible that new or revised precautions exist.
1.3.4 Behavioral Factors that Cause Mishaps

Your behavior is much more complex than the equipment you operate and maintain. Equipment, regardless of how it’s designed and powered, is predictable in its response to certain cues or signals. If a piece of equipment quits working, you can isolate the fault to a specific part with the use of test equipment and schematics. This isn’t true for you. Your behavior while performing a task is based on a combination of factors that come from your

- unique experiences
- knowledge
- attitude
- motivation

Each of the above factors can affect your behavior regarding safety. Behavior that leads to a mishap is usually caused by undesirable attitudes and motivations.

**Attitudes.** Attitudes are complex mental states that affect your reaction toward some object, event, or state of affairs. They cause you to form opinions and act in certain predictable ways, some favorable and others unfavorable. Attitudes that do not support safe behavior hamper mishap prevention. And, they can also actually cause mishaps.

**Motivations.** Motivations are incentives for specific acts. Your behavior is based on your motivation, and your motivation is shaped by your attitudes. Ensuring that you have positive motivations toward job safety is clearly a very complex problem. It’s complicated because you do not simply react to the basic needs of comfort, security, affiliation, and self-fulfillment. Your motivations on and off the job are also greatly affected by the attitudes, feeling, tensions, and emotions of the world around you. The following are some undesirable motivations that can lead you to mishaps in the workplace:

- Motivation to save time and effort
- Motivation to maintain personal comfort
- Motivation to gain approval and attract attention
- Motivation to express resentment
1.3.4.1 Motivation to Save Time and Effort

You may sometimes be more concerned about doing a job quickly than you are about doing it safely. You may believe that saving time and effort will leave extra time for “shooting the breeze” or taking a break. Or, you may just find satisfaction in being the first to finish.

Motivations like these can cause incorrectly dissembled parts, jury-rigged equipment, incorrect use of tools, improper procedures, equipment damage, and injury. Sometimes a command’s operational commitments or a supervisor’s demands, if excessive, will lead to unsafe actions that you normally wouldn’t consider doing.

1.3.4.2 Motivation to Maintain Personal Comfort

Sometimes you perform a job incorrectly because some of the actions required to perform the job properly cause you discomfort. For example, when a task calls for safety goggles, you may decide not to wear them because they’re uncomfortable. The same can apply to hearing protection, safety shoes, and safety harnesses. You may believe you aren’t susceptible to injury - but you are.

1.3.4.3 Motivation to Gain Approval and Attract Attention

Even though you’re normally cautious, you may use hazardous practices if you find the people around you use and approve of such practices. Some of your coworkers may do this because of a need for recognition and status. This is especially true if they are the type who receive more criticism than praise because their normal work habits are poor and hazardous. Such people may seek recognition by driving recklessly, drinking excessively, ignoring standard operating procedures, acting impulsively, disobeying orders, and showing off. While these actions may satisfy their immediate need for recognition, they also threaten mishap prevention efforts, and maybe your life.

1.3.4.4 Motivation to Express Resentment

Many mishaps occur because of immature, irresponsible, or insubordinate behavior. This happens if you or a coworker becomes angry or resentful, and try to strike out at or get even with someone, such as your supervisor.
1.3.5 Medical Factors that Cause Mishaps

Medical factors such as illness, physical impairment, alcohol abuse, fatigue, and motion sickness, can cause mishaps. These factors are frequently associated with either a high tempo of operations that prevents proper rest and nourishment or with events carried over from a recent return from leave or liberty.

1.3.5.1 Illness

Your ability to work safely is sometimes affected by illness or the side effects of medicine. Temporary illness like colds, flu, dizziness, heat stress, and nausea can weaken your physical abilities.

They can either reduce your strength, stamina, and coordination, or disrupt your concentration, mental alertness, memory, and reasoning ability. These side effects of medication, such as drowsiness, sluggishness, and lack of coordination, can sometimes lead to mishaps.

1.3.5.2 Physical Impairments

Any pre-existing physical impairment, such as a lower back injury, a slipped disc, or a hernia, may make you more susceptible to mishaps. Mishaps can also stem from visual and hearing defects. Common visual problems include color blindness, faulty depth perception, farsightedness, and nearsightedness. Hearing defects cause mishaps if they prevent you from hearing instructions or a warning signal.

1.3.5.3 Alcohol Abuse

Some people think alcohol is a stimulant. Nothing is farther from the truth. Alcohol is a chemical depressant. It acts as a general anesthetic for the parts of the brain that suppress, control, and inhibit thoughts, feelings, and actions. Alcohol typically impairs your judgment, gives you unrealistic confidence, slows your coordination, and degrades your performance. These effects are present whether you feel them or not. It’s these effects that cause the risk-taking type of behavior that can lead you to unsafe acts that cause mishaps.
Fatigue is not an all-or-nothing factor. It begins when you start a task, and it increases as you continue to perform the task. At some point during the task, fatigue can become great enough to impair your performance. It can decrease your work output, change your attitude, and reduce your motivation to observe safety precautions. But long before this happens, fatigue will decrease your awareness and reflex actions. It’s at this point where mishaps can occur. The following are some symptoms of fatigue:

- Lower quality of performance
- Irritability
- Impatience
- Forgetfulness
- Confusion
- Higher number of errors

The following are some frequent causes of fatigue:

- Hard work, long hours, and lack of sleep.
- Environmental stress, such as heat, cold, noise, inadequate lighting, and vibration.
- Boredom and monotony.
- Change in routine. Suppose, for example, you’re accustomed to working days and sleeping nights. If you switch to working nights and sleeping days, you will probably experience fatigue.

The results of fatigue vary from person to person, but fatigue always reduces your mental alertness, increasing the chances of a mishap occurring.
1.3.5.5 Motion Sickness

Anything that hinders your normal alert behavior can cause a mishap. Motion sickness can weaken, distract, disorient, and cause you severe nausea. In the early stages of motion sickness, you may experience a decrease in responsiveness and mental alertness. These symptoms may increase carelessness, which can lead to a mishap. Your reduced mental alertness will degrade your decision-making abilities. This, in turn, can increase your chances of having a mishap. As motion sickness progresses, you may be drowsy and have cold sweats and nausea.

1.3.6 Communication Problems that Cause Mishaps

Mishaps can occur when there is a breakdown in the passing, receiving, or understanding of information. The most common communication problem is misunderstanding the message being sent to you. Your brain reacts to what it thinks it hears, not necessarily what it hears. Mishaps can also stem from language barriers. You can’t understand a message if the person sending the message doesn’t speak clearly enough.

1.3.7 Equipment Design Factors

Poorly designed equipment and improperly placed controls can cause mishaps. Controls that can’t be reached quickly and easily, emergency controls protected by cumbersome interlocks, and displays that are difficult to read are examples of design problems that can cause mishaps. Now, refer to the Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, OPNAVINST 5100.19, and read chapter A6. Also read enclosure (4) Afloat Safety Program (OPNAVINST 5100.23G). The information contained in these publications will enhance your knowledge of the overall Mishap Prevention Program.
1.4 MISHAP PREVENTION

Why is mishap prevention necessary? Because the product of the Navy is national defense, the quality of your performance must be far superior to that of any potential adversary. The Navy’s business is deadly serious. It’s conducted by professionals, restricted to limited resources, and allows no room for waste. Mishaps produce waste. Therefore, when mishaps are reduced, waste is reduced, and readiness is improved.

The Navy also considers your safety to be as important as productivity. Unlike most civilian businesses whose safety efforts are directed at reducing on-the-job mishaps, Navy mishap prevention efforts give you complete coverage, both on and off the job, regardless of your duty status, location, or mission.

Mishap prevention is a vital part of your job. By preventing mishaps, you avoid injury to yourself and damage to your equipment. When you think of mishaps, you probably think of deaths. But in 1991, aboard ships and submarines and ashore, for every death, there were 111 mishaps that resulted in equipment damage or personal injury.

Mishap prevention is the process of eliminating mishap-producing causes. The goal of the Navy’s mishap prevention program is to prevent mishaps from occurring or, once they have occurred, to prevent them from recurring. The Navy’s mishap prevention program consists of activities directed to eliminate (1) unsafe acts of persons, and (2) unsafe mechanical, physical, or chemical working conditions.

The best way to prevent mishaps is to eliminate the factors that lead to mishaps. This can involve anything from a minute of extra effort by you that costs nothing to lengthy planning and work by many people at considerable cost. It all depends on the nature of the unsafe condition.

The authority to correct an unsafe condition may involve any level of the chain of command. The following four avenues are available to you.
1. **Order correction where authority permits** - If you have the authority to do so, don’t delay ordering unsafe conditions corrected. Delay means exposure of other people to the unsafe condition. If you’re uncertain about the best correction method, talk to your supervisor immediately.

2. **Report conditions to higher authority** - If you don’t have the authority to correct the unsafe conditions, then promptly report the hazardous or potentially hazardous conditions to your supervisor. Be ready to offer some suggestions about how to correct the unsafe condition. Your ideas may help to speed the correction.

3. **Correct the problem at the source** - Don’t stop with just correcting the unsafe condition. Find its source and begin your corrective actions there. If you have the authority to correct the problem at the source, then do so. If the problem involves people, then point out the unsafe condition and correct the workers causing it. Hold on-the-spot training if needed. If you don’t, you’re inviting repetition of the unsafe practice.

4. **Take temporary precautions** - You may need to delay correcting an unsafe condition because of a shortage of funds, personnel, or equipment. If this happens, take whatever temporary precautions you need to protect both yourself and your coworkers from the unsafe condition until it can be corrected. These precautions may include:
   - securing the hazardous areas
   - disconnecting power sources
   - posting warning signs
   - giving verbal warning to workers.

Whatever precautions are necessary, take them promptly to reduce the exposure of any hazardous condition to all personnel.

Here is an important final word about your responsibility to correct unsafe conditions. Sometimes an unsafe condition may arise that needs IMMEDIATE corrective action. This is especially true in situations that pose an immediate hazard to life or health. Don’t delay because you may not have the authority to correct such an unsafe condition. In emergencies, YOU HAVE IT! Just be sure you don’t put yourself or others in danger of being hurt. And, if you can’t SAFELY correct the problem, inform your supervisor about it immediately.
1.4.1 Operational Risk Management (ORM)

As stated in OPNAVINST 3500.39, ORM is a decision making tool used by personnel at all levels to increase effectiveness by identifying, assessing, and managing risks. By reducing the potential for loss, the probability of a successful mission is increased. It also:

- Increases Navy’s ability to make informed decisions by providing a standardized RM process.

- Minimizes risks to acceptable levels, commensurate with mission accomplishment. The amount of risk the Navy will accept in war is much greater than what the Navy should accept in peace, but the process is the same. Correct application of the ORM process will reduce losses and associated costs resulting in more efficient use of resources.

- Applies to off-duty activities due to their own diverse set of hazards and risks. ORM must be practiced 24 hours a day, 7 days a week, and 365 days a year.

1.4.1.1 ORM Process

The ORM process (Figure 1-1) is a systematic, continuous and repeatable process that consists of the following basic five steps:

- Identify the hazards

- Assess the hazards

- Make risk decisions

- Implement controls

- Supervise
Figure 1-1 The Five Step ORM Process
1.4.1.1 Identify the Hazards

A hazard is any condition with the potential to negatively impact mission accomplishment or cause injury, death, or property damage. Hazard identification is the foundation of the entire RM process. If a hazard is not identified, it cannot be controlled. The effort expended in identifying hazards will have a multiplier effect. Therefore, this step should be allotted a larger portion of the available time.

1.4.1.2 Assess the Hazards

For each hazard identified, determine the associated degree of risk in terms of probability and severity. The result of the risk assessment is a prioritized list of hazards, which ensures that controls are first identified for the most serious threat to mission or task accomplishment. The hazard list is intended for use as a guide to the relative priority of risks involved and not as an absolute order to follow.

1.4.1.3 Make Risk Decisions

There are three basic actions which ultimately lead to making informed risk decisions: identifying control options; determining the effect of these controls on the hazard or risk; and, ultimately deciding how to proceed.

- **Identify Control Options** - For each hazard, develop one or more control options that either avoid the hazard or reduce its risk to an acceptable level.

- **Determine Control Effects** - With controls identified, the hazard should be re-assessed, taking into consideration the effect the control will have on the severity and or probability. This refined risk assessment determines the residual risk for the hazard, assuming the implementation of selected controls. At this point, it is also appropriate to consider the cost (personnel, equipment, money, time, etc.) of the control and the possible interaction between controls. Do they work together?

- **Make Risk Decisions** - A key element of the risk decision is determining if the risk is acceptable. This decision must be made at the right level by the individual who can balance the risk against the mission or task potential benefit and value. This individual decides if controls are sufficient and acceptable and whether to accept the resulting residual risk. If it is determined the risk level is too high, the development of additional or alternate controls, modifications, changes, or rejecting the course of action becomes necessary. Leaders can use the risk assessment in conjunction with their commanders’ guidance to communicate how much risk they are willing to allow subordinate leaders to accept. It is important to keep in mind that risk decisions are based on the residual risk, which is only valid if the selected controls are implemented and remain effective.
1.4.1.1.4 Implement Controls

Once the risk control decisions are made, the next step is implementation. This requires that the plan is clearly communicated to all the involved personnel, accountability is established, and necessary support is provided. Careful documentation of each step in the RM process facilitates risk communication and the rational processes behind the RM decisions.

1.4.1.1.5 Supervise

Supervise and review involves determining the effectiveness of risk controls throughout the mission or task. This involves three actions: monitoring the effectiveness of risk controls; determining the need for further assessment of all or a portion of the mission or task due to an unanticipated change; and capturing lessons learned, both positive and negative.
1.5 SAFETY RESPONSIBILITIES

From the commanding officer on down the chain of command to each individual, safety is everyone’s business. Even though the safety program is ultimately the responsibility of the commanding officer, everyone must take part in the program for it to be successful. The following paragraphs briefly describe the specific responsibilities of the key individuals in a command’s safety program.
1.5.1 Commanding Officer

Commanding officers are directly responsible for the safety of all personnel under their command. They cannot delegate this responsibility. However, they can give all officers and petty officers under their command enough authority to make sure everyone understands and follows all prescribed safety precautions.

1.5.2 Command Safety Officer

The command safety officer is responsible to the commanding officer for coordinating a complete safety program based on the objectives established by the commanding officer. Specifically, he or she performs the following safety related functions:

- Acts as principal advisor to the commanding officer on all internal safety matters
- Coordinates the command-wide safety program
- Promotes maximum cooperation for safety matters at all levels
- Ensures widest dissemination of all safety information
- Monitors submission of required safety and mishap reports to ensure accuracy and timeliness
- Maintains appropriate safety records and mishap statistics
- Serves as a member of the command’s safety council and senior member of the enlisted safety committee
- Serves as the safety council recorder on aircraft carriers

1.5.3 Department Safety Officer

Safety officers for each department support their department head’s responsibilities in all safety matters. In doing this, each department safety officer performs the following functions:

- Keeps the department head informed of the status of the safety program within the department
- Performs mishap prevention functions as assigned by the department head
- Acts as the department’s point of contact in coordinating and evaluating the ship’s safety program
- Ensures that all hazardous conditions revealed through hazard reports are corrected
- Maintains a record of mishap and hazard reports
- Maintains direct liaison with the ship’s safety officer
1.5.4 Division Safety Officer

The safety officer for each division is the division officer. On some small ships where the division officer is the department head, the division safety officer may be a senior enlisted member. In performing his or her duties, the division safety officer:

- Keeps the department safety officer advised of the status of the safety program within the division
- Acts as the division’s point-of-contact in coordinating and evaluating the ship’s safety program
- Designates a senior petty officer, E-5 or above, as the division safety petty officer
- Investigates the division’s mishaps and near mishaps
- Makes sure that corrective action is taken on hazardous situations revealed by mishap and hazard reports and on recommendations made in mishap reports
- Ensures that all division personnel receive mishap prevention training

1.5.5 Division Safety Petty Officer

The division safety petty officer reports directly to the division safety officer in all safety matters. In performing his or her duties, the division safety petty officer should:

- Become thoroughly familiar with all safety directives and precautions concerning the division
- Conduct the division’s mishap prevention training and maintain the related records
- Assist in mishap investigations as directed
- Make recommendations regarding the safety program to the division safety officer
- Assist the division safety officer in performing division safety duties
- Act as technical adviser on mishap prevention within the division
- Serve on the command safety committee

1.5.6 MAA/Safety Force

MAA/Safety force personnel shall:

- Be roving inspectors for hazards that could result in injury to personnel or damage to equipment. All roving security patrols will have this additional duty.
- Assist the Safety Officer in keeping the Safety Program visible to all personnel.
- Carry out a system of internal reporting to focus command attention on material deficiencies and operating practices that jeopardize personnel and equipment.
1.6 PERSONAL SAFETY RESPONSIBILITIES

So far, we’ve discussed the responsibilities of key personnel within your command’s safety program. You may now be asking yourself “Where do I fit into the picture?” Remember, safety is everyone’s business. Here are your specific responsibilities for safety - follow them wherever you are and no matter what you are doing:

1. Observe all the safety precautions related to your work or duty. You may have gotten by with being careless with safety rules in the past, but your luck will not hold out forever. If you continually cross a street without looking, eventually you'll get hit by a car.

2. Report any unsafe conditions or any equipment or material you think might be unsafe. Don’t just walk by an open manhole or turn in a broken tool without saying anything about it. Report it! Remember, if you think it’s unsafe, then it probably is.

3. Warn others of hazards that exist. If you see someone knowingly, or unknowingly, place himself or herself or others in danger, say something. If necessary, report the situation to your supervisor.

4. Report any injury or ill health to your supervisor. A splinter in your finger or a scratch on your leg, if treated immediately, will usually not cause any more trouble. But if left untreated, it may become infected, and what would normally be a 10-minute trip to sick call, may turn into a 10-day hospital stay.

5. Wear protective clothing whenever appropriate or required. If you’re issued electrical safety shoes, wear them. It’s cheaper and easier to replace a $50 pair of shoes than it is to treat your injuries.

6. Be safety conscious. Always remain alert to dangers that may exist.

7. Always inspect equipment and associated attachments for damage before you use them. Make sure the equipment you are using is suited for the job. Check the safety precautions that pertain to each piece of equipment.

Remember, SAFETY should be your first thought before you begin a task and throughout the task, throughout the day.
I AM YOUR WORST ENEMY

I am more powerful than the combined armies of the world. I have destroyed more men than all the wars of all the nations. I massacre thousands of people every year. I am more deadly than bullets, and I have wrecked more homes than the deadliest guns.

In the United States alone, I steal over 150 million dollars each year. I spare no one, and I find my victims among the rich and the poor alike, the young and the old, the strong and the weak. Widows and widowers know me to their everlasting sorrow. I loom up in such proportions that I cast my shadow over every field of labor.

I lurk in unseen places and do most of my work silently. You are warned against me, yet you heed me not. I am relentless, merciless, and cruel. I am everywhere: in the home, on the streets, in the factory, at the railroad crossing, on the land, in the air, and on the sea.

I bring sickness, degradation, and death, yet few seek me out to destroy me. I crush, I maim, I devastate—I will give you nothing and rob you of all you have.

I am your worst enemy—I AM CARELESSNESS.
2 ELECTRONICS SAFETY

2.1 ELECTRIC SHOCK

Ninety-nine percent of what you do, you’ll do around electricity. This makes you extremely susceptible to electric shock. It’s very important for you to know these four things about electric shock:

1. What it is.
2. What factors affect how severe it can be.
3. How to avoid it.
4. What to do if you see someone being shocked.

2.1.1 Definition of Electric Shock

Electric shock is the sensation and muscular spasm caused when electric current passes through the body. Note that the word current is bold in the last sentence. This is to emphasize that it is current and NOT the voltage that causes electric shock. No matter how much voltage is present, you’ll only get shocked if you provide a ground-path for the electric current.

Here is an example taken from a mishap report:

While trying to align the RF turret assembly of a high frequency transmitter, a Third Class Electronics Technician (ET3) received a shock from 1,000 volts of direct current (DC).

While doing preventive maintenance, the technician discovered the high frequency (HF) transmitter did not meet the performance specifications required by the Maintenance Requirements Card (MRC) of the Planned Maintenance System (PMS). After trying to tune the transmitter using the front panel meter, the technician determined the turret assembly was faulty.

The ET3 removed a high voltage insulation cover to get into the transmitter turret assembly adjustment fitting. While adjusting the turret, his thumb brushed a power amplifier tube plate connection. The 1,000 volts DC at the plate connection entered the ET3’s thumb and forearm before finding its way to ground.
The ET3 went to medical and the corpsman sent him to the naval hospital for evaluation and observation. The technician was released the next day.

2.1.2 Severity of Electric Shock

The following factors determine the severity of the effect electric shock has on your body:

- The amount of current that is flowing through your body.
- The path the current takes through your body.
- The amount of body resistance you have to the current flow.
- The length of time the current flows through your body.
2.1.2.1 Path of Current Flow

The two most dangerous paths that current can take through your body are from (1) hand to hand, or (2) from your left hand to either foot. The second path is the MOST dangerous path since the current will flow through both your heart and your vital organs.

2.1.2.2 Amount of Body Resistance

Your body resistance varies greatly in different parts of your body. A value of 1500 ohms is commonly used as the resistance between major extremities of an average human body: hand to hand, or hand to foot. Let’s use Ohm’s Law to figure how much current would flow through your body if you accidentally grabbed a wire carrying 120 volts alternating current (VAC).

Ohm’s Law for figuring current is \( I = \frac{E}{R} \).

Let \( E = 120 \text{ VAC} \) - The voltage you grabbed

Let \( R = 1500 \text{ Ohms} \) - Your (average) body resistance
Now let’s compute it.

\[ I = \frac{120}{1500} \]

\[ I = 0.080 \]

\[ I = 80 \text{ milliamperes} \]

So if you grabbed a 120-VAC wire, 80 milliamperes of current would flow through your body. Now use table 2–1 to determine the effect of 80 milliamperes of electric shock. You can see that you may not be around long enough to grab any more wires. You grabbed 80 milliamps of current! That’s 15 milliamps beyond what could be fatal. It’s also 70 milliamps beyond the “can’t let-go” threshold, and 62 milliamps beyond what is needed to cause you to stop breathing.

<table>
<thead>
<tr>
<th>HUMAN REACTION (at 60Hz)</th>
<th>CURRENT (milliamperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCEPTION - A slight tingling sensation.</td>
<td>1.1</td>
</tr>
<tr>
<td>CAN’T LET GO - Arm and hand muscles close involuntarily (120lb. person)</td>
<td>10.0</td>
</tr>
<tr>
<td>CAN’T LET GO - (175lb. person)</td>
<td>16.0</td>
</tr>
<tr>
<td>CAN’T BREATHE - Paralysis of the chest muscles</td>
<td>18.0</td>
</tr>
<tr>
<td>HEART FIBRILLATION - Rapid irregular contractions of the heart muscles-could be fatal</td>
<td>65.0</td>
</tr>
</tbody>
</table>

It’s important to remember that the 1500 ohms is just an average value. Body resistance varies from person to person and may often be LESS than 1500 ohms. When your skin is moist, your body resistance could be as low as 300 ohms. Also, breaks in your skin at the point of contact reduce your skin resistance to nearly zero.

Skin resistance is only important when you’re handling voltages of less than 240 volts. If you get shocked by more than 240 volts, the voltage arc will burn through your skin and leave deep third-degree burns where it enters your body.
2.1.2.3 Time of Current Flow

The longer you’re being shocked, the more chance there is for your heart to begin fibrillation. Fibrillation is the shocking of your heart into a useless flutter. Most people who die from electric shock die from fibrillation. Fibrillation in a normal adult is unlikely if the current in milliamperes is less than \( \frac{116}{t} \), where \( t \) is the shock duration in seconds. The longer you are shocked, the less current is needed to cause heart fibrillation. Here are some examples of shock current levels and durations that would cause fibrillation:

- 21 milliamperes for 30 seconds
- 44 milliamperes for 7 seconds
- 67 milliamperes for 3 seconds

2.1.3 Avoiding Electric Shock

The three basic ways to prevent yourself from receiving an electric shock can be summed up in three words: *isolate, insulate, and ground*.

