ELECTRONICS MANUAL

COMDTINST 10550.25D
May 2024

THIS PAGE INTENTIONALLY LEFT BLANK

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

U.S. Coast Guard Stop 7710
2703 Martin Luther King Jr Ave SE
Washington, DC 20593-7710
Staff Symbol: CG-672
Phone: (202) 475-3535
Email: HQS-SMB-CG-672@uscg.mil

COMDTINST 10550.25D
16 MAY 2024

COMMANDANT INSTRUCTION 10550.25D

Subj: ELECTRONICS MANUAL

Ref: (a) Coast Guard Configuration Management Policy, COMDTINST 4130.6 (series)
(b) The Coast Guard Integrated Logistics Support (ILS) Manual, COMDTINST M4105.14
(c) Command, Control, Communications, Computers, Cyber, and Intelligence Sustainment Management Policy, COMDINST 5230.72 (series)
(d) Naval Ships' Technical Manual
(e) Equipment Lockout/Tags-Plus Instruction, COMDTINST 9077.1 (series)
(f) Naval Engineering Manual, COMDTINST M9000.6 (series)
(g) American National Standards Institute, ANSI Z359 (series), Fall Protection and Arrest Standards
(h) Risk Management (RM), COMDINST 3500.3 (series)
(i) Coast Guard Medical Manual, COMDTINST 6000.1 (series)
(j) Hazardous Waste Management Manual, COMDTINST M16478.1 (series)
(k) Safety and Environmental Health Manual, COMDTINST M5100.47 (series)
(l) Policy for U.S. Navy Provision and Support of Specified Equipment and Systems to the U.S. Coast Guard, OPNAVINST 4000.79 (series)
(m) Support of Navy Type Navy Owned Combat Systems, COMDINST 7100.2 (series)
(n) Management of the Miniature/Microminiature (2M) Module Test and Repair (MTR) (2M/MTR) Program, COMDINST 4790.2 (series)
(o) Navy Type/Navy Owned (NT/NO) Program Management, COMDINST 3092.1 (series)
(p) U.S. Coast Guard TEMPEST Program, COMDINST 2241.6 (series)

1. PURPOSE. This Instruction promulgates Coast Guard electronics maintenance and associated maintenance safety policies.

2. ACTION. All Coast Guard unit commanders, commanding officers, officers-in-charge, deputy/assistant commandants, chief of headquarter directorates must comply with the policies contained.

3. AUTHORIZED RELEASE. Internet release is authorized.

4. DIRECTIVES AFFECTED. The Electronics Manual, COMDTINST M10550.25C is cancelled.

5. DISCUSSON. This Instruction provides information on the life-cycle management policy and safe electronics maintenance practices employed in the Coast Guard.

6. DISCLAIMER. This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is intended to provide administrative guidance for Coast Guard personnel and is not intended nor does it impose legally-binding requirements on any party outside the Coast Guard.

7. MAJOR CHANGES. Significant changes to this Instruction include:

   a. Organization for Deputy Commandant for Mission Support (DCMS), Assistant Commandant for Command, Control, Communications, Computers, and Information Technology (CG-6), and the Command, Control, Communications, Cyber, and Intelligence Service Center (C5ISC) updated per approved Organizational Modification Requests implemented March 2018.

   