1. **Isolate** - Isolate yourself from the source of electric shock. Make sure you secure the power to equipment before you attempt to remove it. And, make sure all electrical equipment covers, doors, and enclosures are kept in place when you’re not actually working on the equipment. If you must leave live circuitry exposed, rope off the area, post appropriate signs, and warn your fellow workers of the danger.

2. **Insulate** - Make sure the electrical tools and equipment you use are properly insulated. Use only insulated hand and portable electric power tools. Frequently check power and extension cords for deterioration, cracks, or breaks. Breaks in the insulation of power and extension cords cause many electrical mishaps.

3. **Ground** - Electric current always follows the path of least resistance. To prevent yourself from being the unintentional path to ground, make sure your equipment is well grounded. This will direct any stray electric current to ground, thereby protecting you from electric shock. A good ground could also protect your equipment from excessive voltage spikes or lightning. For further information on equipment grounding, see *Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety*, MILSTD-1310 (NAVY).
2.1.4 Rescuing Victims of Electric Shock

The first thing to do when you see someone being shocked is to secure the power. DO NOT touch a victim who is in contact with a live circuit, or you’ll be shocked too. If you cannot secure the power, use a dry insulating material like a rope, a belt (without the buckle), or a wooden cane to remove the victim (by pulling, pushing, or rolling) from the live circuit or wire. Then, immediately call for medical personnel.

If the victim is unconscious AND you are certified to administer cardiopulmonary resuscitation (CPR), begin to do so.

The effects of the electric shock can range from mild surprise to death. It depends on the amount of current, voltage, and the duration of the electric shock. It’s hard to know exactly how a victim of electric shock has been affected. More than likely, the victim will be very pale or bluish in color and unconscious.

2.2 MEASURING VOLTAGE ON ENERGIZED EQUIPMENT

As an ET, you’ll work on energized equipment. You will be troubleshooting a piece of electrical or electronic equipment, and the technical manual will instruct you to measure voltages or to check signal waveforms while the equipment is energized. But, before you hook up the multimeter or oscilloscope, there are certain safety precautions and procedures you MUST follow. They’re designed to protect you from electric shock. These precautions and procedures are divided into two basic categories: (1) voltage measurements below 300 volts, and (2) voltage measurements above 300 volts.

2.2.1 Measuring Voltage below 300 Volts

Most of the voltage measurements that you will make will be below 300 volts. Almost all of the newer electronic systems use voltages that are less than 28 volts, except for the main input AC power. Here are some safety procedures you should follow when you need to measure voltages below 300 volts:

1. Notify and obtain permission from the commanding officer (afloat) or your supervisor (ashore) to work on energized equipment. Some commands require you to complete a checklist before doing this.

2. Study the schematic and wiring diagrams of the equipment on which you’ll be working. Note the location of the points you will be measuring and, also, the location of any other high-voltage points you should be careful not to measure or touch.
3. Remove all metal watches, belt buckles, rings (even wedding bands), and any other items that have exposed metal. If you’re wearing a security badge, put it in your pocket.

4. Make sure you’re wearing electrical safety shoes, if they were issued, and that you’re standing on insulating rubber matting. If you must insert your hand into the enclosure of the energized equipment, wear a pair of electrical safety rubber gloves rated for the appropriate voltage (see table 2-2).

<table>
<thead>
<tr>
<th>Tag Color</th>
<th>Class</th>
<th>Proof Test Voltage AC / DC</th>
<th>Max. Usage Voltage AC / DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beige</td>
<td>00</td>
<td>2,500 / 10,000</td>
<td>500 / 750</td>
</tr>
<tr>
<td>Red</td>
<td>0</td>
<td>5,000 / 20,000</td>
<td>1,000 / 1,500</td>
</tr>
<tr>
<td>White</td>
<td>1</td>
<td>10,000 / 40,000</td>
<td>7,500 / 11,250</td>
</tr>
<tr>
<td>Yellow</td>
<td>2</td>
<td>20,000 / 50,000</td>
<td>17,000 / 25,500</td>
</tr>
<tr>
<td>Green</td>
<td>3</td>
<td>30,000 / 60,000</td>
<td>26,500 / 39,750</td>
</tr>
<tr>
<td>Orange</td>
<td>4</td>
<td>40,000 / 70,000</td>
<td>36,000 / 54,000</td>
</tr>
</tbody>
</table>

5. Have a co-worker stand by; don’t work alone. Make sure your co-worker knows where to secure the power in case of emergency.

Follow these four safety precautions **whenever** you take measurements on energized equipment:

1. Always use test probes with safety guards or barriers on the probe tips. This will prevent your hand from inadvertently touching the probe tip.

2. Always used insulated alligator clips.

3. Always keep your body clear of any metal parts of the equipment on which you’re working.

4. Try and keep one hand in your pocket or behind your back when taking the measurement. This will prevent you from creating a ground path for electric current flow through your body from hand to hand.
Here is an excerpt from a mishap report that will show the importance of following the above precautions:

Member could not get alligator clip on test lead to stay on probe so he held clip to probe with right hand. Member violated safety precautions by continuing to hold clip and probe while energizing the test lead with 1200 volts. Soon thereafter, the member touched the ground lead and received serious shock. The member was treated for minor burns on the palm.

### 2.2.2 Measuring Volts above 300 Volts

All the safety procedures for measuring voltages below 300 volts apply when you are measuring voltages above 300 volts. But, the big difference when measuring voltages above 300 volts is that you must **NOT** hold the test probe in your hand while the equipment is energized. Instead, you’ll attach the test probes while the equipment is de-energized. Here are the safety procedures you should follow:

1. Follow all the preliminary safety procedures for measuring voltage below 300 volts before beginning your measurements.

2. Make sure the equipment you are working on is DE-ENERGIZED. Follow the required tag-out procedures.

3. With a shorting probe, discharge all high-voltage capacitors.

4. Attach the ground probe of the measuring device **first**.

5. Secure the other probe of the measuring device to the test point to be measured.
6. Make sure the measuring device is setup for the voltage level and polarity to be measured.

7. Energize the equipment under test, make the measurement, and then de-energize the equipment.

8. Discharge all high-voltage capacitors.

9. Remove the probes from the equipment.

2.2.3 Electrostatic Discharge Precautions

Electrostatic discharge (ESD) can destroy or damage many electronic components including integrated circuits (ICs) and discrete semiconductor devices. Certain devices are more susceptible to ESD damage than others. Because of this, warning symbols are now used to identify ESD-sensitive (ESDS) items (fig. 2–1).

Figure 2-1 Warning symbols for ESDS devices
Certified 2M technicians are trained in procedures for reducing the causes of ESD damage. The procedures are similar for all levels of maintenance. Some of the protective measures you should follow to prevent ESD damage are:

- Ground the work benches where ESDS devices will be handled
- Be sure you are grounded
- Check packaging and equipment technical manuals for ESD warnings and instructions
- Before opening an electrostatic unit package of an ESDS device or assembly, ground the package
- Minimize the handling of ESDS devices or assemblies
- Avoid unnecessary physical movement
- When removing or replacing an ESDS device or assembly in the equipment, hold the device or assembly through the electrostatic free wrap if possible
- Do not permit ESDS devices or assemblies to come in contact with ungrounded materials
- When moving an ESDS device or assembly, always touch (with bare skin) the surface on which it rests for at least one second before picking it up
- When servicing ESDS devices, do not touch or handle materials that create static charges, or, be sure to repeat the grounding action
- When possible, avoid repairs that require soldering at the equipment level
- Ground the leads of test equipment before energizing test equipment and before probing ESDS items

Remember, although many sources of electrostatic charge are of little consequence during most daily activities, they become extremely important when you work with ESD material. For further information, refer to NEETS, Module 14, Microelectronics.
2.3 ELECTROMAGNETIC RADIATION HAZARDS

The electromagnetic spectrum encompasses everyday use items from commercial power to medical x-rays, as shown in figure 2-2. In this area we will discuss radio frequency radiation and optical radiation.
2.3.1 RF Hazards to Personnel

Radiation from antennas fed by high powered RF transmitters has the potential for injuring personnel who happen to be near the radiating antennas. Transmitters aboard ships, on aircraft, at shore stations, and microwave ovens found both aboard ships and ashore are potential sources of harmful radiation. At some frequencies, exposure to excessive levels of RF radiation will not produce a noticeable sensation of pain or discomfort to give warning that injury may be occurring. Radiated RF energy can also result in RF burns when metal objects with induced high RF voltage levels are touched.

An RF burn is the result of current flowing through the body when parts of the body are in contact with RF voltages induced in conductive objects. The current produces heat as it passes through the resistance of the skin. The effect of the heat on a person ranges from warmth to painful burns.
2.3.2 Laser Hazards to Personnel

The word *laser* is an acronym for Light Amplification by Stimulated Emission of Radiation. A laser is basically a concentrated beam of optical radiation. As technology increases, the use of laser equipment will increase for purposes ranging from industrial to medical to military (both offensive and defensive).

The effects that lasers can have on your eyes range from inflammation of the cornea to corneal burn and on your skin from accelerated skin aging to skin burn.

If you are involved with the use of lasers at your command, be sure to follow all safety precautions for the class of laser in use and all directions given to you by your command’s Laser Safety Officer. Lasers will be discussed in greater detail in volume 9 of this series.

We recommend that you become familiar with the contents of NAVSEA OP 3565/NAVAIR 16-1-529, Technical Manual, *Electromagnetic Radiation Hazards (U), (Hazards to Personnel, Fuel, and Other Flammable Material) (U)*. We also recommend that you read chapter 22 of the *Navy Occupational Safety and Health (NAVOSH) Program Manual*, (OPNAVINST 5100.23) for shore operations, and chapter B9 of the *NAVOSH Program Manual for Forces Afloat* (OPNAVINST 5100.19).
2.4 TAG-OUT BILL

The tag-out bill is a system of documents used to save lives and to prevent unnecessary damage to equipment. It uses CAUTION tags and DANGER tags, out-of-calibration labels, and out-of-commission labels to let you know when a specific switch, circuit breaker, piece of equipment, electronic system, or plumbing valve should be either operated with extra care or completely left alone.

As an ET, you won’t be securing many plumbing valves. But, you will be securing a lot of power switches and circuit breakers to do preventive and corrective maintenance on electronic systems and equipments. It’s not possible in this topic to identify all situations requiring tag-out. However, here are a few situations that do require you to tag out the equipment:

Working Aloft or Over the Side: Since many areas on the exterior of a ship are inaccessible from decks or built-in work platforms, it becomes necessary to go aloft or over the side to reach these areas.

The greatest hazard associated with working aloft or over the side is the danger of a fall. Other hazards include the dropping of objects on (or by) personnel, radiation burns, and asphyxiation. When working aloft, the following must be observed:

- Do not go aloft on masts, maces, stacks, or king posts or be suspended over the side by a crane without first obtaining written permission from the CSOOW, O.O.D., and the CDO in the form of a working aloft checklist.

- Wear supplied air respirators when working near stacks or exhaust which are actively discharging gases.

- Use a climber sleeve assembly in conjunction with the safety harness when going aloft where a climber safety rail is installed.

- Before commencement of work and every 15 minutes thereafter, pass a verbal warning over the 1 MC, DO NOT ROTATE ANTENNAS, ENERGIZE OR RADIATE ANY ELECTRICAL OR ELECTRONIC EQUIPMENT WHILE PERSONNEL ARE WORKING ALOFT. If personnel aloft are in the vicinity of the stacks add, DO NOT BLOW TUBES OR LIFT SAFETY VALVES WHILE PERSONNEL ARE WORKING ALOFT.

- Inform ships in the vicinity that personnel will be working aloft to ensure they take appropriate action on operation of electrical or electronic equipment.
• Departments concerned shall ensure that all radio transmitters and radars that pose radiation hazards are placed in the STANDBY position and a sign placed on the equipment that reads:

**SECURED PERSONNEL ALOFT**  
**DATE_____ TIME_____ INITIALS_____**

• Position a safety observer on deck near the work being performed. Outfit the safety observer with a safety harness, lanyards, and climber safety sleeve to permit rapid emergency assistance aloft if required. The safety observer shall keep the deck area beneath the work aloft free of unnecessary personnel.

Now, refer to *Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat,* (OPNAVINST 5100.19), and read Chapter C8. Then return to this manual.

**Corrective Maintenance:** When you’re working on equipment that must have its power secured, and there’s a chance someone else could inadvertently reapply power while you are still working on it.

**Preventive Maintenance:** When planned maintenance system (PMS) maintenance requirement cards (MRCs) or equipment technical manuals direct you to secure electrical power.

**Danger Exists:** When you are operating equipment that could endanger someone’s life. This could apply to both mechanical and electrical faults.

**2.4.1 Tag-Out Responsibilities**

Commanding officers are responsible for the wellbeing of their people and the operational readiness of their equipments. They are ultimately responsible for making sure their personnel follow the appropriate tag-out procedures. To help do this, they assign *authorizing officers* who have authority to sign, issue, and clear tags and labels.  

There is usually one authorizing officer for each department. The authorizing officer can be a commissioned officer, chief petty officer, or petty officer, typically the CSOOW, EOOW, or the EDO (in port). When the affected system will be rendered out-of-commission as a result of the tag out action, the Authorizing Officer shall obtain permission of the CO when appropriate and the cognizant Department Head before effecting the tag-out. In addition, the Authorizing Officer shall notify the cognizant Division Officer of the requirement for the tag-out.
Your department’s authorizing officer will:

- Make sure you are qualified to do the work you are about to do.
- Maintain the tag-out log(s).
- Sign and issue tag(s) and tag-out record sheet(s).
- Clear the record sheet(s) from the tag-out log(s) and destroy the tag(s) when the work is completed.

2.4.2 Tag-Out Documents

Tag-out documents consist of:

- A tag-out log
- CAUTION Tags (NAVSHIPS 9890/5) (yellow)
- DANGER Tags (NAVSHIPS 9890/8) (red)
- Out-of-Calibration Labels (NAVSEA 92 10/6)
- Out-of-Commission Labels (NAVSHIPS 9890/7)

We will discuss the first three items in depth. The last two items are labels used to identify test equipment that is either out of calibration or out of commission.
2.4.2.1 Tag-Out Log

A tag-out log is a permanent log of the authorizations given for all tag-out actions. It’s kept in a three-ring binder and has five sections that contain the following:

Section 1 - A copy of the Equipment Tag-Out Bill, chapter 6, OPNAVINST 3120.32; and a copy of the command’s amplifying instruction on equipment tag-out.

Section 2 - DANGER/CAUTION Tag-Out Index and Record of Audits (OPNAV 3120/4) (See figure 2-4). The authorizing officer uses this form to assign and track all of the issued DANGER/CAUTION tags.

```
<table>
<thead>
<tr>
<th>Log Serial</th>
<th>Date Issue</th>
<th>Type</th>
<th>Description</th>
<th>Date Cleared</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>(B)</td>
<td>(C)</td>
<td>(D)</td>
<td>(E)</td>
</tr>
</tbody>
</table>
```

Figure 2-4 DANGER/CAUTION Tag-Out Index and Record of Audits (OPNAV 3120/4)

Note that the blocks on figure 2-4 are labeled (A) through (E). Here is an explanation of each block:

(A) LOG SERIAL: The sequential log serial number issued for tag-out actions.

(B) DATE ISSUE: The date the log serial number was issued.

(C) TYPE: The type of tags used, either DANGER or CAUTION.

(D) DESCRIPTION: A description of the system or component that will be tagged-out and any amplifying information.

(E) DATE CLEARED: The date that ALL the tags were cleared.

Section 3 - DANGER/CAUTION Tag-out record sheets (NAVSEA 9210/9) that are still in effect. Figures 2-5 and 2-6 show the front and back sides of this form.
### Figure 2-5 DANGER/CAUTION Tag-Out Record Sheet NAVSEA 9210/9 (Front)

The figure contains a table titled "Operations/Work Items Included in Tag-Out" with columns labeled "Applicable Documentation (i.e., Job Order, RP Out, SIP, etc.) Number & Title," "Tag Numbers Used," "Date/Time Issued Or Added," "Petty Officer In Charge," "Authorizing Officer," and "Work Complete." The table is designed to record specific details related to the tag-out process. Each column has a corresponding label and space for entries, indicating the structured nature of the documentation required for such records.
Note that the items on the form are labeled (A) through (R). When you tag out equipment, you must complete items (A) through (J) and item (M) on the form. Here’s an item-by-item explanation of the form:

(A) DATE/TIME TAG-OUT ISSUED: Enter the date and time the authorizing officer issued you a log serial number from the DANGER CAUTION Tag-Out Index and Record of Audit sheet.

---

**Figure 2-6 DANGER/CAUTION Tag-Out Record Sheet NAVSEA 9210/9 (Back)**
(B) SYSTEM OR COMPONENT: Enter the official nomenclature of the system or equipment you are tagging-out (example, AN/WSC-3[V]).

(C) LOG SERIAL NO.: Enter the number assigned by the authorizing officer.

(D) REASON FOR TAG-OUT: Briefly describe the reason for the tag-out (example, “Preventive maintenance”).

(E) PERSONNEL/EQUIPMENT HAZARDS INVOLVED: Briefly describe any hazards that may exist (examples, “Shock hazard” or “Operation would damage equipment”).

(F) AMPLIFYING INSTRUCTIONS: Briefly describe any other instructions that may apply.

(G) WORK NECESSARY TO CLEAR TAG(S): Briefly describe any work that must be done before the tag(s) can be cleared.

(H) OPERATIONS/WORK ITEMS INCLUDED IN TAG-OUT: Fill in this part of the form as follows:

1. List the jobs to which this tag-out applies. If the tag-out is for an outside repair activity, list the job order number and title.

2. Record the tag numbers used and the date and time they were issued.

3. You, as the “petty officer in charge,” sign in the designated block. Then have a second person sign after he or she verifies that (1) you are using the right type and number of tags and (2) you are tagging out the correct item.

Only qualified ship’s force personnel shall perform the second check of tag installation. The second person shall not accompany the person initially installing the tag(s).

4. Next, have the authorizing officer and the repair activity representative, if applicable, sign in the spaces provided.

5. After the work is completed and the tag-out tags are removed, have the authorizing officer and the repair activity representative, if applicable, certify the work completed and the tags cleared by signing and dating in the blocks provided.

(I) TAG NO: (back side of form): List each tag separately. An example tag number is “76-3”. The “76” is the issue log serial number. The “-3” indicates that the tag is the third one used.
(J) LOCATION: Be specific. Give the power panel identification number and breaker identification number. If the tag-out action is on board a ship or submarine, also give the frame number. If the action is ashore, also give the building and room number.

(K) TAGGED POSITION/CONDITION: State the position in which the tagged item should remain (examples; ON, OFF, OPEN, or CLOSED).

(L) POSTED BY (INITIAL): The person who actually hangs the tag, initials here.

(M) POSTING CHECKED BY: A second person, after checking to make sure the tag was attached correctly, initials here.

(N) CLEARANCE/POSITION/CONDITION: State the position each tagged item should be in when the tag is cleared.

(O) CLEARANCE AUTHORIZED: After you’ve completed the work, the authorizing officer and the outside repair activity authorize you, by signing here, to clear the tags.

(P) DATE/TIME CLEARED: The person who removes the tag enters the date and time the tag is removed.

(Q) CLEARED BY: The person who removes the tag initials here.

(R) SIGNATURE OF WATCH OFFICER/DUTY OFFICER and DATE/TIME: The authorizing officer signs and dates the form here to certify that all switches, circuit breakers, etc., are returned to their normal operating position/condition.

Section 4 - Instrument Log (NAVSHIPS 9890/10). This log is the record of all of the out-of-commission and out-of-calibration labels issued.

Section 5 - DANGER/CAUTION Tag-out Record Sheets that have been cleared and are no longer in effect.
2.4.2.2 Caution Tags (NAVSHIPS 9890/5)

A CAUTION tag is a yellow-colored tag used only as a precautionary measure to give temporary special instructions, or to indicate that unusual caution must be exercised when operating the equipment to which the tag is attached (fig. 2-7).

![Figure 2-7 CAUTION Tag](image)

The instructions you write on the tag must state the specific reason the tag was attached. Do not use a CAUTION tag if there is a chance someone could be hurt or equipment could be damaged when operated using normal operating procedures. Use a DANGER tag instead.
2.4.2.3 Danger Tag (NAVSIPS 9890/8)

A DANGER tag is a red-colored tag used to prohibit operation of equipment that, if operated, could jeopardize the safety of personnel or damage equipment. Under NO circumstances may equipment be operated or removed when tagged with a DANGER tag (fig. 2-8).

Figure 2-8 DANGER Tag
2.4.3 Tag-Out Procedures

Before you tag out a piece of equipment, make sure you get your supervisor’s permission. If the equipment is mission-critical, you may even need your division officer or department head’s permission to tag out the equipment.

Now go to the Standard Organization and Regulations of the U.S. Navy, (OPNAVINST 3120.32), and read chapter 6, section 630.17.6, “Standard Tag-Out Procedures,” and return to this manual.

2.5 PROTECTIVE EQUIPMENT

Wearing the correct protective equipment is essential to all persons in the Navy. It is especially important for the safety of electronics personnel. In the following paragraphs, we will discuss this equipment.

2.5.1 Electrical Safety Shoes

You may be issued a pair of electrical safety shoes when you report to your first duty station. You should wear them whenever you work on or around energized equipment for your own safety.

Take care of your electrical safety shoes. You can clean and shine them just like regular safety shoes. And when they become worn out or damaged, turn them into your supply petty officer for a new pair.

Electrical safety shoes do not have any exposed metal parts like you might find on regular safety shoes. They do have special non-conducting soles designed to protect you from electric shock. The soles are rated to insulate you from a maximum of 600 volts.

Electrical safety shoes are stocked in the Naval Supply System under the National Stock Number (NSN) 8430-00-611-XXXX. The “XXXX” part of the NSN specifies the shoe size.

2.5.2 Rubber Gloves

There are four classes of rubber insulating gloves, the primary features being the wall thickness of the gloves and their maximum safe voltage rating. The classes and the maximum safe voltage for which the gloves can be used are listed in table 2-2.

Class 0 gloves are available in half-sizes from size 9 through size 12.
2.5.3 Safety Shorting Probe

Some of the electronic equipment you’ll work on will use large capacitors to filter the electrical power. You must discharge these capacitors before you can begin any work on the equipment. To do this you will need to get a safety shorting probe and follow these procedures:

1. Make sure input power to the equipment has been secured. Use the appropriate tag-out procedures, if necessary.

2. Open the equipment to gain access to the capacitors that need to be discharged. BE CAREFUL not to touch any exposed terminals! Large filter capacitors can store a lot of energy. And if you touch the exposed terminals... ZAP!!

3. Connect the flexible ground strap of the safety shorting probe to the metal chassis of the equipment. Make sure there is a good metal-to-metal connection.

4. While holding the safety shorting probe by its plastic handle, touch the metal probe tip to the appropriate terminals to be grounded. BE CAREFUL not to touch the metal probe tip or the flexible ground strap while the probe is in contact with the terminals of the capacitor. Repeat this step two or three times to ensure the capacitor is completely discharged.

Approved safety shorting probes are stocked by the Naval Stock System.

2.5.4 Eye Protection

As an Electronics Technician, you depend heavily on your sense of sight in performing your job. To help protect your eyesight, you should know (1) when to wear eye protection, and (2) which eye protection to wear.

The Navy Occupational Safety and Health (NAVOSH) Program Manual (OPNAVINST 5100.23), states that you are required to wear appropriate eye protective equipment when performing eye hazardous operations. In other words, whenever you’re doing something that could damage your eyes, WEAR EYE PROTECTION. Some of the things you’ll do that fall into this category are:

- Using an electric drill
- Soldering
- Maintaining batteries
- Cleaning and maintaining equipment using hazardous materials

2-25
UNCLASSIFIED
Here are a few things to remember about eye protection:

- Eye protection isn’t an option; it’s a requirement. If you’re doing something that calls for eye protection, take the time to get it and wear it. You can replace a scratched pair of goggles, but you can’t replace a scratched eye.

- Wear eye protection even when you are just “walking around” hazardous activities.

- After you are through using eye protection equipment, clean it and store it properly.

### 2.5.5 Hearing Protection

Hearing loss is a problem in the Navy. Every day, you’ll be working with and around many noisy equipments and machinery that could damage your hearing. And, in most cases, the damage won’t happen overnight; it will happen slowly. Your hearing will degrade until you will not be able to hear the softer sounds as well as you could have if you’d worn hearing protection. This is commonly called a *hearing threshold shift*. It simply means that the more you are exposed to damaging levels of noise, the louder normal sounds must be for you to hear them.

You must start NOW to protect yourself from hearing loss. OPNAVINST 5100.23 states that:

a. Hearing protective devices shall be worn by all personnel when they enter or work in an area where the operations generate:

   1. Sound levels greater than 84 dB(A).
   2. 140 dB peak sound pressure level or greater.

b. A combination of insert type and circumaural types, “Mickey Mouse ears”, of personal hearing protectors (double protection) shall be worn when sound levels exceed 104 dB(A), or 165 dB, unless an occupational audiologists, IH, or occupational medicine physician has determined that single protection is adequate for the anticipated duration of exposure.
2.5.6 Respiratory Protection

Chapter 3 discusses the use of hazardous paints, solvents, and other materials associated with the cleaning and maintenance of electronic equipment and antennas. We cannot emphasize too strongly the importance of using the proper respiratory protection when you use these materials. Be sure to ask your supervisor about the need for respiratory protection whenever you:

- Chip lead or chromate based paints while removing corrosion.
- Prime and paint the bases of antennas.
- Clean circuits with spray solvents and alcohol.

Whenever you perform these operations, be sure the work area has good ventilation. This will help prevent you from inhaling hazardous vapors and dusts.

2.5.7 Deck Insulating Material

Your working environment should have deck insulating material (more commonly called rubber matting) to protect you and your shipmates from electric shock. It must be installed wherever work is done on energized electrical and electronic equipment. This includes electronic repair shops that have workbenches to work on electronic equipment.

The rubber matting should be rated for use in areas where the maximum voltage won’t exceed 3000 volts. It must be installed in one continuous run, at least 36" wide, and must extend at least 24" past each end of the workbench. If you must work on energized equipment located in an area where rubber matting is not installed, protect yourself from electrical shock by using a 6-foot piece of rubber matting as a portable safety deck. When you’re done, roll it up and store it for the next job.

Rubber matting does a great job of protecting you from electric shock. But, it won’t do it for long if you don’t take care of it. Here are a couple of tips for keeping the insulating properties of rubber matting intact:

1. Always keep rubber matting clean and free of any excess dirt, oils, or oil-based products. When you clean rubber matting, don’t use any abrasive cleaners or electric buffers. If you do, you will ruin its insulating effectiveness.

2. Periodically inspect the rubber matting for cuts, cracks, or excessive wear. If you notice any of these conditions, replace the entire piece of rubber matting.
Throughout this volume we have discussed safety issues that are important to Electronics Technicians. Now, you must take this knowledge and apply it to your everyday job. Remember, SAFETY FIRST.
3 HAZARDOUS MATERIALS

3.1 INTRODUCTION

What are hazardous materials? They are substances which, depending on their concentration, chemical or physical characteristics, or quantity, pose a threat to human health or the environment. Any flammable material, compressed gas, aerosol, toxic material or corrosive is a hazardous material. Cleaning solvents, paints, batteries, and floor wax are all examples of hazardous materials. To do our job, and maintain equipment and areas, we must use hazardous materials. Whether we use hazardous materials daily or infrequently, we need to know how to identify them and to understand their use, storage, and disposal.

3.2 RECOGNIZING HAZARDOUS MATERIALS

All hazardous materials and hazardous material containers must be labeled. Manufacturers of hazardous materials must follow strict OSHA regulations on labeling. Each label must contain, at least:

1. The name of the material
2. The name and address of the manufacturer
3. The nature of the hazard

Hazardous materials we receive from the stock system, and even open purchase materials, must meet these requirements. You are not authorized to re-label properly labeled hazardous materials. If you dispense a hazardous material into an unlabeled container, you must indicate on the new container the same label information shown on the original container.

The Department of Defense (DoD) has a standard label for marking hazardous materials dispensed or produced by DoD agencies. You may also use this label to mark unlabeled containers. The label is called the Hazardous Chemical Warning Label, DD Form 2522, and is shown in figure 3-1. The information for this label is printed directly from the Hazardous Material Information System (HMIS) computer database.
You may also see Department of Transportation (DoT) shipping symbols on the outside of some hazardous material containers. These symbols, shown in figure 3-2 depict the hazard category of the material. These symbols are used on outer packaging, and are also found on trucks and railway cars transporting those materials.
Types of materials that are **Dangerous**, **Flammable** or **Combustible** are indicated by a diamond with applicable nomenclature that is red in color. Materials that are **Explosive** by nature are indicated by a diamond with applicable nomenclature and red coloring.

![Figure 3-2 Department of Transportation hazardous material shipping symbols](image)

Types of materials that are **oxidizing agents**, **organic peroxide**, or **radioactive**, are indicated by a diamond with applicable nomenclature with yellow coloring. Materials that are **poisonous gas**, **poison**, or **corrosive** are indicated by a diamond with applicable nomenclature and all black and white coloring. Non-flammable gases are indicated by a diamond with applicable nomenclature and green coloring. **Flammable solid** materials are indicated by a diamond with applicable nomenclature and red, blue, and white coloring.

You **must** read the labels on the hazardous materials you use. The label may also contain some handling precautions or other warnings that help you use the product safely.
3.3 HAZARDOUS MATERIAL INFORMATION

Many hazardous materials, if not used properly, can be hazardous to your health. They can burn or irritate your skin, cause internal damage if you inhale them, or poison you if you ingest them. You must be aware of and follow safe handling, storage, and disposal procedures for the hazardous materials you work with.

OSHA regulations require employers to provide every employee with safety information on the hazardous materials they deal with at work. This law also pertains to federal civilian and military personnel. Manufacturers must provide hazardous material information for all hazardous materials they produce and must make a Material Safety Data Sheet (MSDS) available to the user for each hazardous material. In the Navy, MSDSs are provided in a computer database on compact disk-read only memory (CD-ROM) system called Hazardous Material Control and Management (HMC&M). This database contains several publications and a system called the Hazardous Material Information System (HMIS). The HMIS provides over 70,000 MSDSs for materials used within the Department of Defense.

The MSDS must be available to any user of hazardous material. CD-ROM systems with the HMC&M are provided on board every ship and shore station. The MSDS is used to train hazardous material users on the hazards and precautions of that material. MSDs contain:

1. General information, including an emergency phone number
2. Ingredients and identity information
3. Physical/chemical characteristics
4. Fire and explosion hazard data
5. Health and hazard data, including first aid
6. Precautions for safe handling and use
7. Control measures, including protective equipment
8. Transportation data
9. Disposal data
10. Label data

Your Hazardous Material Control Program Manager, Hazardous Material/Hazardous Waste Coordinator, or Safety Officer can provide you with MSDSs upon request. Ashore, the MSDSs for a work center will be located within that work area. Aboard ship, the MSDSs are available through your supervisor.

Safety information on hazardous materials is also available in chapter C23 of Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, OPNAVINST 5100.19.
3.4 SAFETY PRECAUTIONS FOR HAZARDOUS MATERIALS

You must follow the prescribed safety precautions for the hazardous materials you use or handle in your workplace. There are requirements for personal protective equipment, spill response, and disposal of waste that you need to know. This section will cover safety precautions for the following types of materials commonly used or handled by Electronics Technicians: solvents, aerosol containers, polychlorinated biphenyls, batteries, and vacuum tubes.

3.4.1 Solvents

Varnishes, lacquers, cleaning fluids, and some paints contain solvents that can ignite at relatively low temperatures. Such materials pose a serious fire hazard. Some solvents give off toxic vapors that are harmful if you inhale them. Some will also cause serious problems if they come in contact with your skin.

Many solvents are used in the day-to-day maintenance of electronic equipment. The safest solvents are those that dissolve in water (water-based). If water-based solvents won’t work, the two most popular non-water-based solvents are trichloroethane and methyl alcohol. Both of these are EXTREMELY flammable. Use these only when you have adequate ventilation.

When you use hazardous paints or solvents, always follow these safety precautions:

1. If you spill them, **wipe them up immediately.**
2. Place rags or other items you use to clean them up **in a separate, covered container.**
3. **Use** protective clothing, goggles, gloves, or other appropriate safeguards to prevent the paints or solvents from getting on your skin or in your eyes.
4. Have **accessible fire-fighting equipment nearby.**
5. Have **adequate ventilation.**
6. **Dispose** of the paints and solvents when you no longer need them. Make sure you dispose of them properly. If you are unsure of the disposal procedures, check with the safety officer.
7. Store flammable solvents in approved flammable storage lockers. Make sure you store flammable and corrosive materials separately.
8. **DO NOT** use carbon tetrachloride. This is a highly toxic compound and is banned from use. Use trichloroethane instead.

9. **DO NOT** smoke or use an open flame or allow anyone else to do so in areas where paint, varnishes, lacquers, or solvents are being used.

10. **DO NOT** breathe the vapors of any cleaning solvent for prolonged periods. If you don't have proper ventilation, use a respirator.

11. **DO NOT** spray cleaning solvents on electrical windings or insulation.

12. **DO NOT** apply cleaning solvents to heated equipment, since this could cause a fire.

### 3.4.2 Aerosol Containers

Aerosol containers are everywhere. You use them to groom your hair, to clean and freshen your living quarters, and to paint parts of the equipment you work on. When properly used, aerosol containers will dispense their chemicals quickly and effectively. But if they’re misused, they can hurt you and cause damage to your surroundings. To prevent this, you must be aware of the dangers of aerosol containers and how to protect yourself from them.

Before using any aerosol container, read the label on the container. It usually has instructions on how to use, store, and dispose of the container safely. **DO NOT** ignore these instructions. If you do, you may become sick from the toxic effects of the chemicals in the container. Or, even worse, you may be seriously injured if the container explodes.

Here are some basic rules to follow when using aerosol containers:

1. Make sure you **have plenty of ventilation** when you use aerosols that contain dangerous or toxic gases. If you must use such aerosols when ventilation is not adequate, wear the appropriate respiratory equipment.

2. Dispose of the containers **according to the instructions of your supervisor**. Some aerosol containers are considered hazardous waste.

3. **Keep** all aerosol containers **away from** open flames, sunlight, heaters, and other possible sources of **heat**.

4. **DO NOT** spray paint or other protective coatings on warm or energized equipment. You may cause a fire.
5. **DO NOT** spray any paints or solvents on your skin. Some liquids in aerosol containers may burn you, while others may cause a skin rash.

6. **DO NOT** dent or puncture these containers. They are pressurized and can explode if dented or punctured.

7. **DO NOT** store these containers in heated areas where temperatures can exceed the recommended storage temperature on their labels. Aboard ship, all aerosols are considered flammables and must be stored in a flammable liquid storage compartment or cabinet.

8. **DO NOT** discard these containers in wastebaskets that will be emptied into an incinerator; they could explode.

**3.4.3 Polychlorinated Biphenyls (PCB’S)**

Polychlorinated biphenyls (PCBs) are toxic chemicals belonging to the chlorinated hydrocarbon group of substances. They range in form and appearance from oily liquids to crystalline solids and hard transparent resins. These chemicals exhibit many favorable physical and chemical properties, including high heat capacity, chemical stability, non-corrosivity to metals, low flammability, low vapor pressure, and low electrical conductivity. They have, therefore, been used extensively as insulators and coolants in electrical equipment.

Any PCBs in use aboard ship will typically function as insulating fluids or coolants within electrical equipment. (The chemicals might occasionally be found in totally-enclosed hydraulic and heat transfer systems.)

Remember, these chemicals are toxic. That means they can be harmful to your health or even deadly. Their adverse effects can result from either brief or repeated exposure. The effects from short-term contact with high concentrations of PCB vapors or liquids include eye, nose, and throat irritation, headaches, and a skin rash known as chloracne. Repeated exposure can result in severe skin irritation, respiratory irritation, digestive tract damage, and damage to the liver. Systemic intoxication, that is, an adverse effect to your entire bodily system, can result from severe overexposure. Systemic intoxication is indicated by nausea, vomiting, weight loss, jaundice, and abdominal pain, and can be fatal.
To protect all personnel, all equipment and cabinets containing in-service small and large PCB capacitors should be marked with the label shown in figure 3-3.

![Label Example](image)

Figure 3-3 Sample 4”x 4” EPA-required label

You can find additional information on PCBS in the Shipboard Management Guide for Polychlorinated Biphenyls (PCBs), NAVSEA S9593-A1-MAN-010. Although we do not require that you read this publication, we highly recommend that you do so.
3.4.4 Batteries

A battery consists of a group of cells that provide a source of direct-current electrical power. Batteries are used in automobiles, boats, aircraft, ships, submarines, lighting equipment, and portable and stationary electrical and electronic equipment. They can be used as main power sources or as secondary or backup power sources. Some batteries are rechargeable and some are not.

Batteries can be dangerous. If used or handled improperly, they can explode, release toxic gases, or leak hazardous chemicals. This section gives you the safety precautions for the following six types of batteries ETs are most likely to see:

1. Carbon-zinc
2. Manganese-dioxide alkaline-zinc
3. Mercuric-oxide
4. Lithium
5. Lead-acid
6. Nickel-cadmium

3.4.4.1 Carbon-Zinc Dry Cell Battery

This is a very common battery in the Navy. It has a zinc outer container, a carbon center electrode, and a chemical paste for the electrolyte. It is usually sealed in a cardboard or plastic casing.

There are three important safety precautions concerning using, storing, or disposing of carbon-zinc batteries:

1. **DO NOT** store carbon-zinc batteries in electronic equipment for extended periods. The corrosive electrolyte could leak out of the battery and damage the equipment.

2. **DO NOT** throw carbon-zinc batteries into a fire; they could explode. Keep them away from incinerators.

3. **DO NOT** throw carbon-zinc batteries overboard while at sea. These batteries contain metal pollutants. Store them on board (in a steel container) until you can properly dispose of them ashore.
3.4.4.2 Manganese-Dioxide Alkaline-Zinc Cell Battery

Commonly called an *alkaline* battery, this type of battery is similar to the carbon-zinc battery. The only difference is the type of electrolyte used. You’ll find these batteries in portable electronic equipment. The safety precautions for alkaline batteries are identical to the safety precautions for carbon-zinc batteries.

3.4.4.3 Mercuric-Oxide Zinc Cell Batteries

Commonly called *mercury cells*, these batteries are small and powerful. They have longer shelf life than the two previous types of batteries. They were first used to power miniature equipments of the space program. Today these batteries are used in electronic test equipment, cameras, hearing aids, periscope cameras, missiles, cryptographic equipment, and sonar devices.

Mercury cells are safe when used properly. But, if they’re misused, **BOOM!** They could explode. Use the following safety precautions for mercury batteries:

1. **DO NOT** place a direct “short circuit” on a mercury cell.
2. **DO NOT** discharge a mercury cell after its voltage falls below 70 percent of its original voltage, or after it fails to operate the equipment it is in.
3. **DO NOT** leave the battery switch on when the equipment isn’t in use, or after the mercury cell fails to operate the equipment.
4. **DO NOT** expose mercury cells to temperatures over 400 degrees Fahrenheit.
5. **DO NOT** keep exhausted mercury cells. Discard them as soon as possible. If you’re at sea, store them temporarily under water in a steel container until you can dispose of them properly ashore. When you store exhausted mercury cells, never purposely puncture their jackets.
3.4.4.4 Lithium Cell Batteries

Lithium batteries are high-energy, long-lasting batteries with a longer shelf life than most other batteries. They are making their way into electronic equipments. They’re used in computers, communications and cryptographic equipments, torpedoes, and missiles. Unfortunately, lithium batteries can be very dangerous. They’ve been known to release toxic gases or to explode. If you handle lithium batteries, observe the following safety precautions to prevent injury to yourself and damage to your equipment:

1. Use **only** lithium batteries that are approved for use in your equipment.

2. Store them in **cool, well-ventilated areas** away from flammable items.

3. **ALWAYS observe polarity** when you install them.

4. **DO NOT** pierce, short-circuit, recharge, crush, cut, burn, drop, dismantle, modify, or otherwise carelessly handle them.

5. **DO NOT** leave them in equipment that won’t be used for long periods.

6. **DO NOT** throw them away with daily trash. Dispose of them properly. See the *Environmental and Natural Resources Program Manual*, (OPNAVINST 5090.1), for more disposal information on lithium batteries.

If you use lithium batteries on a daily basis, we recommend that you get a copy of the *Technical Manual for Batteries, Navy Lithium Safety Program Responsibilities and Procedures*, NAVSEA S9310-AQ-SAF-010, and read through it.
3.4.4.5  Lead-Acid Cell Batteries

This is the most widely used wet-cell battery. It is also one of the most dangerous batteries to use and maintain. Lead-acid batteries use sulfuric acid, and their battery gases (mainly hydrogen) are extremely explosive. You’ll see this battery in automobiles and large backup power systems.

Remember, lead-acid batteries are very dangerous. To prevent injury to yourself, you should use the following safety precautions:

1. **ALWAYS** keep open flames and sparks of all kinds away from lead-acid batteries.

2. Be **sure** to have proper ventilation when you charge lead-acid batteries to prevent the buildup of hydrogen gas.

3. Follow the manufacturer’s instructions when charging lead-acid batteries.

4. Handle battery acid (electrolyte) **VERY** carefully. This material is highly corrosive to the skin and eyes and requires full body protection.

5. Keep the battery acid **above** the tops of the separators.

6. Use **only** pure, distilled water when adding liquid to lead-acid batteries.

7. **DO NOT** operate lead-acid batteries in temperatures over 125 degrees Fahrenheit (52 degrees Celsius).

8. **DO NOT** connect or disconnect charging connections when charging current is flowing.

9. **DO NOT** short-circuit lead-acid battery terminals.

10. **DO NOT** pour water into battery acid; always pour the acid into the water. And, make sure you wear appropriate skin and eye protection whenever you handle battery acid.

11. **DO NOT** put or allow salt water into a lead-acid battery. It will create an extremely toxic chlorine gas.
3.4.4.6 Nickel-Cadmium Cell Batteries

Commonly known as NICADs, nickel-cadmium batteries are used in most cordless, rechargeable equipment, such as flashlights, cordless drills, and soldering irons, and in portable stereos.

The following safety precautions for NICADs are relatively simple:

1. Charge NICADs in series, NEVER in parallel.

2. ALWAYS follow the manufacturer’s instructions for charging NICADs.

3. DO NOT expose NICADs to temperatures over 113 degrees Fahrenheit (45 degrees Celsius).

4. DO NOT short-circuit NICADs.

5. DO NOT store NICADs and lead-acid batteries in the same container or in the same area.

6. DO NOT dispose of NICADs by throwing them overboard. Temporarily store exhausted cells in a steel container until you can dispose of them properly ashore.

3.4.5 Vacuum Tubes

There are basically two categories of vacuum tubes: (1) electron tubes, and (2) cathode-ray tubes. There are certain safety precautions you need to follow when working with or handling vacuum tubes. The following paragraphs provide a brief discussion on the safety precautions for each category of tube.

3.4.5.1 Electron Tubes

Electron tubes are fairly rugged devices. Most of them can handle the shocks and knocks of everyday use. However, they are not indestructible. Most electron tubes contain a near vacuum enclosed by glass. Any excessive stress, like dropping the tube, may cause the glass to shatter, causing an IMPLSION. An implosion is the opposite of an explosion. When the glass shatters, the outside air rushes into the tube to fill the vacuum. As the air rushes into the tube, it carries the glass fragments with it, right on through the center of the tube and out the other side. If you’re in the path of these flying fragments, you could be seriously injured. So, handle ALL electron tubes with care.
Some electron tubes contain radioactive material. These must be handled with **EXTRA CARE**. Radioactive material is added to some electron tubes to aid ionization. Unbroken, the radioactive tubes are as safe as other electron tubes. This is because the tube’s radioactive material emits slow-moving particles that are contained within the tube’s thick glass envelope. But breaking the tube will expose the hazardous radioactive material.

To prevent injury to yourself or others, use the following safety precautions when handling either regular or radioactive tubes:

1. Handle **ALL** electron tubes, whether radioactive or not, with **EXTREME** care.

2. Immediately put any electron tube that has just been removed, whether radioactive or not, into a protective container, such as its shipping container.

3. Let your supervisor know immediately if a radioactive electron tube is broken.

4. **Seal off a radioactive-contaminated area immediately** so no other personnel are exposed to the radioactive material.

5. Treat **ALL** bad or damaged radioactive electron tubes as radioactive waste and dispose of them accordingly.

6. **DO NOT** remove a radioactive tube from its shipping container until you’re ready to install it.

7. **DO NOT** let your skin come in contact with **any** radioactive fragments. If it does, wash yourself thoroughly with soap and water and get medical attention.

### 3.4.5.2 Cathode-Ray Tubes (CRTs)

Cathode-ray tubes (CRTs) are everywhere. They’re used in televisions, desktop computers, radars, and electronic warfare systems. You’ll probably maintain electronic systems that use CRTs. So, it’s important for you to know about their hazards, and how to handle and dispose of them.
3.4.5.2.1 CRT Hazards

CRTs can be extremely hazardous. A CRT consists of a large glass envelope that maintains a high vacuum inside. It also has a toxic phosphor coating on its face. CRTs are under great atmospheric pressure. For example, a 10-inch CRT is subject to nearly 2,000 pounds of force. Of that, 1,000 pounds is felt on the tube’s face alone. Therefore, if you break the glass envelope, it will cause a violent implosion.

When a CRT breaks, high external pressure causes it to implode (burst inward). As a result, all the glass fragments, metal parts, and toxic phosphor are expelled violently.

A CRT can also be hazardous when it’s energized. This is because it carries a very high voltage and emits X-rays.

3.4.5.2.2 CRT Handling

To protect yourself from serious injury, you must never do anything that would cause the CRT’s glass envelope to break and cause an implosion. When handling CRTs, follow these precautions:

1. Always follow the manufacturer’s handling instructions.
2. Keep a new CRT in its shipping carton until you’re ready to use it.
3. When you remove a defective CRT, place it in a shipping carton immediately.
4. Wear gloves and goggles.
5. **DO NOT** remove a CRT until the high-voltage anode has been discharged.
6. **DO NOT** strike or scratch the surface of a CRT’s glass envelope.
7. **DO NOT** stand in front of a CRT when you install it. If the CRT should implode, the electron gun in its neck could be propelled at a very high velocity through the face of the tube and into your body.
8. **DO NOT** carry a CRT by its neck.
9. **DO NOT** come in contact with phosphor coating; it is extremely toxic. If a CRT should break, clean up the glass fragments very carefully. And, if you touch the phosphor, go to medical.
3.4.5.2.3 CRT Disposal

CRTs are disposed of by shipping them back to the manufacturer, or by discarding them locally. If you ship a CRT back to the manufacturer, put it in the shipping container intact. If you dispose of it locally, follow the procedure that has been prescribed by your safety officer.

3.4.6 Hazard Reporting

The reporting of unsafe or unhealthful conditions in the work place is extremely important. Each identified/validation hazard shall be assigned a Risk Assessment Code (RAC) by the activity safety office. The RAC represents the degree of risk associated with the deficiency. Hazard severity categories shall be assigned by Roman numeral according to the following criteria.

Category I - Catastrophic: The hazard may cause death, or loss of a facility.

Category II - Critical: May cause severe injury, severe occupational illness, or major property damage.

Category III - Marginal: May cause minor injury, minor occupational illness, or minor property damage.

Category IV - Negligible: Probably would not affect personnel safety or health, but is nevertheless in violation of a NAVOSH standard.

Mishap Probability is the term used to describe the probability that a hazard will result in a mishap, based on an assessment of such factors as location, exposure in terms of cycles or hours of operation, and affected population. Mishap probability shall be assigned an Arabic letter according to the following criteria:

Subcategory A - Likely to occur immediately or within a short period of time.

Subcategory B - Probably will occur in time.

Subcategory C - May occur in time.

Subcategory D - Unlikely to occur.
3.4.7 General Stowage Requirements

Proper stowage of hazardous material is essential to ship and personnel safety. The supply department and individual work center personnel are responsible for proper stowage of hazardous material in areas under their cognizance. For answers to your questions concerning hazardous material stowage, consult your supervisor, supply officer, or your hazardous material/hazardous waste coordinator.

Hazardous materials aboard ship are typically packaged in cases or allotments of individual containers.

Do not store hazardous materials in heat producing areas, or near heat-producing items. Shield hazardous material stored on the weather deck or in exposed areas from direct sunlight.

Temporary stowage of hazardous material in work spaces should be limited to the quantity necessary for one work shift.

We recommend that you get a copy of Naval Ships’ Technical Manual, Chapter 670, “Stowage, Handling, and Disposal of General Use Consumables,” and read sections 3 through 6 to enhance your knowledge on stowage of the material covered in this chapter. Additional informational is also provided in chapter C23, of the NAVOSH Program Manual for Forces Afloat, (OPNAVINST 5100.19).
4 GENERAL ADMINISTRATION

4.1 INTRODUCTION

Records and reports are the bywords in administration. They are vital in each of the following department and division functions:

- The supervision and assignment of ETs
- The upkeep and cleanliness of the spaces
- Electronics supply
- Allocation of funding
- Procurement of tools; consumables (such as fuses, bulbs, solder), and equipage items to replace those lost, expended, or surveyed

Without records and reports, performing these functions would be impossible.

- As an ET2, you will be involved with either creating or maintaining various administrative records and reports in addition to maintaining and repairing electronic equipment.

In this chapter we will discuss some of the reports that you may be involved in filling out. We will also cover the different periodicals that will assist you in your administrative responsibilities.

4.2 REPORTS

Reports, like inspections, are a “necessary evil” to the working technician. Without reports and a system of accountability, our job of maintenance and repair would be impossible. There would be no way to maintain supply support for our equipment, no way to know what equipment was on board, in what quantity, or where. In this section, we will introduce surveys, getting under way reports, casualty reports, and trouble reports and logs.

4.2.1 Survey

A survey is made and reported when naval property is (1) condemned as a result of damage, obsolescence, or deterioration, or (2) acknowledged to be nonexistent because of loss, theft, or total destruction. Figure 4-1A and 4-1B is a sample of the Report of Survey, DD Form 200. You can find more information on DD Form 200 in NAVSUP P-485, Afloat Supply Procedures, located in your supply department.
### FINANCIAL LIABILITY INVESTIGATION OF PROPERTY LOSS

#### PRIVACY ACT STATEMENT

**AUTHORITY: 10 USC 2775; DoD Directive 7200.11; EO 9397.  **

**ROUTINE USE(S): None.**

**DISCLOSURE: Voluntary; however, refusal to explain the circumstances under which the property was lost, damaged, or destroyed may be considered in determining if an individual will be held financially liable.**

1. **DATE INITIATED (YYYYMMDD)**
2. **INQUIRY/INVESTIGATION NUMBER**
3. **DATE LOSS DISCOVERED (YYYYMMDD)**

4. **NATIONAL STOCK NO.**
5. **ITEM DESCRIPTION**
6. **QUANTITY**
7. **UNIT COST**
8. **TOTAL COST**

9. **CIRCUMSTANCES UNDER WHICH PROPERTY WAS (X one)**
   - LOST
   - DAMAGED
   - DESTROYED

10. **ACTIONS TAKEN TO CORRECT CIRCUMSTANCES REPORTED IN BLOCKS 9 AND PREVENT FUTURE OCCURRENCES (Attach additional pages as necessary)**

11. **INDIVIDUAL COMPLETING BLOCKS 1 THROUGH 10**
    a. **ORGANIZATIONAL ADDRESS** (Unit Designation, Office Symbol, Base, State/Country, Zip Code)
    b. **TYPED NAME (Last, First, Middle Initial)**
    c. **DSN NUMBER**
    d. **SIGNATURE**
    e. **DATE SIGNED**

12. **(X one) RESPONSIBLE OFFICER (PROPERTY RECORD ITEMS)**
    **REVIEWING AUTHORITY (SUPPLY SYSTEM STOCKS)**
    a. **NEGLECT OR ABUSE EVIDENTIALLY SUSPECTED (X one)**
    - YES
    - NO

13. **APPOINTING AUTHORITY**
    a. **RECOMMENDATION**
       - APPROVE
       - DISAPPROVE
    b. **COMMENTS/RATIONALE**
    c. **FINANCIAL LIABILITY OFFICER APPOINTED (X one)**
    - YES
    - NO

14. **APPROVING AUTHORITY**
    a. **RECOMMENDATION**
       - APPROVE
       - DISAPPROVE
    b. **COMMENTS/RATIONALE**
    c. **LEGAL REVIEW COMPLETED IF REQUIRED (X one)**
    - YES
    - NO

**DD FORM 200; OCT 1999**

*PREVIOUS EDITION IS OBSOLETE.*

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**Figure 4-1A Report of Survey, DD Form 200 (Front)**
**Figure 4-1B Report of Survey, DD Form 200 (Back)**

<table>
<thead>
<tr>
<th>15. FINANCIAL LIABILITY OFFICER</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. FINDINGS AND RECOMMENDATIONS (Attach additional pages as necessary)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16. INDIVIDUAL CHARGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I HAVE EXAMINED THE FINDINGS AND RECOMMENDATIONS OF THE FINANCIAL LIABILITY OFFICER AND (X one)</td>
</tr>
<tr>
<td>b. I HAVE BEEN INFORMED OF MY RIGHT TO LEGAL ADVICE. MY SIGNATURE IS NOT AN ADMISSION OF LIABILITY</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. ACCOUNTABLE OFFICER</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. DOCUMENT NUMBER(S) USED TO ADJUST PROPERTY RECORD</td>
</tr>
</tbody>
</table>

DD FORM 200 (BACK), OCT 1999
4.2.2 Getting Underway Report

The Electronics Material Officer (EMO) is normally responsible for turning in an equipment status report before getting under way. You may be asked to furnish information about the equipment in your work center or about such diverse areas as:

- Major systems status
- Estimated time of repair (ETR)
- Power out and MDS readings from the radars
- Power out and receiver sensitivity readings from communications equipment

This report is usually a locally generated form and may vary between commands.

4.2.3 Casualty Report (CASREP)

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. You can find information on preparation and submission of casualty reports in Operational Reports, NWP 10-1-10 (formerly NWP 7 [REV. A]).

4.2.4 Trouble Reports and Logs

Trouble reports and logs are locally generated and, if used, are a great help in filling out 3-M documents. They are usually filled out each time an equipment trouble is detected. These reports and logs indicate such things as equipment affected, nature of the trouble, and time of failure. When the trouble has been corrected, the technician ensuring that the correction has been completed should then make an entry on the report or in the log stating so with the date of completion and his or her signature.

Other locally generated logs that your shop may maintain are a test equipment checkout log, to track test equipment on loan to other divisions; a consumable usage log, to track the use of the shop’s consumable supplies; and a tool accountability log, to track the tools issued to individuals.
4.3 PERIODICALS

Periodicals come in many variations. They maybe bulletins, magazines, messages, or publications. The periodicals that we discuss in the following paragraphs will bring you updates on equipment, safety items, and overall information that could affect you as an ET.

4.3.1 Afloat Safety Advisories

Afloat Safety Advisories are sent out to ships via naval message. Additionally, each January the Navy Safety Center sends an advisory, via naval message, listing the effective afloat safety advisories from previous year(s). Your command may contact the safety center at DSN 564-3520.

4.3.2 Ship’s Safety Bulletin

The SHIPS SAFETY BULLETIN is published by the Naval Safety Center in Norfolk, Virginia. It is distributed quarterly and occasionally put out as a special issue on one topic.

This bulletin covers all aspects of safety information, from electrical safety shoes to revisions of safety courses. If your work center does not maintain copies of the SHIPS SAFETY BULLETIN, find out where they are kept and review them to keep yourself up to date on safety related items. Figure 4-2 is an illustration of the front cover of the SHIPS SAFETY BULLETIN.
SHIPS' SAFETY BULLETIN

1st Edition - 2013

Suggested routing should include CO, XO, department heads, division officers, CMC, CPO mess, petty officers' lounge, work-center supervisors, and crew's mess. Banks provided for initials following review.

Para Sense Area
Halocarbon Refrigerant Monitors Common Discrepancies That Are Often Found On Safety Surveys.

By MMC (SW/AW) Esters Wright

To eliminate death and injuries from exposure to halocarbons in auxiliary machinery rooms, shaft alley reefer decks take heed to below items.

Common Discrepancies:

1. No Power
2. Audible Alarm Switch Is In The Off Position
3. System Operating Under Faulty Condition

What To Look For When Standing Watch

1. A steady green light on front of the panel indicate system is healthy and operating correctly.
2. When a fault is detected, green light will flash and indicate on main screen status system faulty.
3. After 18 months of operation the monitor will report one of the following messages: “calibration check required”, “recalibration” or “service required”. These fault messages can only be cleared by replacing STYX module.
4. Other messages that can be observed on the monitors display screen include a flashing green, flashing amber or flashing red lights, each of which indicate either a system fault or refrigerate leak. If any flashing light is observed notify appropriate personnel and exercise protective measures.

FMS: MIP 4361/028

Figure 4-2 SHIPS SAFETY BULLETIN cover page
4.3.3  *Sea Compass*

*Sea Compass* (ISSN 1550-1434) is published by Commander, Naval Safety Center, at 375 A Street, Norfolk, VA 23511-4399. Periodical postage paid at Norfolk, Va. *Sea Compass* is published twice yearly and distributed to ships, submarines, diving commands, shore-based commands, and DoD agencies. Contents are not necessarily the official views of, or endorsed by, the U.S. Navy, the Department of Defense, or the U.S. government. Photos and artwork are for illustrative purposes only, unless otherwise noted. Reference to commercial products or links to non-DoD resources do not imply Department of the Navy endorsement. Unless otherwise stated, material in this publication may be reprinted without permission; please credit the magazine and author. We reserve the right to edit all submissions for clarity and applicability.

Our mission is to deliver relevant, interesting and useful material to help with the Department of the Navy's mishap-prevention efforts.

![Figure 4-3 Front cover of *Sea Compass* magazine](image-url)
4.3.4 Decisions

Decisions (ISSN 2167-2431/244X) is published by Commander, Naval Safety Center, at 375 A Street, Norfolk, VA 23511-4399. Periodical postage paid at Norfolk, Va. Decisions is published twice yearly and distributed to readers located at shore-based commands, deployed with aircraft squadrons and carrier groups, and DoD agencies. Contents are not necessarily the official views of, or endorsed by, the U.S. Navy, the Department of Defense, or the U.S. government. Photos and artwork are for illustrative purposes only, unless otherwise noted. Reference to commercial products or links to non-DoD resources do not imply Department of the Navy endorsement. Unless otherwise stated, material in this publication may be reprinted without permission; please credit the magazine and author. We reserve the right to edit all submissions for clarity and applicability.

Decisions magazine is your source of information for managing risk, removing the potential for error, and improving performance. You will find articles about best practices, lessons learned, technological advances, research and development, new ideas, personal experiences, and risk-and-resource management strategies.

Figure 4-4 Front cover of Decisions
4.4 USING SOURCES OF INFORMATION

Use bulletins, instructions, and periodicals to increase your knowledge of electronics. They are excellent sources for discovering new techniques in troubleshooting and testing of equipment, and for obtaining updates on safety procedures.

You can use individual command logs, such as those that we mentioned earlier, to keep an accurate history of equipment performance, and the location of test equipment.

You can also use the sources of information that we discussed above as training aids for newly reporting personnel. New personnel can use the sources to bring themselves up to date on new procedures and troubleshooting techniques. In addition they can use the log books to learn about the operating history of the equipment they are assigned to maintain.

4.4.1 Navy Knowledge Online (NKO)

Navy Knowledge Online (NKO) is the Naval Education and Training Command's (NETC) enterprise-scaled knowledge management system for Career Management, Personal Development, Leadership, Learning and reference resources.

NKO can be utilized to find the NKO Communities of Practice (CoP), Navy Programs, Learning Centers, Organizations, and Naval Reserve pages. Access the vast information resources available across NKO and the internet using the Reference community. Access official Navy and Marine Corps Education and Training materials via Navy e-Learning. Collaborate with others to share information regarding projects, programs, performance, and professional/personal development. Use Message Boards, Polls, and Feedback tools for information sharing and rapid communication with colleagues and site members.

NKO combines many of the tools available both online and offline into a single source, accessible from anywhere in the world. It is your passport to Navy information, breaking news, documents, Internet communication, and more. To access NKO you must have a Common Access Card (CAC card) and obtain an NKO account.
Figure 4-5 Navy Knowledge Online (NKO)
4.4.1.1 Community of Practice (CoP) Page

NKO Communities of Practice (CoP) A Community of Practice (CoP) workspace provides a web-based collaborative environment where members of a group use shared information and administrative and communication tools to conduct business, manage a project, keep abreast of important group issues and solve problems. You can choose your CoP capabilities, revise its structure, and manage your content.

You might think of CoPs as a "community of communities," bringing together people with similar needs to provide them the support they need to perform their jobs.

Each CoP residing within Center for Surface Combat Systems (CSCS) is a self-contained, virtual community that represents a particular segment of the CSCS workforce. Each member of each online community fulfills a particular role and performs associated responsibilities. Community members use their CoP workspace features to interact and collaborate, as well as to find and access knowledge resources critical for performing their jobs.

CoPs provide individuals direct access to information and communities, at the time and place most convenient to them. Such access includes:

- Information resources and best practices/strategies
- Knowledge bases where members contribute findings and resources
- Colleagues engaged in similar work and tackling similar challenges
- Experts (SMEs) who may be able to address a question or provide references and point to resources
- A place to pose research and implementation (technical, instructional design, and product evaluation) questions
- A forum to challenge personal practices, hypotheses, or thinking on a particular topic
- Resources and strategies for furthering professional development
- Colleagues who might want to collaborate on projects

CoPs also:

- Generate knowledge
- Contribute to identifying effective practices and defining underlying principles
- Help create common vocabularies and conceptual frameworks

The ET Cop page contains a wide variety of information directly beneficial to a fleet ET to include systems information, references, advancement information, as well as the ability to provide feedback to the ET Cop administrator who is an active duty ET.
Figure 4-6 Communities of Practice (CoP) Page
4.5 MAINTAINING SOURCES OF INFORMATION

Since sources of information are of great importance to every technician, there is a need to maintain, update, and care for all of them. In the remainder of this chapter, we will discuss how to care for the Electronics Technicians’ primary sources of information.

4.5.1 Schematics

Let’s begin with the schematics that took you so much time to color code when you were in school, particularly in “C” school. The instructor for schematics gave you certain information that you thought would be valuable in the future. You probably put that information on your schematics. After “C” school, you may have referred to those schematics during certain repair procedures. The schematics became good reference material. If you still have the schematics, laminate them and make them part of your personal, professional reference library.

Now let’s look at the schematics contained in your technical manuals. The first thing to remember is that the technical manuals in your shop are for every technician to use. Do not write on these schematics. If you do, you will probably confuse you shipmates when they need to use them. Often, these schematics tend to tear along the folds. Reinforce these areas with clear tape. Finally, be sure to fold the schematics neatly back into the technical manual when you have finished using them.

4.5.2 Shop Logs

Far too often, shop logs become scratch pads or doodle pads. To ensure that this does not happen with your shop logs, place them on book shelves when you have completed your entries into them. Remember, these logs will contain information on equipment history that shipmates who arrive on board long after you have transferred may need to use.

4.5.3 Periodicals

Periodicals such as the Decisions and the SHIPS SAFETY BULETIN should be kept in hard binders in chronological order. Keep these binders in a bookcase or shelf in your shop for everyone in the shop to use. They also may be received electronically in .pdf format. As we mentioned before, these periodicals are filled with technical and safety information. There is no formal requirement to maintain periodicals as the information contained in them is considered advisory in nature, not directive. The decision to maintain periodicals is up to each individual command.
4.5.4 Instructions

There are many instructions in the Navy, and to keep them all in your shop would be an impossibility. However, in many of these instructions, you will find pertinent information that pertains directly to the ET world, such as electronic safety, hazardous material control, and so on. Instructions and pertinent information is normally kept on the ship’s LAN and can be accessed electronically.

4.6 CONCLUSION

In this chapter we have discussed some of the reports, logs, and publications that will be helpful to you in your everyday job as a technician. You now have the responsibility to apply this information and to enhance your administrative skills. In the next chapter you will learn about the technical administration aspects of your job as an Electronics Technician.
5 TECHNICAL ADMINISTRATION

5.1 INTRODUCTION

Technical administration is basically the filling out of paperwork required to complete a task. Whether the task is maintenance or repair in nature, it is not fully completed until all documenting paperwork has been finalized. You, as the technician, are responsible for ensuring that all paperwork is completed for each task you are assigned.
5.1.1 Naval Tactical Command Support System

Naval Tactical Command Support System (NTCSS) is a multi-application information system program that provides standard information resource management to afloat and shore-based fleet activities. NTCSS was established by the merger of three key programs: The Shipboard Non-Tactical Automated Data Processing Program (SNAP), the Naval Aviation Logistics Command Management Information System (NALCOMIS), and Maintenance Resource Management System (MRMS).

NTCSS provides a full range of standardized mission support automated data processing (ADP) hardware and software to support management of logistics information, personnel, material, equipment maintenance, and finances required to maintain and operate ships, submarines, and aircraft in support of the Navy and Marine Corps.

Major components include R-ADM, R-Supply, OMMS-NG, and NALCOMIS.

5.1.2 Organizational Maintenance Management System-Next Generation (OMMS-NG)

Organizational Maintenance Management System-Next Generation (OMMS-NG) provides Navy maintenance personnel with quick, convenient access to the maintenance information they need to ensure warship readiness. Such information includes information concerning configuration items, work candidates, and ordering parts for equipment.

OMMS-NG tracking assists shipboard personnel in the planning, scheduling, and reporting of maintenance and related logistics support actions. This application interfaces with other applications in the NTCSS suite including R-Supply. It also interfaces with shore activities that need ship and sub configuration, maintenance, and logistics information.

OMMS-NG increases a ship's availability for fleet operations, standardizes surface ship maintenance practices, levels loading of repair activities, and reduces cyclic costs of repairs, ensuring combat readiness.
5.2 MAINTENANCE DATA SYSTEM

The Maintenance Data System (MDS), provides a means of recording maintenance actions in substantial detail. This allows a variety of information concerning these actions and the performance of equipment involved to be retrieved. One of the major objectives of the MDS is to provide the capability of reporting configuration changes. In the following paragraphs, we will describe MDS subsystems that you will use frequently. Examples of MDS are, SKED, Organizational Material Maintenance System-Next Generation (OMMS-NG), and Naval Aviation Logistics Command Management Information System (NALCOMIS).

5.2.1 Maintenance Data System (MDS) Forms

In the following paragraphs we will briefly discuss the MDS forms that you as an ET are most likely to come across in your daily routine. For more in-depth information on the MDS forms, we recommend that you read chapter 9 of OPNAVINST 4790.4, Ships’ Maintenance and Material Management (3-M) Manual. Because the supply forms associated with the MDS have been discussed in other training manuals, we will not cover them here.

5.2.1.1 Ship’s Maintenance Action Form-OPNAV 4790/2K

This form, shown in figure 5-1, is the primary maintenance form. It is used by maintenance personnel to report (1) deferred maintenance actions and (2) all completed maintenance actions (including previously deferred actions).

The OPNAV 4790/2K contains six sections that require entries, depending on the type of maintenance action being reported. The form is printed on paper that does not require carbon to make multiple copies. Whenever you make an entry on this form, print the information, using all CAPITAL letters. Be sure the information is legible and inserted within the “tic” marks. If you make an error, line it out using a single line and enter the correct information.
Figure 5-1 OPNAV 4790/2K, Ship’s Maintenance Action Form
5.2.1.2 Supplemental Form-OPNAV 4790/2L

This form, illustrated in figure 5-2, is used to provide amplifying information for a maintenance action reported on a 2K form. For example, you may include on the 2L information from drawings, listings, associated parts placement, part labels, and the like, for use by a repair activity.

When you need to use an OPNAV 4790/2L OPNAV 4790/2K, enter in block 35 of the notation “2L USED.”

![Figure 5-2 OPNAV 4790/2L Supplemental Form](image-url)
5.2.1.3 Maintenance Planning and Estimating Form-OPNAV 4790/2P

This form is used with an OPNAV 4790/2K that defers maintenance to be done by an IMA under the Intermediate Maintenance Management System (IMMS). It provides information necessary to allow screening and planning to be done in detail.

Chapter 12 of OPNAVINST 4790.4B contains detailed information on the use of the form.

5.2.1.4 Automated Ship’s Maintenance Action Form-OPNAV 4790/2Q

This form is basically the same as the 4790/2K, except that it is filled in by computer. It contains the same information as the 2K. You may enter additional information by hand as necessary. You may also use this form as an automated work request and in preparation for INSURV.

NOTE: Data entered into the computer is checked for accuracy and completeness. Elements that contain errors are brought to the attention of the operator for correction as required by OPNAVINST 4790.4.

5.2.1.5 Automated Work Request (AWR)-OPNAV 4790/2R

This form is produced by the computer and combines the basic information submitted on the OPNAV 4790/2K and the planning information submitted on the OPNAV 4790/2P, if the 2P has been entered into the IMMS. A simulated AWR, produced under the Shipboard Non-Tactical ADP System (SNAP), is a valid work request and will be accepted by all involved activities. An AWR may be used for any of the following purposes:

- To describe all work and planning information relating to a specific job
- To enter planning information relating to a specific job with the OPNAV 4790/2K replacing the OPNAV 4790/2P
- By an IMA to conduct advance planning of a tended unit’s availability

Chapter 12 of OPNAVINST 4790.4 contains detailed information on this form.
5.2.1.6 Ship’s Configuration Change Form–OPNAV 4790/CK and Ship’s Configuration Change Form Continuation Page–OPNAV 4790/CK(C)

These forms shown in figures 5-3A and 5-3B are used to report configuration changes at the individual equipment level.

When you use the OPNAV 4790/CK form, you do not need to document the associated maintenance action on an OPNAV 4790/2K form. The OPNAV 4790/CK form is used both as a closing deferral for reporting the accomplishment of a previously deferred maintenance action that results in a configuration change, and as a completed maintenance action (no prior deferral) reporting a configuration change.

A configuration change occurs whenever a maintenance action results in the following situations:

1. Addition or installation of any new equipment.

2. Deletion or removal of any installed equipment.

3. Replacement or exchange of any equipment. A replacement or exchange is reported as the removal of an installed equipment and installation of new equipment.

4. Modification of any installed equipment. A modification results from a maintenance action that alters the design or operating characteristics of the equipment, or a maintenance action in which nonstandard replacement parts (not identified on the APL or in the technical manual) are used.

5. Relocation of any equipment.

6. Accomplishment of any alteration directive.

Two excellent documents that provide block-by-block instructions for completing the OPNAV 4790/CK are OPNAVINST 4790.4 (3-M Manual) and SPCCINST 4441.170, the COSAL Use and Maintenance Manual.
Figure 5-3A OPNAV 4790/CK, Ship's Configuration Change Form
Figure 5-3B OPNAV 4790/CK(C), Ship's Configuration Change Form Continuation Page
5.2.2 Current Ship’s Maintenance Project (CSMP)

The CSMP is an administrative system that provides the command and work center with the management data needed for the systematic accomplishment of repair and alteration of ship’s hull, installed equipment, and material. It identifies at any one time the backlog of deferred maintenance for each work center. The MDS provides the means for gathering this information. If the information provided is not accurate or up-to-date or is improperly used by supervisors or maintenance technicians, the CSMP system is worthless.

The usefulness of the MDS depends upon your accuracy, thoroughness, and timeliness in reporting information. The MDS is a system in which potential benefits are directly proportional to the efforts applied. Programs for improving reliability, maintainability, and logistic support of fleet equipment depend on how conscientiously you adhere to reporting procedures.

5.2.3 Planned Maintenance System (PMS)

The Planned Maintenance System provides each command with a simple standard means for planning, scheduling, controlling, and performing planned maintenance of all equipment. PMS maintenance actions are the minimum required to maintain the equipment in a fully operable condition. Maintenance procedures are contained on cards called “maintenance requirement cards” (MRCs).

5.2.3.1 Maintenance Requirement Cards (MRCs)

The MRCs provide detailed information for performing preventive maintenance. They state exactly the “who, what, when, how, and with what resources” associated with a specific maintenance requirement (See figures 5-4A and 5-4B).
Figure 5-4A Maintenance Requirement Cards (Front)
WARNING: Ensure all objects are clear of engine and propeller or water jet when operating engine.

b. Put on hearing protection.

NOTE 2: If Engine Revolutions Per Minute (RPM) is controlled by separate lever ensure throttle control lever is set into a position that will not increase engine RPM above IDLE.

c. Start engine, inspect for oil pressure within proper operating range as indicated on oil pressure gauge.
d. Allow engine to operate at idle until engine is at normal operating temperature.
e. Stop engine.

1. Test Propulsion Engine Neutral Safety Switch.

NOTE 3: Engine should only start when the control head is placed in the NEUTRAL/IDLE position. If the engine starts while the control head is in FORWARD or REVERSE position, the neutral safety switch has failed.

WARNING: Neutral safety switch shall not be bypassed/disconnected or removed from any control head, transmission, or engine. Failure to comply could result in damage to the boat or injury/death to the personnel.

WARNING: Neutral safety switch failure may cause the boat to move with force if engine RPM is placed above idle, this force can cause damage to boat, dock, and injuries to personnel. Do not engage control levers in any position that will produce engine RPM above IDLE at anytime while conducting the maintenance requirement.

a. Place engine control head in IDLE/NEUTRAL position.
b. Start engine, inspect for oil pressure within proper operating range as indicated on oil pressure gauge or engine control console or boat operators control console.
c. Confirm the propulsion system is neutral by inspecting the following, as applicable:
   (1) Propeller is not rotating indicated by lack of water flow from propeller.
   (2) Water jet impeller is not rotating, indicated by lack of water flow from water jet.
d. Move the control head lever out of the detent position and place in FORWARD. Ensure that engine RPM is set to IDLE.
e. Stop engine.
f. Attempt to start the engine:
   (1) If the engine starts the neutral safety switch has failed, immediately move the control head lever to the NEUTRAL position and stop the engine.
   (2) If the engine does not start move the control head to the NEUTRAL position.
g. Start the engine. Move the control lever out of the detent position and place in REVERSE. Ensure that the engine RPM is set to IDLE.
h. Stop engine.
i. Attempt to start the engine:
   (1) If the engine starts the neutral safety switch has failed, immediately move the control head lever to NEUTRAL position and stop the engine.
   (2) If the engine does not start move the control head to NEUTRAL position.
j. Repeat steps 1a through i.1(i.2) for remaining engines.
k. Remove hearing protection.
l. Report discrepancies to Work Center Supervisor, correct as directed.
m. Return equipment to readiness condition.

Figure 5-4B Maintenance Requirement Cards (Back)
5.2.3.1 List of Effective Pages (LOEP)

The work center LOEP (figure 5-5) contains a list of the Maintenance Index Pages (MIPs) and a brief description of the systems and equipments in the work center.

<table>
<thead>
<tr>
<th>Add</th>
<th>MIP</th>
<th>Nomenclature</th>
<th>RICs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1501/001-C4 Superstructure And Fittings</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>3000/001-A8 Misc Shipboard Elect Equip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4121/002-88 MK-162 Mod 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4151/009-86 AN/KHC-101(V)8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4400/001-A8 Exterior Communications Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4402/001-57 DK-424 (V, 4551) / WSC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4402/001-58 AN/SWC-1,1A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4403/001-B7 Frequency Distribution System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4414/009-96 R-2368, 2368A, R/URR, R-2369A (V)1/URR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4415/004-A8 Portable Communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4415/017-B7 AN/SHG-53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4416/032-40 AN/SWC-3 (V) LOS Versione</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>4415/045-A8 AN/SWC-55 (V) Hydra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4415/059-78 AN/KDC-13(V) Radio Set</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4415/061-5B AN/SHG-211 Radio Set</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4416/021-66 AN-SA-211A(V) Remote Communication Devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/011-70 AN/USG-145(V) Multiple Access Communication Sys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/021-89 AN/USC-38 (V)1-13, AN/USC-38(B)(V)1,2 EHF SATCOM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/023-68 AN/USC-3,1(V) 1,2,3,4,13,15,16,17,19,AN/WSC-3A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/022-66 INMARSAT A/B/SAH Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/021-96 Global Broadcast System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/021-A6 AN/USC-6A(V)7 EHF SATCOM System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4417/021-96 AN/USG-106(V) ( ) Multiplexer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4418/021-A8 RD-674A, B, C/JNH Recorder-Reproducer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4419/024-89 AN/SYQ-26 (V) NAVNAG (T)/SMG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4419/022-A8 AN/SYQ-7 (V) 1,2,3,4,5,6,8,14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4461/001-A8 Security Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4461/021-17 Network Encryption System (NES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4461/021-17 KG-250 Cryptographic Device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4461/031-A6 SA-2112(V)3,4,5,6,7,8/STQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>4661/001-88 AN/SA-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>5000/005-70 Valves And Valve Operators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>5513/017-78 L.P. Air Control Panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>6300/001-5B Preservation And Coverings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>5941/001-58 Desk Covering</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--- NMR - No Maintenance Required, Do Not Schedule
NMR-4451/002-84 AN/UVR-17P, 6 CV-3510R/UG
NMR-5111/010-99 Duplicators/COPYIERS

--- MRS - The need for Maintenance Requirements is Substantiated
MRS-4461/003-85 TSBQ/KY-61

Figure 5-5 List of Effective Pages (LOEP)
5.2.3.2 Maintenance Index Page (MIP)

A MIP (figure 5-6) contains a brief description of the maintenance requirements on all the MRCs for each item of equipment.

### Figure 5-6 Maintenance Index Page (MIP)

<table>
<thead>
<tr>
<th>OTHER MRC NO.</th>
<th>MAINTENANCE REQUIREMENT DESCRIPTION</th>
<th>PERIODICITY CODE</th>
<th>RATES</th>
<th>MAN HRS</th>
<th>RELATED MRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>78 38M1 N</td>
<td>Lubricate Steering Gear</td>
<td>8-1</td>
<td>E33</td>
<td>0.2</td>
<td>None</td>
</tr>
<tr>
<td>78 3EX N</td>
<td>Lubricate Push-Pull Type Steering Cable on Outboard Engine Equipped MRC</td>
<td>8-2</td>
<td>B38D</td>
<td>0.4</td>
<td>None</td>
</tr>
<tr>
<td>78 58Y5 N</td>
<td>Lubricate Center-Pull Type Steering Gear</td>
<td>A-1</td>
<td>E383</td>
<td>0.9</td>
<td>None</td>
</tr>
<tr>
<td>78 50L7 N</td>
<td>Inspect Hydraulic Steering System</td>
<td>A-2</td>
<td>M35</td>
<td>1.0</td>
<td>None</td>
</tr>
<tr>
<td>78 62C2 N</td>
<td>Change Oil in Steering Gear Controls</td>
<td>A-3</td>
<td>E383</td>
<td>1.0</td>
<td>None</td>
</tr>
<tr>
<td>78 9EM1 N</td>
<td>Change Lube Oil in Steering Gear</td>
<td>A-4</td>
<td>E33</td>
<td>0.3</td>
<td>None</td>
</tr>
<tr>
<td>78 38M1 N</td>
<td>Replace steering pump for leaks if leaks are found using code and inspect valve locations (Power assisted hydraulic systems only)</td>
<td><strong>2-04-1</strong></td>
<td><strong>E35</strong></td>
<td><strong>0.3</strong></td>
<td>None</td>
</tr>
<tr>
<td>78 3EX N</td>
<td>Replace, repair, or replace hydraulic steering system if leaks are found using code and inspect valve locations (Power assisted hydraulic systems only)</td>
<td><strong>2-04-1</strong></td>
<td><strong>E35</strong></td>
<td><strong>0.3</strong></td>
<td>None</td>
</tr>
<tr>
<td>78 58Y5 N</td>
<td>Inspect hydraulic lines for signs of leaking if leaks are found using code and inspect internal lines (Power assisted hydraulic systems only)</td>
<td><strong>4-04-1</strong></td>
<td><strong>E35</strong></td>
<td><strong>0.3</strong></td>
<td>None</td>
</tr>
<tr>
<td>78 50L7 N</td>
<td>Inspect Manual Hydraulic Steering System</td>
<td>B-1</td>
<td>M35</td>
<td>0.3</td>
<td>None</td>
</tr>
</tbody>
</table>

### Notes:
- **NOTE:** Accomplish this maintenance requirement when any of the following periodicities or situations occur:
  - Failure to operate.
- **NOTE:** Accomplish this maintenance requirement when any of the following occur:

---

5-14
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5.2.3.3 Schedules

PMS schedules are dynamic, meaning they automatically change according to ship evolutions, equipment status, situational events, and other maintenance requirements. PMS schedules are equipment-based and centered on the use and organization of Maintenance Items and Maintenance Groups.

5.2.3.3.1 SKED 3.1 Schedule

Maintenance is scheduled on cycle, quarterly, and weekly schedules.

**Cycle Schedule** - Displays the PMS requirements to be performed during the period between major overhauls.

![Cycle PMS Schedule](image)

Figure 5-7 The Cycle PMS Schedule
**Quarterly Schedule** - Displays each work center’s PMS requirements to be performed during a specific 3-month period.

![Quarterly PMS Schedule](image)

Figure 5-8 The Quarterly PMS Schedule
Weekly Schedule - Displays the planned maintenance scheduled for accomplishment in a work center during a specific week.

![Weekly Schedule Table](image)

Figure 5-9 The Weekly PMS Schedule
5.2.3.3.2 SKED 3.2 Schedule

SKED 3.2 uses a calculated scheduling interval by periodicity from the last scheduled instance of an MRC. This true interval scheduling maintains proper periodicity between scheduled maintenance tasks.

Scheduling rules revolve around a specific number of days. Weekly checks are performed every 7 days; monthly checks every 31 days; quarterly checks every 91 days; and so on. The same time intervals are maintained and future maintenance is automatically rescheduled based on the interval when a maintenance task is not performed when originally scheduled.

When Supervisors add or reschedule PMS, future occurrences of the check will adjust accordingly to maintain proper periodicity.

Supervisors are not allowed to manually reschedule checks that are out of periodicity. If maintenance is not performed, the check is moved to the next week on the schedule when the Work Center is closed out for the week. If a maintenance task goes out of periodicity, a PMS alert will be generated when a weekly closeout is performed. An automated workflow sends the PMS alert to the chain of command. At this time, the Work Center Supervisor shall provide a reason why maintenance was not performed on time.

Equipment-based schedules enable Work Center Supervisors to forecast man-hours, tools, parts, and test equipment.

Individual ships sometimes consider it desirable or necessary to shift maintenance responsibility from one Work Center to another. Transferring ownership of Work Center equipment will be performed electronically utilizing SKED 3.2, which allows the maintenance history to be maintained in the Work Center acquiring responsibility. In addition to the responsibilities outlined in Chapter 2.5, Work Center Supervisors will conduct the following:

1. Utilizing SKED 3.2, perform a revision to move the equipment from the original Work Center’s current schedule to the Work Center receiving the maintenance responsibility.
   a. Export the data.
   b. Save data to a disk.
   c. Upload data into receiving Work Center.
The Schedule display of SKED 3.2 (Figure 5-10) lists the maintenance tasks for a selected Work Center. This display provides the type of maintenance that must be performed, on which equipment the maintenance must be performed, personnel assigned to perform the maintenance, and the date the work is due to be accomplished.

![Schedule Display](image)

Figure 5-10 Schedule Display

5.2.3.4 PMS Feedback Report (FBR)-OPNAV 4790/7B

The PMS feedback report, shown in figure 5-11A and 5-11B, provides the command with an easy method of recommending changes to maintenance requirement cards, ordering MRCs that have been lost or mutilated, and notifying the systems commands of any discrepancies in coverage.

The FBR is a five-part form composed of an original and four copies. Instructions for preparing and submitting the form are printed on the back of the last copy as illustrated in figure 5-11B. You can obtain these forms through the Navy Supply System. For detailed instructions on 3-M procedures, refer to OPNAVINST 4790.4B.
Figure 5-11A OPNAV 4790/7B, PMS Feedback Report (FBR)
1. ORIGINATOR:
   
a. Typewritten copies are preferred, however handprinted copies are acceptable. Use ballpoint pen and ensure all copies are legible.

b. EQUIPMENT IDENTIFICATION: Fill in titled blocks that apply. Give as much information that can be determined. Ensure that current APL number is used for hull, mechanical or electrical equipment or electronic/weapon equipment which does not have an Army-Navy number or mark/mod designation.

c. DESCRIPTION OF PROBLEM: Check the appropriate box.
   
Category A

(1) MIP/MRC REPLACEMENT: Ensure that PMS documentation request is current in accordance with latest SFR. For missing MIPs/MRC's, give SYSCOM control numbers when they can be determined. If SYSCOM control numbers cannot be determined, provide as much nameplate data as can be obtained. When ordering a variety of missing/worn MIP's/MRC's, the subject section shall be left blank.

Category B

(2) TECHNICAL: (a) Identify specific discrepancy discovered in PMS by MRC control number, step number, etc.
   
(b) For publication discrepancies identify publication by number, volume, revision date/number, change number, page, paragraph and or figure as appropriate.
   
   THIS FORM WILL NOT BE USED TO ORDER PUBLICATIONS.

(3) TYCOM ASSISTANCE: Includes clarification of J-M instructions and other matters related to PMS administration.

(4) OTHER: Identify in detail any problem not covered by (1) through (3) above. Shifts of maintenance responsibility will be reported under this item. Ensure that all work centers involved in the change are identified by work center code. Approval by the Executive Officer will be shown in the "Remarks".

d. REMARKS: Provide brief, but complete, description of problem or requirement. Executive Officer indicate approval of maintenance responsibility shift by endorsement. Use additional forms if more space is required. Mark additional forms, "page 2 of 2", "page 2 of 3", etc. Staple additional forms behind basic form.

e. ORIGINATOR IDENTIFICATION: Sign and insert work center code in appropriate space.

2. DIVISION OFFICER: Review for accuracy and completeness and sign in the space provided.

3. DEPARTMENT HEAD: Review for accuracy and completeness and sign in the space provided.

4. J-M COORDINATOR:
   
a. Sign and date in the appropriate spaces.

b. Routing Instructions: For Category "A" FBR's forward the white and yellow copies to the appropriate NAVSEACEN and the pink copy to the TYCOM. For Category "B" FBR's forward the white, yellow and pink copies to the TYCOM. Retain blue copy in suspense file. Return green copy to the originator.
5.3 THE TECHNICAL LIBRARY

Now that we have discussed the paperwork needed to complete maintenance actions, we will look at the technical library that should be setup and maintained to provide technicians the technical documents they need to perform maintenance.

In the following paragraphs we will discuss various manuals and publication that will give you a good starting point for a technical library.

5.3.1 Naval Ship’s Technical Manual

The NSTM is a set of books (chapters) that contain general information on a variety of topics. You can find a complete listing of the NSTM chapters in chapter 001, General - NSTM Publications Index and User Guide. The chapters we have listed below are related to your job, both as a technician and as a member of a ship’s or station’s organization.

5.3.1.1 NSTM Chapter 79 - Practical Damage Control (DC)

This chapter provides broad guidance for establishing a DC organization. This guidance is designed to help organizations plan before damage occurs, spend a minimal amount of time localizing damage that does occur, and make emergency repairs or restoration as quickly as possible after damage occurs.

5.3.1.2 NSTM Chapter 300 – Electrical Plant

This chapter provides information and instructions on electrical equipment, electrical safety precautions, electrical insulation and insulation resistance, and maintenance reconditioning of electrical equipment. It provides the requirements we, as ETs, must meet in a shipboard safety program, including use and maintenance of organizational electrical and electronic equipment and personal electrical and electronic equipment.

5.3.1.3 NSTM Chapter 400 – Electronics

This chapter provides major policies and instructions pertaining to maintenance of electronic equipment and safety information aboard active and reserve ships.

5.3.1.4 NSTM – Chapter 555, Volume 1 - Surface Ship Firefighting

This volume provides guidance for firefighting equipment and procedures on surface ships.
5.3.1.5 NSTM Chapter 631 - Preservation of Ships in Service

This chapter provides instructions, requirements, and information for prevention of corrosion of ships, boats, and small craft. Topics include surface preparation, painting, and application of other preventive measures.

5.3.1.6 NSTM Chapter 634 – Deck Coverings

This chapter provides information concerning materials, installation procedures, maintenance and repair of deck coverings, gratings, sealing methods, and caulking compounds used for sealing deck seams.

5.3.1.7 NSTM Chapter 670, Volume 2 - Hazardous Materials Users Guide (HMUG)

Volume 2, the Hazardous Material User’s Guide (HMUG), provides material safety and health information to personnel responsible for using, storing, and handling chemicals grouped into the twenty HMUG groups. The groups are referenced by ship Maintenance Requirement Cards (MRCs) and contain information concerning general information, risk assessment, material storage and compatibility, control measures/Personnel Protective Equipment (PPE), safety precautions, health hazards, spill controls, and offload guidelines.

5.3.2 Electronics Installation and Maintenance Book (EIMB)

The EIMB is the medium for collecting, publishing, and distributing, in one convenient source, safety information, maintenance policies and philosophies, installation standards and practices, and overall electronic equipment and material-handling procedures required by Chapter 400 of the Naval Ships’ Technical Manual. The EIMB is organized into a 13-volume series of individual books.

5.3.2.1 EIMB General Handbook

This handbook provides data pertaining to administration, supply, publications, and safety matters, and contains the subject index for information contained in the other handbooks.

5.3.2.2 EIMB Installation Standards Handbook

This handbook issues approved standards, techniques, and practices for the installation of electronic equipment aboard ships.
5.3.2.3 EIMB Electronic Circuits Handbook

This handbook provides the theory of operation and circuit description of basic vacuum tube and semiconductor circuits.

5.3.2.4 EIMB Test Methods and Practices Handbook

This handbook provides technicians with reference information on the fundamentals of test methods and basic measurements, step-by-step procedures for testing typical electronic circuits and equipment, and fictional descriptions of the theory of operation of the test equipment used and circuits tested.

5.3.2.5 EIMB Reference Data Handbook

This handbook contains an encyclopedic presentation of useful and informative definitions, abbreviations, formulas, and other general data related to electronics installations and maintenance.

5.3.2.6 EIMB EMI Reduction Handbook

This handbook contains techniques and procedures for the elimination or reduction of electromagnetic interference created by own force’s electromagnetic radiating devices.

5.3.2.7 EIMB General Maintenance Handbook

This handbook contains routine maintenance concepts, techniques, and procedures common to all electronic and electrical equipment.

5.3.2.8 EIMB Equipment-Oriented Handbooks

For the basic equipment category, each of the six handbooks contains general servicing information; servicing information for specific equipments; a field change identification guide that provides field change information for all equipments of the basic equipment category; and functional descriptions common to the equipment of the basic equipment category. The six equipment-oriented handbooks are as follows:

1. Communications
2. Radar
3. Sonar
4. Test Equipment
5. Radiac
6. Countermeasures
Periodically, the equipment-oriented handbooks are updated by incorporating the *Engineering Information Bulletin* (EIB) articles. The EIMBs are an excellent source of basic information that can be used as a training tool for your work center. If space is available, you will benefit from having a complete set for your technical library.

### 5.3.3 Other Publications

There are many other useful publications throughout the fleet. However, because of the vast number, we will only describe a few in the following paragraphs.

#### 5.3.3.1 Miniature/Microminiature (2M) Electronic Repair Program

While this publication (three volumes under one cover) gives procedures and techniques, personnel must be formally trained and certified to make high-quality, reliable repairs to state-of-the-art electronic printed circuits and modules.

#### 5.3.3.2 Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety, Military Standard 1310 (NAVY)

The requirements of this standard apply to all new shipboard installations and to any part of an existing installation that is being modified. The procedures and methods specified in this standard apply to any situation that requires the technician to (1) bond, ground, insulate, or use nonmetallic materials to provide electromagnetic compatibility; (2) provide personnel safety from electrical shock hazards; (3) safeguard electrical transmissions of classified information; and (4) provide a dc reference ground. We recommend this publication as a MUST reading assignment for all Electronics Technicians.

#### 5.3.3.3 Electromagnetic Radiation Hazards (Hazards to Personnel, Fuel, and Other Flammable Material)

This manual prescribes operating procedures and precautions to prevent injury to personnel, ignition of volatile vapors, and premature initiation of electro-explosive devices in ordnance caused by exposure to environmental electromagnetic radiation.

**Volume I**
Hazards to Personnel, Fuel, and Other Flammable Material (U)

**Volume II**
Part I–Hazards to Unclassified Ordnance Systems (U)
Part II–Hazards to Classified Ordnance Systems (U)

Volume I and Volume II, Part One, are unclassified. All classified data are contained in Volume II, Part Two.

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UNCLASSIFIED
5.3.3.4 Installation Criteria for Shipboard Secure Electrical Information Processing Systems, Military Standard 1680 (SHIPS)

This standard sets forth the design and installation criteria that apply to shipboard secure electrical information processing systems, including detailed hardware and equipment requirements and the applicable inspection and reporting procedures and documentation. Installation and maintenance technicians of these processing systems MUST be well versed in the contents of this standard.

5.3.3.5 General-Purpose Electronic Test Equipment, Military Standard 1364 (Series) (NAVY)

This standard identifies standard General-purpose Electronic Test Equipment (GPETE), GPETE support items that are suitable for Navy use and for which the Naval Sea Systems Command exercises material support responsibility by management of item entry. This standard also establishes uniform procedures for submission of applications to procure nonstandard GPETE.

5.3.3.6 Military Specification Manuals, Technical: Functionally Oriented Maintenance Manuals (FOMM) for Electronic, Electromechanical, and Ordnance Equipment Systems, and Platforms, Military Specification MIL-M-24100C

This specification sets forth the content and format requirements for FOMMS, and their revisions and changes, necessary for the installation operation, repair (organizational-level, intermediate-level, and depot-level), and parts support of equipment, systems, and subsystems without the services of manufacturer’s representatives.

5.3.3.7 Procedures for Conducting a Shipboard Electromagnetic Interference (EMI) Survey (Surface Ships), Military Standard 1605 (SHIPS)

This standard provides detailed procedures for conducting an electromagnetic interference survey aboard surface ships.

5.3.3.8 Navy Electricity and Electronics Training Series (NEETS)

At present there are 24 NEETS modules. These modules contain a vast amount of information from an introduction to matter, energy, and direct current to an introduction to fiber optics.

The NEETS modules are high quality training aids as well as excellent review publications for basic electronics for all ETs.
5.3.4 Catalogs, Lists, Indexes, and Directories

The following paragraphs will discuss catalogs, lists, indexes and directories of electronic equipment.

5.3.4.1 Guide for User Maintenance of NAVSEA Technical Manuals

The maintenance of up-to-date technical manuals aboard your command is essential to the operational readiness of the command systems and equipment. This guide will be an important part of the technical library.

5.3.4.2 Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding electrically initiated explosive devices) (METRIC), Military Handbook 263A

This handbook provides guidance, not requirements, for the establishment and implementation of an Electrostatic Discharge (ESD) Control Program according to the requirements of MIL-STD-1686. This document applies to the protection of electrical and electronic parts, assemblies and equipment from damage due to ESD. It does not provide information for the protection of electrically initiated explosive devices.

5.3.4.3 Metrology Automated System for Uniform Recall and Reporting (MEASURE) User’s Manual

This manual outlines the procedures that apply to Navy calibration facilities using the system, ship and shore activities obtaining services from them, and other military activities whose use of MEASURE is in effect.

5.3.5 Technical Data Management Information System (TDMIS)

The Technical Data Management Information System (TDMIS) is a Department of the Navy (DoN) database used to manage and track the life-cycle history of technical manuals (TMs). TDMIS currently contains technical manuals from Naval Sea Systems Command (NAVSEASYSCOM), Space and Naval Warfare Systems Command (SPAWARSYSCOM) and Naval Air Systems Command (NAVAIRSYSCOM) Air Traffic Control and Landing System (ATC&LS).
6 LOGISTICS

6.1 INTRODUCTION

As an Electronics Technician, you will definitely be involved with the supply department in getting the exact items you need to complete your tasks. To work effectively and smoothly with the supply department, you must understand how to use the supply system. This chapter should help you understand the overall operation of the system.

6.2 NAVAL SUPPLY SYSTEMS COMMAND

The Naval Supply Systems Command (NAVSUPSYSCOM) controls the procurement of materials and services throughout the Department of the Navy. It combines into one overall system inventory managers, distribution activities, and other activities that are responsible for providing responsive and efficient material support to the operating forces of the Navy.

6.2.1 Inventory Managers

Navy inventory managers have the primary responsibility for managing assigned groups or categories of items of supply. The primary function of an inventory manager is to balance parts required and parts available so that Navy fleet and shore activities receive effective and efficient support. Navy inventory managers include systems commands, project managers, bureaus, offices (including Military Sealift Command), and inventory control points (ICPs) under the command of NAVSUPSYSCOM.

6.2.2 Inventory Control Points (ICPs)

Each ICP manages one or more types of material held at stock points in a distribution system. The ICPs position materials at stock points, maintain inventory control through an extensive stock reporting system, and provide technical assistance and cataloging services to the supply system and its customers.

6.2.3 Stock Points

Stock points are large facilities, such as supply centers and depots, that stock parts and assemblies for shipment to requesting commands.
6.2.3.1 Supply Centers and Depots

Naval supply centers (NSCs) and depots are command organizations that furnish supply support to fleet units and shore activities. These stock points are primarily concerned with procuring, receiving, storing, issuing, and shipping material. Fleet and shore activities send requisitions to the stock points; which, in turn, ship the material and bill the unit for payment. The stock points inform the ICPs of material shipped so the ICPs can track the inventory level and determine when to buy additional material. Stock points stock Navy, Defense Logistics Agency, and General Service Administration cognizance material for issue to supported units.

Supply centers and depots perform similar functions, but at different levels. Supply centers are managed by the Naval Supply Systems Command and support supply depots and other activities that perform depot functions. Supply depots are commanded by a fleet command and normally support only local commands.

6.2.3.2 Industrial Naval Air Stations (INASs)

The INASs are primary Navy stock points for aviation material. These stock points are collocated with Naval Aviation Depots (NADEPs) and function as storage and shipment points of aviation cognizance material. The INASs report transactions of aviation material to the cognizant ICP.

6.2.4 Mobile Logistics Support Force (MLSF)

The purpose of the MLSF is to release deployed fleet units from direct dependence on shore bases for supply support. To do this, the MLSF stocks militarily essential items in high demand by deployed fleet units. The materials carried by MLSF ships are listed in the Consolidated Afloat Requisitioning Guide Overseas (CARGO), NAVSUPP-4998-A (Atlantic) and P-4990-P (Pacific).

6.2.5 General Services Administration (GSA)

The General Services Administration controls items of material that are common to both military and civilian worlds. Examples of GSA items are paint, paper, hand tools, chalkboards, movie projectors, and the like. GSA items are stocked at the naval supply centers located in Norfolk Virginia; and San Diego, California.

6.2.6 Defense Logistics Agency (DLA)

The Defense Logistics Agency controls items of material that are common to all the military services but not to the civilian world. Examples of DLA items are fuels and bullets. DLA items are also stocked at the Norfolk and San Diego naval supply centers.
6.3 INTEGRATED NAVY SUPPLY SYSTEM

The Navy supply system is an integrated system, allowing materials to be obtained usually from more than one point in the system. In the remainder of this chapter, we will discuss the Navy supply system in general, introduce the primary instructions and forms, and provide a brief description of how to use the system to get parts and supplies.

The following is a description of how the integrated Navy Supply System might react to a typical supply requisition:

1. USS Ship requisitions cognizance symbol 9N material from the NSC.

2. The NSC, a Navy retail stock point, usually ships the requested material. However, after screening its stocks, the NSC determines that the requested material is not carried. It then refers the requisition to the Defense Electronics Supply Center (DESC), Dayton, the cognizant inventory manager.

3. The DESC, Dayton, after researching its master records and determining that the material is available at NSC Oakland (a specialized support point), refers the requisition to NSC, Oakland.

4. The NSC, Oakland, issues the material to USS ship.

5. The NSC, Oakland, then makes an issue transaction report to DESC, Dayton.

6. The DESC, Dayton, after applying the issue report to its master record, learns that stock of the item at NSC, Oakland, is below the required level and issues a contract to the ABC Corporation for additional stocks of the item.

7. The ABC Corporation ships the material to NSC, Oakland.

8. The NSC, Oakland, makes a receipt transaction report to DESC, Dayton.

As you can see, if an item is not available at the local NSC, the requisition does some traveling. So it may take a little time to get the item you requested.
6.3.1 Coordinated Shipboard/Shorebased Allowance List (COSAL/COSBAL)

The COSAL/COSBAL is the document that drives the operational and supply support for a ship. It is a dynamic document that changes constantly, as the ship’s configuration changes. Each ship in the U.S. Navy has its own COSAL or COSBAL tailored specifically to its mission. The COSAL or COSBAL lists include the following:

- The equipment or components required for the unit to perform its operational assignments
- The repair parts and special tool required for the operation, overhaul, and repair of those equipments
- The miscellaneous portable items necessary for the care and upkeep of the unit

The COSAL/COSBAL is both a technical document and a supply document. It provides nomenclature, operating characteristics, specifications, parts list, and other technical data pertaining to all installed equipment and machinery. It also provides nomenclature and characteristics of the equipage and tools required to operate and maintain the unit and its equipment.

The COSAL recommends which items should be stocked by the supply department or held in the custody of other departments to support the equipment known to be installed on the ship and is in printed form. The computerized SNAP database contains information in the COSAL (plus certain additional information) and may be accessed through the SNAP Ported Systems, Supply and Financial Management (SFM), Maintenance Data Subsystem (MDS), Integrated Logistic Subsystem Modules, SNAP Optimized Organizational Maintenance Management System-Next Generation (OMMS-NG) or the Relational Supply Systems (R Supply).

No one can predict exactly when a circuit card in an AN/URT-23 will fail or when a bearing will wear out in a freshwater pump. However, the COSAL/COSBAL can help maintenance and supply personnel in a unit to make an educated guess. The COSAL/COSBAL computers analyze the frequency of failures of parts used aboard units and, based on these analyses, develop an allowance of repair parts that the supply officer should stock.

The COSAL/COSBAL is used primarily for two purposes-to identify repair parts (storeroom items) and to determine operating space allowances (equipage).
6.3.1.1 Description of COSAL Parts and Sections

Since the COSAL and COSBAL are similar, we will describe just the COSAL parts and sections. Certain aviation components (aviation supply offices [ASOs]) will also be included in the COSAL when specifically designated. For more information and complete instructions in the use of the COSAL, we recommend that you read the COSAL Use and Maintenance Manual, SPCCINST 4441.170. You can view the COSAL in OMMS-NG.

Each COSAL publication is produced in three parts. Part I contains indexes. Part II contains associated APLs and AELs. Part III contains allowances and cross-reference data. The three parts are subdivided as follows:

**Part I**
Summary of Effective Allowance Parts/Equipage Lists (SOEAPL)
Index - Section A (Equipment Nomenclature Sequence)
Index - Sections B, C, D, and E

**Part II**
Section A - Allowance Parts Lists (APLs)
Section B - Circuit Symbol Data
Section C - Allowance Equipage Lists (AEL)

**Part III**
Section A - Storeroom Items (SRI)
   Stock Number Sequence List (SNSL)
Section B - Operating Space Items (OSI)
   Stock Number Sequence List (SNSL)
Section CF - Maintenance Assistance Module (MAM)
Section CR - Ready Service Spares (RSS)
Section D - Alternate Number Cross-Reference to Stock Number
Section E - General Use Consumables List (GUCL)
Section F - Forms and Publications

The following paragraphs provide a brief description of the parts of the COSAL listed above:
PART I - SUMMARY - The Summary of Effective Allowance Parts/Equipage Lists (SOEAPL) is a numerical listing of all APLs and AELs used to determine how many of each part is listed on the stock number sequence list (SNSL). Figure 6-1 is an example of a summary page, with a description of the information it contains.

![Figure 6-1 Summary of effective allowance parts/equipage lists (SOEAPL)](image)

PART I - COSAL INDEX - The Index identifies the APLs and AELs associated with the ship’s equipment. It also provides other information, such as the code of the work center responsible for the maintenance and various maintenance-related codes. The index is published in five parts; sections A through E. Sections A and B provide a cross-index of all APL/AELs listed in Part II. They contain the same information, but in two slightly different formats. Figure 6-2 shows both the A and B indexes. All areas of information are in the same relative positions, except that column 8 in Section A listings shifts over to become column 1 in section B listings.

The bulk of the information you will need to repair an item covered by COSAL is contained on the appropriate APL or AEL. To identify the appropriate APL or AEL, you will need to look up either the name of the equipment in Section A or the use of that equipment in Section B.

Table 6-1 describes the uses of the Index columns and is keyed to the numbers shown in figure 6-2.
### COSAL INDEX — PART I (SECTION A)

<table>
<thead>
<tr>
<th>Equipment/Component</th>
<th>Identification No.</th>
<th>Service Application/Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>NV-AR-CGT-3</td>
<td>543790080</td>
<td>ECPAA RADIO</td>
</tr>
<tr>
<td>NV-AR-PIP-1A</td>
<td>564803881</td>
<td>ECPAA IC PUBLIC ADDRESS SET</td>
</tr>
<tr>
<td>V-AR-SRC-21</td>
<td>571121189</td>
<td>ECPAA RADIO</td>
</tr>
<tr>
<td>V-AR-URC-32</td>
<td>564421080</td>
<td>ECPAA RADIO</td>
</tr>
<tr>
<td>V TRANSMITTER, Course Order MXA2/80</td>
<td>49481665</td>
<td>ECPAA FCS TRANSMITTER</td>
</tr>
</tbody>
</table>

### COSAL INDEX — PART I (SECTION B)

<table>
<thead>
<tr>
<th>Equipment/Component</th>
<th>Identification No.</th>
<th>Service Application/Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN/SLG-32 ELECTRONICS COUNTERMEASURES SYSTEM XMM1081</td>
<td>569403601</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AN/SLG-32(E2), COUNTERMEASURES SET</td>
<td>59925064</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3116/SLO-12(V), ANTENNA ASSY.</td>
<td>59925065</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3117(SLO-12)</td>
<td>59925066</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3118/SLO-12(V), ANTENNA</td>
<td>59925067</td>
<td>ECPAA</td>
</tr>
<tr>
<td>CP-1375/SLO-12(V), PROCESSOR, SIGNAL DATA</td>
<td>624065309</td>
<td>ECPAA</td>
</tr>
<tr>
<td>CP-1375/SLO-12(E), PROCESSOR, SIGNAL DATA</td>
<td>624065311</td>
<td>ECPAA</td>
</tr>
</tbody>
</table>

### COSAL INDEX — PART I (SECTION C)

<table>
<thead>
<tr>
<th>Equipment/Component</th>
<th>Identification No.</th>
<th>Service Application/Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN/SPS-49 RADAR SYSTEM</td>
<td>920191205</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AN/SPS-49(V) FCS P/O OR-2/SPS-49(V)</td>
<td>57941230E1</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AN/SPS-49(V) RADAR SET</td>
<td>57941230E2</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E3</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E4</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E5</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E6</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E7</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E8</td>
<td>ECPAA</td>
</tr>
<tr>
<td>AS-3252(SPS-49(V), ANTENNA</td>
<td>57941230E9</td>
<td>ECPAA</td>
</tr>
</tbody>
</table>

---

**Figure 6-2 COSAL indexes**

6-7

UNCLASSIFIED
Table 6-1 Description of Contents of Columns of COSAL Index

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equipment/Component Military Essentiaity Code</td>
<td>Indicates those items of equipment that are essential to the ship’s mission. V - Vital. Failure of the equipment could reduce the ship’s capability to perform its mission. NV – Non-vital. Failure of the equipment would not adversely affect the ship’s mission.</td>
</tr>
<tr>
<td>2</td>
<td>Equipment/Component/Equippage Nomenclature/Characteristics</td>
<td>The noun name and partial characteristic description of each APL and AEL.</td>
</tr>
<tr>
<td>3</td>
<td>Identification Number</td>
<td>The APL or AEL identification number.</td>
</tr>
<tr>
<td>4</td>
<td>Quantity</td>
<td>The quantity of each equipment/component per service aboard ship, covered by the applicable APL. Column 4 will be blank for all AELs.</td>
</tr>
<tr>
<td>5</td>
<td>Column Number</td>
<td>The applicable AEL column number from which the allowance is determined. This column is blank for all APLs.</td>
</tr>
<tr>
<td>6</td>
<td>Notes</td>
<td>A code that indicates specific information about an APL/AEL entry. These codes are listed and defined in the Introduction.</td>
</tr>
<tr>
<td>7</td>
<td>Allowance Support Code</td>
<td>Reserved for future use. (See item 11.)</td>
</tr>
<tr>
<td>8</td>
<td>Service Application/Information</td>
<td>The service or major shipboard function in which the equipment/component/equipage operates or performs a service.</td>
</tr>
<tr>
<td>9</td>
<td>Ship Type and Hull Number</td>
<td>The specific ship for which the COSAL is prepared.</td>
</tr>
<tr>
<td>10</td>
<td>Date</td>
<td>Date of preparation (may be expressed as Julian or month-day-year date).</td>
</tr>
<tr>
<td>11</td>
<td>Allowance Support Codes</td>
<td>Pertains to item 7.</td>
</tr>
<tr>
<td>12</td>
<td>Page</td>
<td>Consecutive page numbering from first page to last. Page numbers preceded by “H” apply to Hull, Mechanical and Electrical (Example H-1). Page numbers preceded by “Z” apply to Ordnance (Example Z-1).</td>
</tr>
</tbody>
</table>

*Refer to Figure 6-2
PART II, SECTION A - ALLOWANCE PARTS LIST (APL) - An APL (fig. 6-3) is a technical document that lists the repair parts authorized to be kept on board a ship for a particular piece of equipment. Separate APLs are prepared for each different piece of equipment on board a ship and for each major component of the equipment. APLs are listed in numerical sequence by identification number in Part II of the COSAL.

The parts data contained in each APL is arranged in alphanumeric order by part reference or symbol number. This part number is a number, other than a stock number, by which the part may be identified. Examples of such a number are a manufacturer’s number, a drawing or circuit symbol a service part number, and number. In table 6-2, the different data elements are numbered and refer to the numbers in figure 6-3.

Figure 6-3 Allowance parts list (APL)
Table 6-2 Data Elements of the APL

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Equipment/Component Nomenclature/Characteristics</td>
<td>Name of equipment or component and brief description. This corresponds to the Index entries.</td>
</tr>
<tr>
<td>2. Technical Document Number</td>
<td>The predominant technical manual or plan number. Additional numbers shown in item 8.</td>
</tr>
<tr>
<td>3. Identification Number</td>
<td>Identifying number assigned to a particular item or component of equipment. This number is shown at top and bottom of page.</td>
</tr>
<tr>
<td>4. Date</td>
<td>COSAL publication date.</td>
</tr>
<tr>
<td>5. Page</td>
<td>Consecutive numbering of all pages required to describe one equipment/component which is identified by a single APL number. This is shown at both top and bottom of page. APLs have the word “END” printed in the center of the page immediately following the last line of data for that APL. This enables you to ensure that you have a complete APL.</td>
</tr>
<tr>
<td>6. Characteristics</td>
<td>Complete nameplate data on the equipment/component named in item 1.</td>
</tr>
<tr>
<td>7. Reference/Symbol Number</td>
<td>A number, other than an NSN, by which a part may be identified, arranged in alpha/numeric sequence. It may be a manufacturer’s part, drawing, piece, or circuit symbol number.</td>
</tr>
<tr>
<td>8. Additional Date Area</td>
<td>When additional technical manuals or plans are applicable, they are listed in this area under an appropriate caption. These are in addition to those listed in items 2 and 6.</td>
</tr>
<tr>
<td>9. Item Name</td>
<td>The name listing of repair parts and/or related accessory components for the equipment/component covered by the APL.</td>
</tr>
<tr>
<td>10. Stock Number</td>
<td>The NSN assigned to a specific repair part. When an NSN has not been assigned, the reference number from item 7 is repeated.</td>
</tr>
<tr>
<td>11. Accessory Components</td>
<td>Accessory components applicable to a “Parent Equipment” are listed on the “Parent APL”. Any additional accessory components not listed on the APL should be reported to SPCC.</td>
</tr>
<tr>
<td>12. Federal Supply Code for Manufacturers (FSCM)</td>
<td>Indicates a coded number of a manufacturer.</td>
</tr>
<tr>
<td>13. Part Military Essential Code (Part MEC)</td>
<td>There are two codes. They are shown on the APL and the SNSL. 1 - Failure of the part would have a major effect on the dependence/operation of the component. 3 - Failure would have little effect on the dependence/operation of the component.</td>
</tr>
<tr>
<td>14. Source Code</td>
<td>Indicates the availability of repair parts and method of procurement. These codes are defined in the introduction</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15. Maintenance Code</td>
<td>A three digit code signifying the maintenance activity authorized to replace, repair, and condemn an item. Only first digit now used. These codes are defined in the introduction.</td>
</tr>
<tr>
<td>16. Recovery Condemnation Code</td>
<td>Indicates the recoverability characteristics of items removed during maintenance. R - Repairable S - Salvageable C - Consumable</td>
</tr>
<tr>
<td>17. Notes Code</td>
<td>Provides necessary and important information about individual items listed on the APL. The introduction lists and defines these codes.</td>
</tr>
<tr>
<td>18. Quantity in One Equipment/Component</td>
<td>The total population of the part within the equipment/component described by the APL.</td>
</tr>
<tr>
<td>19. Unit of Issue</td>
<td>The term connotes the physical measurement or count of quantities of an item for procurement, storage, and issue.</td>
</tr>
<tr>
<td>20. Allowance Item Code</td>
<td>Refer to part III to determine applicable allowances.</td>
</tr>
<tr>
<td>21. On-Board Allowance Table</td>
<td>APLs published as part of an allowance list for shipboard use and contained in Part II of the COSAL will not have quantities printed in the onboard allowance table columns. Instead, “SEE SNSL FOR ALLOW” will be printed. APLs which are received after regular COSAL will have quantities shown so you can update you SNSL and stock record cards.</td>
</tr>
<tr>
<td>22. Ship Type and Hull Number</td>
<td>The specific ship/activity for which the APL is published.</td>
</tr>
<tr>
<td>23. Page</td>
<td>Consecutive page numbering from the first page to last of all pages published as Part II.</td>
</tr>
<tr>
<td>24. Identification Number</td>
<td>Same as item 3 above.</td>
</tr>
<tr>
<td>25. Date</td>
<td>Same as item 4 above.</td>
</tr>
<tr>
<td>26. Page</td>
<td>Same as item 5 above.</td>
</tr>
</tbody>
</table>

*Refer to Figure 6-3.*
PART II, SECTION B - CIRCUIT SYMBOL DATA - Section B (fig. 6-4) is furnished as microfiche with the COSAL. It contains those CSNs that appear in the technical manual for the equipment and is arranged in circuit symbol number (CSN) sequence. The CSNs are cross referenced to the NIIN/PNICN/TNICN part number that appears in Section A. Table 6-3 identifies the data elements of the APL (Part II, Section B) and refers to the numbers in figure 6-4.
Table 6-3 Data Elements of the APL, Section B

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Unit</td>
</tr>
<tr>
<td></td>
<td>The Unit Number assigned by the manufacturer. (Part of the CSN).</td>
</tr>
<tr>
<td>2.</td>
<td>CSN</td>
</tr>
<tr>
<td></td>
<td>Circuit Symbol Number which is obtained from the equipment technical manual or drawings. (Also known as the Reference Symbol Number.) When APLs</td>
</tr>
<tr>
<td></td>
<td>are in Part Number sequence, the Part Number will appear in this space.</td>
</tr>
<tr>
<td>3.</td>
<td>Notes</td>
</tr>
<tr>
<td></td>
<td>For Codes and Definitions see Appendix (C).</td>
</tr>
<tr>
<td>4.</td>
<td>FSCM - REF#/ ACN/NIIN</td>
</tr>
<tr>
<td></td>
<td>The FSCM and reference number, ACN or NIIN which applies to this CSN.</td>
</tr>
<tr>
<td>5.</td>
<td>SMR</td>
</tr>
<tr>
<td></td>
<td>Source and Maintenance Recoverability Code which applies to this application. (see Appendix C for definition).</td>
</tr>
<tr>
<td>6.</td>
<td>APPL</td>
</tr>
<tr>
<td></td>
<td>Number of applications with the same CSN.</td>
</tr>
<tr>
<td>7.</td>
<td>ADD</td>
</tr>
<tr>
<td></td>
<td>An addendum indicator showing how this item was affected by cumulative addenda issued by SPCC. for this APL, (i.e., A = Added, D = Deleted, C = Changed, F = NIIN update, * = this item is appearing for the first time in this addendum. When the APL is revised, no addendum indicators appear.</td>
</tr>
<tr>
<td>8.</td>
<td>Nomenclature</td>
</tr>
<tr>
<td></td>
<td>The equipment for which the APL is prepared.</td>
</tr>
<tr>
<td>9.</td>
<td>APL Number</td>
</tr>
<tr>
<td></td>
<td>The equipment/component identification number.</td>
</tr>
</tbody>
</table>

**HOW TO USE SECTION B**

Determine the NIIN (FIIN) ACN or Part Number from Section B, referring to the Reference Symbol Number on Part II, Section A or C (whichever is applicable). The Reference Symbol Number is crossed to the stock number column which will reflect the latest NSN or ACN. Refer to the applicable section of the COSAL Part III to determine if the item is allowed.

*Refer to Figure 6-4.
PART II, SECTION C - ALLOWANCE EQUIPAGE LIST (AEL) - The AEL is a technical and supply document prepared for various categories of equipage associated with mechanical, electrical, electronic, and ordnance systems. When an AEL is written for a system, it identifies the items required to operate the system and the repair parts required to maintain it. The AEL lists specific information for each item, such as name, NSN, unit of issue, quantity needed, and quantity allowed on board. AELs are filed in numerical sequence by AEL identification number. As a technician, you should be aware of where all pertinent AELs can be found.

PART III, SECTIONS A, B, CF, AND CR - STOCK NUMBER SEQUENCE LISTS (SNSL) - The SNSL is a product of today’s data processing capability and is a great timesaver in controlling parts and other items. Consider the amount of work that would be necessary to determine how many of what items to order by just using the APL and AELs. The SNSL has four listings of all NSNs that apply to your unit. They are Section A, Storeroom Items (SRIs); Section B, Operating Space Items (OSIs); and Section CF, Maintenance Assistance Module (MAM); and Section CR, Ready Service Spares (RSS). These sections contain information such as stock number, item name, identification of the equipment in or on which the item is intended for use, and specific supply management information.

PART III, SECTION E-GENERAL USE CONSUMABLES LIST (GUCL) - The GUCL identifies consumables used for general purposes in the routine maintenance and administration of the ship. The items listed in the GUCL are in addition to materials listed in other parts of the ship’s COSAL. The GUCL is published by the Fleet Material Support Office (FMSO), but only for new construction, major conversion, or reactivated units. Normally, it will not be published with or for COSALs resulting from ship overhaul or maintenance actions.

The GUCL contains basic information, such as nomenclature, NSN, unit of issue, weight, and price for both hazardous and nonhazardous materials kept or used in operating spaces and store rooms.

PART III, SECTION F-FORMS AND PUBLICATIONS - Section F identifies the various forms and publications the ship needs to conduct normal business and provides information on how to obtain them.
6.3.1.2 How to Use the COSAL

Once you become familiar with the indexes, you will find the COSAL easy to use. The best way to gain this familiarity is by studying the COSAL for your command. Read the entries in both the Part I, Section A and B indexes, then see how they provide across-index by using the same entries but in a different sequence. As you study the entries, refer to the introduction for the meanings of abbreviations that you do not understand.

Chapter 4 of the COSAL Use and Maintenance Manual provides instructions for using the COSAL. After you have become familiar with the terminology (chapters 1 through 3), refer to chapter 4 for further instructions and sample problems.

To be of maximum use to you, the COSAL must be kept up-to-date at all times. Anytime you use the COSAL, check to be sure it is up-to-date. In the following paragraphs we will discuss the use of the COSAL according to SPCCINST 4441.170, the COSAL Use and Maintenance Manual.

6.3.1.2.1 Methods of Entry

You may enter the COSAL by any of the following methods:

- By the name of the equipment/component or equipage—use Part I, Section A of the Index
- By the shipboard service application, location, or end use of the equipment/component or equipage - use Part I, Section B of the Index
- By the circuit symbol number (CSN) of the part—use Part II, Section B (microfiche only) to cross-reference the CSN to the NINN/PNICN/TNICN/FSCM/REF. NO. Then use Part II, Section A, to cross-reference the above number to the NSN/PNICN/TNICN
- By the NIIN/part number—use Part III, Section A or B
- By an alternate part number—use Part III, Section D to cross reference alternate numbers to NIIN/PNICN/TNICNs
6.3.2 Organizational Maintenance Management System-Next Generation (OMMS-NG)

Provides Navy maintenance personnel with quick, convenient access to the maintenance information they need to ensure warship readiness. Such information includes information concerning configuration items, work candidates, and ordering parts for equipment.

OMMS-NG tracking assists shipboard personnel in the planning, scheduling, and reporting of maintenance and related logistics support actions. This application interfaces with other applications in the NTCSS suite including R-Supply. It also interfaces with shore activities that need ship and sub configuration, maintenance, and logistics information.

OMMS-NG increases a ship's availability for fleet operations, standardizes surface ship maintenance practices, levels loading of repair activities, and reduces cyclic costs of repairs, ensuring combat readiness.

OMMS-NG provides access to maintenance information needed to ensure ship readiness. It contains information on configuration items, work candidates (formerly 2-Kilos) and ordering parts for equipment.

6.3.3 SNAP

The system for SNAP Automated Shore Interface (ASI) provides a set of procedures for the automated exchange of configuration and logistics data between ship and shore to ensure data integrity between the ship's database and the CDMD-OA database/WSF. Through the ASI process, equipment configuration updates, Allowance Parts List (APL) supersessions/cancellations, pen and ink changes, allowance updates, and other logistics changes are provided electronically to update an automated ship's files. The ASI process is currently used on SNAP Optimized ships (both UNIT and FORCE) equipped with the Organizational Maintenance Management System-Next Generation (OMMS-NG)/Relational Supply (R-Supply), Ported (Legacy) SNAP ships and Micro-SNAP sites.

6.3.4 Ordering Parts, Tools, and Supplies

There are numerous supply publications that you should be familiar with to use the supply system to its full capability when you requisition parts and tools. These publications are discussed in Military Requirements for Petty Officers Third and Second Class,NAVEDTRA 14504.
Although the supply department is responsible for supplies, you, the technician, need to know how to identify what is needed, how to write out the request, and how to report on the use of the supplies. As a Divisional Repair Parts Petty Officer (RPPO), you may be required to access R-SUPPLY for ordering and tracking various parts and consumables. The publications containing the stock numbers are kept in the supply department; therefore, to perform your assigned duties, you must cooperate with supply personnel.

6.3.5 Supply Requisition Forms

Documenting material usage and cost data on maintenance transactions requires a joint effort of the ship’s supply and maintenance personnel. NAVSUP Form 1250-1 and DD Form 1348 (discussed in Chapter 7 of Military Requirements for Petty Officers Third and Second Class and OPNAVINST 4790.4) are the primary supply documents used by maintenance personnel. They are used to requisition parts and materials and to record material usage and cost data in support of maintenance actions. Normally, maintenance personnel are responsible for filling out and forwarding the supply forms for materials that they need to do their jobs. However, supply personnel will provide assistance whenever difficult or unusual documentation problems arise.

On an automated ship, when a repair part is required to complete a specific maintenance action, maintenance personnel use DD Form 1348. Chargeable services are also requisitioned on the DD Form 1348.

NAVSUP Form 1250-1 (fig. 6-5) is used as a consumption document by all forces and as a MILSTRIP requisitioning/issuing document by non-automated ships of the submarine forces. The form is used primarily for procuring materials or services. Submarine tenders or bases also use the form as an invoice for materials supplied to supported units of the fleet. NAVSUP Form 1250-1 was developed to meet two needs: (1) to improve inventory control procedures and (2) to report consumption under the maintenance data system (MDS). Prepare NAVSUP Form 1250-1 according to the following general instructions:

1. Use a ballpoint pen or typewriter.
2. Annotate each entry in the proper data block.
3. To avoid confusion between the numeric 0 and the alphabetic O, use the communication Ø for zeroes.

For non-NSN requirements, the Non-NSN Requisition form (NAVSUP Form 1250-2) consolidates the information previously submitted on two forms (NAVSUP Form 1250-1 and DD Form 1348-6). Distribution and preparation procedures for this seven-part form (fig. 6-6) are identical to those for NAVSUP Form 1250-1. Additional information on this form can be found in NAVSUP P-485.
Figure 6-5 Single Line Item Consumption/Requisition Document (Manual), NAVSUP Form 1250-1
Figure 6-6 Non-NSN Requisition, NAVSUP Form 1250-2
6.3.6 Military Standard Requisitioning and Issue Procedures (MILSTRIP)

The DD Form 1348 (fig. 6-7), DOD Single Line Item Requisition System Document, designed to meet MILSTRIP requirements, is discussed in Military Requirements for Petty Officers Third and Second Class, NAVEDTRA 14504. You will be using DD Form 1348s and your ready reference list of codes (NAVSUP Publication 409) as you order the items you need.

Figure 6-7 DD Form 1348; Upper-manual. Lower-mechanical
Here are a few reminders as you use the forms: Prepare the DD Form 1348 by typewriter or ballpoint pen. Do not use pencil because pencil marks can cause errors when the requisition is processed through mark-sensing equipment at shore activities. In preparing requisitions, you do not need to space the entries within the tic marks printed on the forms, but you must make the entries within the proper data blocks. Remember to use the communication symbol to indicate zero on MILSTRIP requisitions.

The DD Form 1348 requires the same information as the NAVSUP Form 1250 but in a different order.

Most material requirements are requisitioned on DD Form 1348. However, certain items are excluded from MILSTRIP and are ordered on DD Form 1149 figure 6-8, included here for your review) unless otherwise indicated.

Figure 6-8 Requisition and Invoice/Shipping Document, DD Form 1149
6.3.7 SERVMART

A SERVMART is a self-service store operated by a shore supply activity and is stocked with items frequently required by most departments. Most SERVMARTs prepare a shopping guide that lists the items carried in the SERVMART. Also, most SERVMARTs provide a shopping list on which you can write the names of items you want.

The use of standard forms such as a DD 1149 may be required at certain supply activities, while at others no listing of items is required.

If a DD form 1348 is required, make up your shopping list; then prepare the DD Form 1348. The money value limit for the shopping list and the authorized signature are entered in the “Remarks” portion of the requisition. The money limit shown is equal to the total amount of the supporting shopping list, plus an additional 10 percent to allow for price variations. Figure 6-9 shows a sample shopping list and an MVO (money-value-only) requisition.

At some SERVMARTs “credit cards” are used. These cards are issued to activities frequently using the SERVMART and satisfy the same requirement as the DD Form 1348, thereby eliminating the need for this MVO requisition.
### Figure 6-9 SERVMART shopping list and covering DD Form 1348

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit Price</th>
<th>Extension</th>
<th>Req No</th>
<th>Fund Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BOOK, RECORD</td>
<td>EA 1 50</td>
<td>9 00</td>
<td>00-222-3525</td>
<td>52192</td>
</tr>
<tr>
<td>2</td>
<td>PAPER, CARBON, 8 x 11</td>
<td>BT 2 00</td>
<td>4 00</td>
<td>00-281-3685</td>
<td>42171</td>
</tr>
<tr>
<td>3</td>
<td>PAPER, BOND, 8 x 13</td>
<td>RM 1 87</td>
<td>1 87</td>
<td>00-290-0598</td>
<td>33649</td>
</tr>
<tr>
<td>4</td>
<td>ERASER</td>
<td>EA 5 05</td>
<td>5 05</td>
<td>00-370-0606</td>
<td>1348</td>
</tr>
</tbody>
</table>

**TOTAL COST LIMITATION**: 116.76

**NAME and RANK of Authorized Shopper**: LT 1 L. GARNER, SC, USN

**SIGNATURE AND RANK**: 

**FUND**: NAV 組織form 1348

**UNCLASSIFIED**
6.3.8 Master Repairable Item List (MRIL)

The Navy’s Master Repairable Item List (MRIL) is provided to identify Navy-managed mandatory turn-in repairable items. It also provides shipping instructions for unserviceable repairables that must be turned in to a designated repair facility.

The MRIL (figure 6-10) consists of two basic parts:

Part I - Listing of Items

Part II - Shipping Addresses

Part I lists all repairables that are no longer serviceable and gives disposition instructions. Usually, unserviceable components are shipped to a designated repair facility or collection point. The repairables are listed in sequence by the last 9 characters of their 13-character NSN or NICN. Part I also lists the shipping code of the activity to which an unserviceable repairable must be shipped.

Part II lists the shipping addresses of designated repair activities (military and civilian contractors) and collection points to which the repairables are to be sent.

As a work center supervisor or division supply petty officer, you must cooperate with the supply department by returning replaced parts. By doing that, you will help the fleet use assets more efficiently.
<table>
<thead>
<tr>
<th>PART I - LISTING OF ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LONG SUPPLY IND.</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>L S</td>
</tr>
<tr>
<td>S R</td>
</tr>
<tr>
<td>I C</td>
</tr>
<tr>
<td>* Y</td>
</tr>
<tr>
<td>Y 2R H</td>
</tr>
<tr>
<td>Y 2R H</td>
</tr>
<tr>
<td>Y 2R H</td>
</tr>
<tr>
<td>* 2R H</td>
</tr>
<tr>
<td>7H H</td>
</tr>
<tr>
<td>6A Q</td>
</tr>
<tr>
<td>Y 7H E</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART II - SHIPPING ADDRESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHIPPING CODE</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>C44100</td>
</tr>
</tbody>
</table>

Figure 6-10 Master Repairable Item List (MRIL), Parts 1 and 2
6.3.9 Mandatory Turn-In Items

You should already be familiar with the basic description of the mandatory turn-in repairable program from completing Military Requirements for Petty Officers Third and Second Class, NAVEDTRA 14504. The knowledge you have should enable you to answer the following questions concerning the turn-in system:

- Why should the item(s) be turned in?
- Is there special material content?
- Is there hazardous material content?
- Is the item a depot level repairable?

Mandatory turn-in repairable can be identified by the material control codes H, E, X, G, or O located in the third position of the item’s NSN.

For the program to work as intended, you must return repairable items promptly and in repairable condition. At the time you present your request for a mandatory turn-in item, supply must inform you that the removed part must be returned. Therefore, when you receive the replacement you are required to do the following:

- Remove the defective item without damaging it beyond its already defective condition.
- Provide adequate protection to the item so it will not be further damaged before it is turned in to supply. The most effective way, if at all possible, is to place the defective part in the same container in which you received the replacement part.
- Resist the temptation to cannibalize the item for components that you might possibly use sometime in the future.
- Return the defective item to supply as soon as practical.

Sometimes the needed replacement item is not in the storeroom; supply must obtain it. Normally, you should still turn in the failed item, even though you have not received the replacement item. This way the failed item can enter the repair cycle and be available for reissue soon.

**NOTE:** The exception to this requirement is when equipment can still be used under limited operation with the failed part in place until the replacement is received. If this is the case, you MUST obtain a “Remain in Place” certification.
You can find information about the packaging for protection in the technical manual of the equipment involved. You can also obtain additional information from the supply department at your command. They may suggest that you not package the turn-in item because of any inspections required before shipment or they may say their shipping personnel have the necessary materials to package the item properly. There are two references that you should know about if supply department personnel are not readily available to assist you. They are the *Afloat Supply Procedures*, NAVSUP Publication 485; and *Supply Ashore*, NAVSUP Publication 1.

You will be responsible for learning as much as possible about the supply system by using the training aids available. Most of the ETs in the fleet don’t fully understand the supply system and how it works. Most obtain the desired part by any method handy at the time. You MUST become familiar with the system to receive the best results!

### 6.3.10 Federal Classification System

The Federal Classification System requires that only one identification number be assigned for each item of material. The Federal Classification System includes naming, describing, classifying, and numbering all items carried under centralized inventory control, as well as the publication of catalogs and related identification data. The system is managed by the Defense Logistics Agency (DLA).

### 6.3.11 Material Classification

The Defense Supply System contains over 4 million different items. The Navy uses and has interest in over 1.5 million of these items. The Federal Supply Classification (FSC) system is a tool to permit the classification of all items of supply used by the federal government. It provides a common language so one service or agency can use available materials held by another.

The FSC is a commodity classification. Groups and classes have been established for the numerous commodities with emphasis on the items in the supply systems of the military departments.

Examples of commodity groups and class are as follows:

- **58 - Communications Equipment** (group)
  - 5815 - Teletype and Facsimile equipment (class)
  - 5831 - Intercoms and Public Address Equipment, Airborne

- **59 - Electrical and Electronic Equipment Components**
  - 5905 - Resistors
  - 5910 - Capacitors
  - 5920 - Fuses and Lightning Arresters
In the FSC system, most material used by the Navy is assigned a national stock number (NSN). The national stock number is a 13-digit number that includes a four-digit FSC number and a nine-digit National Item Identification Number (NIIN). For example, in the NSN 6135-00-385-7281, the FSC number is 6135 and the NIIN is 00-385-7281.

The following NSN, 5920-00-248-5708, preceded by a cognizance material control code, and followed by a special material identification code (SMIC), shows all the elements with which you should be familiar:

Separated, this NSN, cognizance material control code, and SMIC will tell you the following information about the item:

9N = Navy-owned stocks of defense electronic material

H = depot level repairable

59 = electrical and electronic equipment components

20 = fuses and lightning arresters

00 = FSNS assigned before 31 March 1975

00-284-5708 = the individual item identification number (NIIN)

VN = electrostatic discharge sensitive material
6.3.12 Searching for the Elusive NSN

Various publications are available to help you find the stock numbers of the parts you want. Afloat, there are three basic publications.

1. *Coordinated Shipboard Allowance List* (COSAL)
3. *Navy Consolidated Master Cross-Reference List* (C-MCRL)

Also, many catalogs are published to help you translate your needs to stock numbers. (We will discuss some of these catalogs later in this chapter.) In many cases, the problems of identifying the stock number of an item are much more difficult than those normally encountered by civilian businesses. This complexity has led to the publication of more and more catalogs. As of this writing, a complete set of Navy and federal supply catalogs would occupy some 76 feet of shelf space. Maintaining all these catalogs aboard ship would be difficult, if not impossible. The four basic publications contain enough information to help you identify most of the items you will require.

6.3.12.1 General Services Administration (GSA) Catalog

The GSA catalogs nonmilitary items in general use by both military and civil agencies of the United States. The GSA Catalog provides a handy reference in identifying consumable-type material and is similar to the ASG. The material in the GSA Catalog is listed in the ML-N as cognizance symbol 9Q and is carried in stock at stock points under Navy ownership for issue.

**NOTE:** Not all items in the catalog are suitable for shipboard use.
6.3.12.2 Management List-Navy (ML-N)

You have read about the ML-N in the Military Requirements for Petty Officers Third and Second Class. The ML-N includes the basic management data for preparing requisitions. Figure 6-11, included here for review, shows the different columns of information and what they contain. The introduction (first fiche-first frames) to the ML-N lists all the codes used and their meanings.

![Figure 6-11 Management List-Navy (ML-N)]
6.3.12.3 Master Cross-Reference List (MCRL)

The MCRL (fig. 6-12), Part I, provides a cross-reference from a reference number (manufacturer’s part number, drawing number, design control number, etc.) to its assigned NSN. Part II provides a cross-reference from an NSN to a reference number.

![Figure 6-12 Master-Cross-Reference List (MCRL), Parts I and II](image-url)
6.3.12.4 Federal Supply Code for Manufacturers (FSCM)

The FSCM provides a five-digit identification number for commercial firms, primarily manufacturers that supply material to the Department of Defense. It is published in three volumes:

1. H4-1 - Manufacturer’s name to manufacturer’s code
2. H4-2 - Manufacturer’s code to manufacturer’s name
3. H4-3 - Other countries

Figure 6-13, views A and B, show the format and content of H4-1 and H4-2. When you use the C-MCRL to determine an NIIN, you will frequently find the same reference number listed more than once, with each listing having a different NIIN. For proper identification, you must then select the NIIN from the line entry showing the FSCM for the company that made the needed part.

The identification lists of the Federal Supply Catalog include the FSCM in the item descriptions. The introduction to each section includes a numerical listing of all FSCMs included in that section.
Figure 6-13 Federal supply code for manufacturers (FSCM): (A) H4-1, name to mfg. code; (B) H42, code to name
6.3.13 Identification to a Current NSN

To obtain required material, you must first find its current NSN. There are three basic methods of entry you may use with the catalogs to obtain this information:

1. Entry with an NSN (which may or may not be current)

2. Entry with a reference number (manufacturer’s part number, Navy drawing number, or other reference number)

3. Entry with a noun name and or physical characteristics description

6.3.13.1 Entry with NSN

In actual practice, if you already have the NSN, you just submit the completed requisition to the supply department.

6.3.13.2 Entry with Part, Drawing, or Piece Number

A reference number is generally any number, other than a current NSN, that can be used to identify an item or to aid in determining the current NSN. Reference numbers, therefore, include old FSNs, electron tube numbers, and electronic equipment circuit symbol numbers. There are, however, two additional important types of reference numbers that you can convert to national stock numbers by using the C-MCRL. They are (1) manufacturer’s part numbers and (2) Navy drawing and piece numbers.

Manufacturer’s part numbers are numbers assigned to parts by the manufacturer who designs and builds the equipment. The manufacturers assign the numbers for their own use in cataloging and identifying their own material. Some manufacturers use part number systems in which their plan or drawing and piece numbers form all or a portion of their part numbers.

Navy drawing and piece numbers were assigned originally by Navy technical commands to identify items in equipment built and or designed by those commands. Some items may have both manufacturer’s part numbers and Navy drawing and piece numbers listed in various reference publications.

When you first try to determine an item’s current NSN, you will probably look for a manufacturer’s part number or a Navy drawing and piece number. There are several possible places to look for such numbers:
1. On an Allowance Parts List (APL).

2. On the part to be replaced. The part number may be stamped on it.

3. In equipment technical manuals. They may refer to a manufacturer’s part number or Navy drawing and piece numbers.

4. On equipment plans. Plans available on the ship may contain Navy drawing and piece numbers.

5. In EIMB reference data.

Technical manuals, furnished by the manufacturer, contain a detailed description of equipment and instructions for its effective use. Normally, the supply officer does not have technical manuals; they are maintained and used by the ship’s technicians in maintaining the complex equipment installed in the ship. They can serve as a basic source of identification information for repair parts.

To obtain a current NSN when you know a reference number, enter the C-MCRL to determine the NIIN. When the NIIN is listed, check to ensure that the FSCM coincides with that of the manufacturer of the part.

When the number is listed more than once, you will need to obtain the manufacturer’s code. When you obtain the correct NIIN, update your records to reflect the current stock number.

6.3.13.3 Entry with Noun Name and or Physical Description

The third method of obtaining a current NSN involves beginning the search with a physical characteristic or noun name description of the item.

There are two different methods of describing an item other than by the NSN. The first method uses a physical description of the item and perhaps a description of its electrical, chemical, and other properties. (This type of description is similar to that provided in mail order catalogs.) The second method, which we covered previously, uses only a reference number; that is, manufacturer’s part number. Most of the items in the Navy Supply System are covered only by reference number descriptions because these items are very difficult to describe.

There are, however, many items that you can easily describe by physical characteristics. Included in this category are many common-use items of nontechnical nature, such as paint, hand tools, nuts and bolts; and some technical items, such as fuses, resistors, and electron tubes.
You can find the NIIN for a common-use item with a noun name/physical characteristics description in the ASG or GSA catalog. The ASG is sequenced by Federal Supply Groups and Classes. A noun-name-item number index for the ASG is contained in the Introduction and Master Index.

### 6.3.14 Plant Property

Plant property includes all real property (land or buildings and improvements) owned by the Navy or for which the Navy is accountable. This property may be located at either a Navy shore facility or in the plant of a private contractor. Plant property also includes all personal property of a capital nature (equipment) owned by the Navy. Plant property does not include items of equipment in storage (items that are carried) in the Navy Stock Account (NSA) but that have not been issued for end use. Also it does not include items in the custody of a unit of the operating forces that are moved with the unit. As an Electronics Technician carrying out fiscal and supply duties ashore, you may be called upon to perform tasks associated with plant property accounting.

Identification numbers are used with plant property items to make the following functions easier:

- Selection of specific items for transfer
- Physical inventories of equipment
- Maintenance of property record card files
- Specific identification of equipment items in shipment orders, invoices, and survey reports
- Maintenance of history record cards

Each item of equipment meeting the criteria of plant property is marked with an identification or registration number. This number is also recorded on the plant property record card maintained for that item.
Figure 6-14 is an example of an identification tag that you may find on a piece of electronic equipment.

![Identification Tag Example](image)

6.3.15 Integrated Logistics Review (ILR)

A ship’s ability to perform its operational missions depends to a large extent on the crew’s ability to keep the equipment installed on board working as it is designed to work. To do your job as a technician, you must have the proper technical manuals, test equipment, planned maintenance material, and repair parts readily available for use. One of the Navy’s efforts to deal with these requirements and to improve each command’s readiness is called the Integrated Logistics Review (ILR). Working closely with this program is the Integrated Logistics Overhaul (ILO) program.

The ILO is scheduled to coincide with upgrades during overhaul periods. Under the guidance of an experienced ILO site staff member, called a ship project manager (SPM), a small number of selected personnel from the command aide in overhaul work to provide the command with complete logistics support. This system includes not only repair parts but also technical manuals and PMS materials for the equipment installed during an availability or overhaul.
Integrated logistics support (ILS) audits are performed on commands that have completed installation of new or modified systems and equipments during an overhaul or availability period. The logistics support planned for these alterations includes audits on the accuracy of the allowance parts list (APL), the coordinated shipboard allowance list (COSAL), and allowance appendix pages (APPs). The correct technical manual that coincides with the installed equipment configuration is reviewed. Test equipment required to perform maintenance functions is determined by reviewing maintenance requirement cards (MRCs). The Planned Maintenance System (PMS) documentation audits include verification of the command’s list of effective pages (LOEP), maintenance index pages (MIPs), and maintenance requirement cards (MRCs). The adequacy of personnel training is checked. Spare parts are sight validated, as are the command’s selected records and drawings of the newly installed equipment. When the audits are completed, the command will be aware of deficiencies in the total support for the equipment on board. As a technician, you will be assured of the availability of everything necessary for you to maintain your equipment.

6.4 SUMMARY

As an Electronics Technician, your job is to have your equipment in good repair and ready for action. You also must know how to research the supply publications so you can identify the repair parts you need. You must feed information into the supply system so parts will be available when you need them. Finally you must know how to obtain those parts through the supply system.

As you advance in pay grade and responsibilities, you will become aware that as a technician you are one of many people who make up the repair team. Now is the time for you to work closely with the Storekeepers and learn the supply system so that it will work for you and not delay any of your repair tasks.
APPENDIX A
References


Electronics Installation and Maintenance Book, General, NAVSEA SE000-00-EIM-100 through SE000-00-EIM-110 and SE-000-00-EIM-160 are all now in Navy Installation and Maintenance Handbook, NAVSEA SE000-01-IMB-010, and is supported in IETM format only.


ASSIGNMENT 1


1-1. Which of the following occurrences is/are basic to a mishap?

1. A planned or intentional event
2. Contact that causes injury or property damage
3. Stops or interrupts work
4. Both 2 and 3 above

1-2. In what year were safety engineers assigned to each major shipyard?

1. 1917
2. 1929
3. 1947
4. 1951

1-3. What is/are the number one cause of mishaps?

1. Equipment
2. Weather
3. Personnel
4. Broken tools

1-4. Who is the designated occupational safety and health (OSH) official for the Department of the Navy?

1. Chief of Naval Operations
2. Vice Chief of Naval Operations
3. Secretary of the Navy
4. Assistant Secretary of the Navy

1-5. Who monitors safety and occupational health statistics and provides direct support and assistance to fleet units in safety matters?

1. Chief, Bureau of Medicine and Surgery
2. Chief, Naval Education and Training
3. Commander, Naval Sea Systems Command
4. Commander, Naval Safety Center
1-6. Which of the following OPNAV instructions covers the Navy Occupational Safety and Health program?

1. 5100.12
2. 5100.19
3. 5100.21
4. 5100.23

1-7. Of the following factors, which forms the basis of mishap prevention?

1. Mishaps are caused
2. Tools are unsafe
3. Training is inadequate
4. Equipment is designed improperly

1-8. MAA/Safety Force personnel are roving inspectors for hazards that could result in injury to personnel or damage to equipment.

1. True
2. False

1-9. Hazards that may cause severe injury, severe occupational illness, or major property damage are assigned what category?

1. I
2. II
3. III
4. IV

1-10. If you are assigned a task that is beyond your skill level, you should take which of the following actions?

1. Skim over the technical documents before starting
2. Take shortcuts to finish the task and look good to your supervisor
3. Tell your supervisor and ask for assistance
4. Refuse to do the work

1-11. There is no need to review all precautions for a task you have performed many times before.

1. True
2. False
1-12. Behavior that leads to a mishap is usually caused by which of the following problems?

1. Undesirable attitudes
2. Lack of knowledge
3. Undesirable motivations
4. Both 1 and 3 above

1-13. What type of motivation can cause “jury-rigged” equipment?

1. Motivation to gain approval
2. Motivation to save time
3. Motivation to maintain personal comfort

1-14. Which of the following are incentives for specific acts?

1. Attitudes
2. Unique past experiences
3. Motivations

1-15. Which of the following is NOT a symptom of fatigue?

1. Boredom
2. Confusion
3. Impatience
4. Irritability

1-16. Which of the following statements pertains to a mishap probability assigned subcategory B?

1. It is likely to occur immediately
2. It will probably occur in time
3. It is unlikely to occur

1-17. Which of the following problems can cause a communication problem and lead to a mishap?

1. A breakdown in the passing of information
2. Misunderstanding information
3. Language weakness
4. All of the above
1-18. What law assures safe and healthful working conditions for every worker in the United States?

1. The Navy Safety Program
2. The Occupational Safety and Health Act
3. The Congressional Act on Safe Working Conditions
4. The Consolidated Labor Union Workers’ Benefits

1-19. What is the objective of the Navy’s mishap prevention program?

1. To investigate all mishaps
2. To prevent mishaps from occurring
3. To prevent mishaps from reoccurring
4. Both 2 and 3

1-20. When you need to delay correcting an unsafe condition, which of the following actions should you take?

1. Take whatever temporary precaution you need to protect yourself
2. Take whatever temporary precautions you need to protect yourself and your coworkers
3. Send a memo to your supervisor
4. Send a memo to your division officer

1-21. Commanding officers can delegate their responsibilities for safety of all personnel under their command to the executive officer.

1. True
2. False

1-22. Factors that can contribute to worker caused mishaps include

1. lack of experience, outdated procedures
2. negative motivation
3. medical and communication problems
4. all of the above

1-23. The quantity of hazardous material stored in the work space should be limited to what amount?

1. Enough for one work shift
2. Enough for one week
3. Enough for one month
IN ANSWERING QUESTIONS 1-24 THROUGH 1-29, REFER TO FIGURE 1-A. MATCH THE TYPE OF BATTERY IN FIGURE 1-A WITH ITS MOST CORRECT CHARACTERISTIC(S) AND HAZARD(S) IDENTIFIED IN THE QUESTION.

1-24. Used in most cordless, rechargeable equipment; should not be stored in an area where lead-acid batteries are stored.

   1. A
   2. C
   3. D
   4. F

1-25. Commonly called mercury cells; small and powerful; should not be exposed to heat over 400 degrees F.

   1. A
   2. B
   3. D
   4. E

1-26. Most widely used wet-cell battery; battery gases are extremely explosive; contains sulfuric acid.

   1. B
   2. C
   3. D
   4. F
1-27. Has high energy; is long lasting; could release toxic gases or explode.

1. A  
2. B  
3. C  
4. D

1-28. Commonly called an alkaline battery; used in portable radios; safety precautions same as for carbon-zinc batteries.

1. B  
2. C  
3. E  
4. F

1-29. Most common battery in the Navy; could explode if put into a fire.

1. A  
2. D  
3. E  
4. F

1-30. What group is responsible for the proper stowage of hazardous material in an area under their cognizance on board ships?

1. The supply department  
2. Individual work center personnel  
3. Both 1 and 2 above

1-31. You should never remove a cathode ray tube unless its high voltage anode has been charged.

1. True  
2. False

1-32. The form and appearance of PCBs can range from oily liquids to crystalline solids.

1. True  
2. False
1-33. All hazardous material and hazardous material containers do not have to be labeled.

   1. True
   2. False

1-34. If you dispense a hazardous material into an unlabeled container, what must you do?

   1. Place a large red “X” on the outside of the container
   2. Use all of the dispensed material within 1 hour and then dispose of the container
   3. Both 1 and 2 above
   4. Indicate on the new container the same label information shown on the original container

1-35. Which of the following items must manufacturers of hazardous materials provide for users?

   1. Information sheets on all hazardous materials they produce
   2. A material safety data sheet (MSDS) to the user for each hazardous material
   3. Both 1 and 2 above
   4. Protective clothing

1-36. Where are the MSDSs for a work center located at shore stations?

   1. At the main supply center
   2. Within the work center
   3. The Safety Officer’s files
   4. At public works

1-37. What is the background color of the Department of Transportation (DOT) hazardous material shipping symbols for non-flammable gas?

   1. Red
   2. Orange
   3. Yellow
   4. Green

1-38. You have the authority to re-label properly labeled hazardous material.

   1. True
   2. False
1-39. Which of the following actions should you take when using hazardous solvents?

1. Spray solvents on electrical windings only
2. Apply cleaning solvents to heated elements only
3. Ensure there is adequate ventilation
4. Place all rags used with the solvents in an open container outside of the workspace

1-40. Which types of solvents are the safest?

1. Oil-based
2. Petrolatum-based
3. Ammonia-based
4. Water-based

1-41. What should you do before using an aerosol container?

1. Clear the area of all personnel
2. Read the label
3. Point the can away from you and test it
4. Remove the label

1-42. Which of the following information is contained on an MSDS?

1. Ingredients and identity information
2. Transportation data
3. An emergency phone number
4. All of the above

1-43. All equipment and cabinets containing in-service PCB capacitors must be marked with a label similar to the one shown in figure 3-3 of the text.

1. True
2. False

1-44. Which of the following is a label used by the Navy on hazardous material?

1. Department of Defense Hazardous Chemical Warning Label
2. Supply Corps Identification Label
3. Department of the Navy Identification Label
4. Supply Department Hazardous Warning Label
1-45. In which section of the Tag-Out Log will you find DANGER/CAUTION tag-out record sheets that have been cleared and are no longer in effect?

1. 2
2. 3
3. 4
4. 5

1-46. The instrument log is found in which section of the Tag-Out Log?

1. 1
2. 2
3. 3
4. 4

1-47. DANGER/CAUTION tag-out record sheets that are still in effect are kept in which section of the Tag-Out Log?

1. 1
2. 2
3. 3
4. 5

1-48. Which of the following is the greatest hazard associated with working aloft?

1. The danger of a fall
2. The dropping of objects
3. Radiation burns
4. Asphyxiation

1-49. An RF burn is the result of RF voltages passing through the body.

1. True
2. False

1-50. Which of the following is the best basic description of a laser beam?

1. A concentrated beam of infrared light
2. A concentrated beam of medical X-rays
3. A concentrated beam of optical radiation
4. A concentrated beam of electricity
1-51. When removing or replacing an ESDS device, which of the following actions should you take?

1. Ensure that you are grounded
2. Move around, so you don't build up a static charge
3. Hold the device through electrostatic-free wrap if possible
4. Both 1 and 3 above

1-52. When measuring voltage above 300 volts, you should attach the test probe while the equipment is de-energized.

1. True
2. False

1-53. What is the first action that you should take if you see someone being shocked?

1. Call for medical personnel
2. Secure the area
3. Remove the victim from the live circuit
4. Secure the power

1-54. Information on equipment grounding can be found in which of the following publications?

1. NAVEDTRA 12052
2. SECNAVINST 5216.5C
3. MIL-STD-1310
4. SPCCINST 4441.170

1-55. How much time, in seconds, is required for 44 milliamperes to cause your heart to begin fibrillation?

1. 3
2. 7
3. 14
4. 30
IN ANSWERING QUESTION 1-56, REFER TO TABLE 2-1 OF THE TEXT.

1-56. What is the “can’t let go” current in milliamperes for a person weighing 175 pounds?

1. 10.0  
2. 16.0  
3. 18.0  
4. 65.0

1-57. Voltages over 240 volts will burn through the skin and leave deep third-degree burns where the charge enters the body.

1. True  
2. False

1-58. What is the resistance, in ohms, between major extremities of an average human body?

1. 500  
2. 1000  
3. 1500  
4. 2000

1-59. Which of the following is the most dangerous path current can take through the body?

1. Hand to hand  
2. Left hand to either foot  
3. Right hand to either foot  
4. Foot to foot

1-60. Which of the following factors cause(s) electric shock?

1. Current  
2. Voltage  
3. Low body resistance  
4. Both 2 and 3 above
1-61. When personnel work aloft, a verbal warning must be passed over the 1MC prior to commencement of the work and at what time intervals, in minutes, until the work is completed?

1. 5  
2. 10  
3. 15  
4. 20

1-62. Whose permission is required to work aloft?

1. Officer of the Deck  
2. Commanding officer  
3. Operations officer  
4. Engineer officer

1-63. Only qualified ship’s force personnel may perform the second check of tag installation.

1. True  
2. False

1-64. The number “70” in tag number 70-16 represents which of the following information?

1. The last two digits of the Julian date  
2. The log serial number  
3. The tag number

1-65. When tag requirements have been identified and the affected system will be rendered out-of-commission as a result of the tag-out, the authorizing officer must obtain permission from which of the following individuals prior to effecting the tag-out?

1. Commanding officer  
2. Operations officer  
3. Cognizant Department head  
4. Both 1 and 3 above
ASSIGNMENT 2


2-1. Who is normally responsible for turning in an equipment status report before getting under way?

1. DCA
2. EMO
3. XO
4. CO

2-2. A DD Form 200 must be submitted when which, if any, of the following actions occurs?

1. Installation
2. Theft
3. Modification
4. None of the above

2-3. Which of the following references is used for preparation and submission of CASREPs?

1. NWP-7
2. 3-M manual
3. NWP-3
4. NWP 10-1-10

2-4. How are Afloat Safety Advisories sent out to ships?

1. on a cd
2. via naval message
3. through regular mail to the ship’s Safety Officer
4. None of the above

2-5. Navy Knowledge Online (NKO) combines many of the tools available only online into a single source, accessible from anywhere in the world.

1. True
2. False
2-6. Electromagnetic Radiation Hazards discusses classified data in which of the following publications?

1. Volume I, section one
2. Volume I, section two
3. Volume II, part one
4. Volume II, part two

2-7. What publication discusses procedures and techniques to make high-quality, reliable repairs to state-of-the-art electronic printed circuits and modules?

1. Single Sideband Communications Handbook
2. Mil-HDBK-162
3. Directory of Electronic Equipment
4. 2M Electronic Repair Program

2-8. What publication discusses design and installation criteria applicable to shipboard secure electrical information processing systems?

1. MIL-STD-1310
2. MIL-HDBK-175
3. MIL-STD-1680
4. MIL-STD-162

IN ANSWERING QUESTIONS 2–9 THROUGH 2-14, SELECT THE EIMB HANDBOOK TYPE THAT CONTAINS THE SUBJECT MATTER IDENTIFIED IN THE QUESTION.

2-9. Functional descriptions common to equipment in a basic equipment category.

1. Reference Data
2. EMI Reduction
3. General Maintenance
4. Equipment-Oriented

2-10. Definitions, abbreviations, formulas, and general data concerning electronics.

1. Reference Data
2. EMI Reduction
3. General Maintenance
4. Equipment - Oriented

1. Reference Data
2. EMI Reduction
3. General Maintenance
4. Equipment-Oriented

2-12. Field change identification information for all equipment of a basic equipment category.

1. Reference Data
2. EMI Reduction
3. General Maintenance
4. Equipment-Oriented

2-13. Techniques and procedures for elimination of electromagnetic interference.

1. Reference Data
2. EMI Reduction
3. General Maintenance
4. Equipment–Oriented

2-14. Routine maintenance concepts, techniques, and procedures.

1. Reference Data
2. EMI Reduction
3. General Maintenance
4. Equipment–Oriented

IN ANSWERING QUESTIONS 2-15 THROUGH 2-18, SELECT THE EIMB HANDBOOK THAT CONTAINS THE SUBJECT MATTER DESCRIBED IN THE QUESTION.

2-15. Basic vacuum tube and semiconductor theory of operation and circuit description.

1. General
2. Installation Standards
3. Electronic Circuits
4. Test Methods and Practices
2-16. Approved standards, techniques and practices for installation of electronics aboard ships.

1. General
2. Installation Standards
3. Electronic Circuits
4. Test Methods and Practices

2-17. Procedures for testing typical electronic circuits and equipment.

1. General
2. Installation Standards
3. Electronic Circuits
4. Test Methods and Practices

2-18. Safety matters and subject index of other handbooks.

1. General
2. Installation Standards
3. Electronic Circuits
4. Test Methods and Practices

2-19. Which chapter in the NSTM covers electronics?

1. 79
2. 300
3. 400
4. 631

2-20. The Cycle Schedule displays PMS requirements to be performed:

1. on an “as required” basis
2. as directed by your 3-M Coordinator
3. during the period between major overhauls
4. during a specific 3-month period

2-21. A Maintenance Index Page (MIP):

1. contains a list of systems and equipment in the work center.
2. provides detailed information for performing preventative maintenance.
3. states exactly the “who, what, when, how, and with what resources” are associated with a specific maintenance requirement.
4. contains a brief description of the maintenance requirements on all the MRCs for each item of equipment
2-22. The usefulness of the CSMP, PMS, and the entire 3-M systems depends on which of the following factors of the MDS?

1. Accuracy
2. Timeliness
3. Thoroughness
4. Each of the above

2-23. The purpose of the CSMP is to provide the command and work center with which of the following management data?

1. Scheduled maintenance actions
2. Current maintenance actions
3. Deferred maintenance actions
4. Completed maintenance actions

2-24. Which of the following statements define(s) a configuration change?

1. Addition or deletion of any new or installed equipment
2. Replacement or exchange of any new or installed equipment
3. Modification, relocation, or accomplishment of any alteration, by directive of any equipment
4. All of the above

2-25. What form should be used with a ship’s maintenance action form deferring maintenance to be done by an IMA under IMMS?

1. OPNAV 4790/76
2. OPNAV 4790/2P
3. OPNAV 4790/2R
4. OPNAV 4790/2Q

2-26. What form should be used to provide amplifying information relating to a maintenance action reported on a ship’s maintenance action form?

1. OPNAV 4790/CK
2. OPNAV 4790/2K
3. OPNAV 4790/2R
4. OPNAV 4790/2L
2-27. What form must be used to report completed maintenance actions and deferred maintenance actions?

1. OPNAV 4790/2K  
2. OPNAV 4790/2L  
3. OPNAV 4790/2P  
4. OPNAV 4790/7B

2-28. What form is filled in by computer and contains the same information as the ship’s maintenance action form?

1. OPNAV 4790/CK  
2. OPNAV 4790/2R  
3. OPNAV 4790/2Q  
4. OPNAV 4790/2P

2-29. What form must be used to recommend changes to maintenance requirement cards?

1. OPNAV 4790/2K  
2. OPNAV 4790/2R  
3. OPNAV 4790/CK  
4. OPNAV 4790/7B

2-30. Which of the following items contains written maintenance procedures?

1. PMS  
2. MRC  
3. MDS  
4. MIP

2-31. Which of the following is one of the major objectives of the MDS?

1. Reporting configuration changes  
2. Scheduling corrective maintenance  
3. Providing detailed information on MRCs  
4. Performing preventive maintenance

2-32. Which of the following documents should you review to find out what test equipment you will need to perform maintenance on newly installed equipment?

1. MRC  
2. ILR  
3. SPM  
4. ILO
2-33. Which of the following is a program that audits commands having completed installations of new or modified systems and equipment during availability or overhaul?

1. PMS
2. ILS
3. APL
4. ILR

2-34. Which of the following is a program that provides logistics support of repair parts, technical manuals, and PMS materials for equipment installed during availability/overhaul?

1. SPM
2. ILO
3. PMS
4. ILR

2-35. Which of the following is a program designed to deal with material requirements and to improve a command’s readiness?

1. PMS
2. ILS
3. SPM
4. ILR

2-36. Which of the following statements describe(s) plant property?

1. Navy-owned and Navy-controlled real and personal property of a capital nature
2. Land, buildings, and improvements of all real property owned by the Navy
3. NSA items not issued and in storage are not included
4. All of the above

2-37. Of the following statements, which apply(ies) to SERVMART?

1. Use of MVO requisitions is not permitted
2. Only DD Form 1348 is authorized
3. It is a self-service store stocked with frequently required items
4. All of the above
2-38. Which of the following forms should be used to requisition items excluded from MILSTRIP?

1. DD Form 1149
2. DD Form 1348
3. NAVSUP 1250
4. SPCC Form 4790

2-39. When you prepare a DD Form 1348, you may use a typewriter, ballpoint pen or pencil.

1. True
2. False

2-40. There are two different methods of describing an item other than by NSN. One method uses a physical description. Which of the following is the best description of the other method?

1. Manufacturer’s part number
2. Electrical properties
3. Chemical composition

2-41. Which of the following publications is a basic source of identification information for repair parts?

1. EIMBs
2. Technical manuals
3. MSGs
4. GSA catalogs

2-42. Which of the following EIMB handbooks can be used to find manufacturer’s part numbers, Navy drawing numbers, or piece numbers?

1. General
2. Reference Data
3. Installation Standards
4. EMI

2-43. Which of the following publications converts manufacturer’s part numbers, Navy drawing numbers, and piece numbers to NSNs?

1. FSCM
2. GSA
3. C–MCRL
4. ASG
2-44. Which part of the MCRL provides a cross-reference from a reference number to its assigned NSN?

1. Part I
2. Part II
3. Part III
4. Part IV

2-45. Which of the following publications provides an identification number for primary manufacturers of DoD material?

1. C-MCRL
2. ASG
3. ML–N
4. FSCM

2-46. Which of the following is the best description of the ML-N?

1. It includes basic management data for preparing requisitions
2. It includes all NSN codification information
3. It includes requisition submission information and SMIC usage
4. It includes a complete listing of all FSCs and manufacturer’s codes

2-47. The GSA catalog is designed to provide which of the following information?

1. Identification of NSN items most frequently requested by ships
2. Cross-reference of COSAL and C–MCRL items
3. Identification of consumable–type material
4. All of the above

2-48. An ILO site staff member can also be referred to as:

1. 3-M Coordinator
2. Ship Project Manager (SPM)
3. Logistics Controller
4. Logistics Officer’s Assistant
IN ANSWERING QUESTIONS 2–49 AND 2-50, USE THE FOLLOWING NSN: 9N H 5920-00–284-5708–VN

2-49. What portion of the NSN is the NIIN?
1. 9N H
2. 00-284-5708
3. 5920
4. 00

2-50. What does the “5920” indicate?
1. Material control code
2. Navy–owned stocks
3. Electrical and electronic fuses and lightning arresters
4. Electrostatic discharge sensitive material

2-51. NSNs are composed of which of the following parts?
1. NCB numbers
2. NIINs
3. FSC numbers
4. All of the above

2-52. The FSC system is a tool to permit classification of all items of supply used by the federal government.
1. True
2. False

2-53. Which of the following information is included as part of the federal classification system?
1. Item naming, description, and classification
2. Item numbering, if carried under centralized inventory control
3. Publication of catalogs and related identification data
4. All of the above
2-54. For which of the following reasons may you NOT want to package a turn-in item before it is delivered to supply?

1. Packaging is not your responsibility
2. Proper packing instructions are controlled by supply
3. Supply is the only department authorized to package an item
4. Item inspection prior to shipment may be required

2-55. What condition must exist for an item to be considered an exception to normal mandatory turn-in procedures?

1. The defective item is further damaged during removal
2. The defective item’s original container is not available
3. The defective item is not to be turned in to supply
4. The defective item permits limited operation of equipment

2-56. When you are returning a mandatory turn-in item, you should resist the temptation to cannibalize the item for components.

1. True
2. False

2-57. The third position of a mandatory turn-in repairable’s NSN will contain which of the following material control codes?

1. H only
2. O only
3. G, X, and E only
4. Any of the above

2-58. The MRIL discusses which of the following types of information?

1. Non-automated procedures for MILSTRIP mandatory turn-in
2. Direct turnover material identification and requisition
3. Consolidation of repair lists to identify and return mandatory turn-in items
4. Consolidation of fill-in procedures for issue and turn-in documentation
2-59. When preparing NAVSUP Forms 1250 and 1250-1, to avoid confusion between the number zero and the alphabetic O, you should take which of the following actions?

1. Use the slashed numeric symbol for zero only
2. Use the lower case alphabetic “o” only
3. Use either the numeric symbol for zero or the lower case alphabetic “o”
4. Use the word “zero”

2-60. Which of the following is/are the purpose(s) of NAVSUP Form 1250-1?

1. To identify the rate of use on any ship or station
2. To report consumption under MDS and improve inventory control procedures
3. To control the amount issued and to whom it is issued
4. To document the equipment failure–rate down time

2-61. DD Form 1348 is used by maintenance personnel on ships having what type of supply system?

1. Nonautomated
2. Automated
3. Nonautomatic
4. Automatic

2-62. When you have the NIIN/part number, you may enter the COSAL through which of the following sections?

1. Section A or B, Part III
2. Section A, Part II
3. Section D, Part III
4. Section B or C, Part II

2-63. Through the ASI process, logistical changes are provided electronically to update an automated ship’s files.

1. True
2. False
2-64. What document should you look in for information on how to use the COSAL?

1. NAVSEA 0967-LP-008-9000
2. NAVSUP P-4998–A
3. NAVEDTRA 10044
4. SPCCINST 4441.170

2–65. Which of the following is the best description of an APL?

1. A cross-reference from NIIN/PNICN/TNICN to APL
2. A cross-reference from NIIN/PNICN/TNICN to NSN
3. A cross index from NSN to NIIN/PNICN/TNICN
4. A cross-index from APL to NIIN/PNICN/TNICN

2-66. Which of the following information is contained in the COSAL/COSBAL?

1. Repair parts and special tools for overhaul, and repair of onboard equipment
2. Miscellaneous portable items for care and upkeep of the ship
3. Equipment or components required to perform operational assignments
4. All of the above

2-67. The COSAL is used primarily for which of the following reasons?

1. To identify storeroom items and determine equipage
2. To give procedures for storage and issue of repair parts
3. To list equipment’s test equipment stowage requirements
4. To provide accountability of all equipment necessary for the mission of the command

2-68. How many parts is each COSAL publication produced into?

1. 4
2. 3
3. 1
4. 2
2–69. Sections A and B of Part I of the COSAL are set up in which of the following ways?

1. They are basically identical, and are arranged as a cross-reference for SOEAPLs in Part II
2. They are basically identical, and are arranged as a cross-index for APL/AELs in Part II
3. They are not identical, and are arranged as a cross-index for AEL/APLs in Part I
4. They are not identical, and are arranged as a cross-reference for SOEAPLS in Part I

2–70. DLA has cognizance over items of material that are common to what users?

1. All government offices Worldwide
2. Military services, but not the civilian world
3. Air Force and Marine Corps personnel
4. Government services, but not the military

2–71. GSA has cognizance over items of material that are common to what users?

1. Aviation and submarine forces
2. Army and Navy supply systems
3. Military and civilian worlds
4. Navy and Coast Guard

2–72. Which of the following organizations are primary stock points for aviation material?

1. MLSFs
2. NADEPs
3. AIMDs
4. INASs

2–73. Stock points devote their primary effort to which of the following actions?

1. Procuring and disposing of material
2. Receiving and storing of material
3. Issuing and shipping of material
4. All of the above
2–74. What is the primary function of an inventory manager?

1. To assure that supply support is at maximum levels
2. To assure that fleet only units are serviced properly
3. To assure the proper balance between parts requirements and assets
4. To assure that stock assets meet new construction requirements

2–75. Which of the following is the best description of NAVSUPSYSCOM?

1. It has cognizance over procurement of materials and services throughout the Department of the Navy
2. It controls contract buying and selling of civilian goods throughout the DOD
3. It inspects the storage and distribution of services on afloat commands and aircraft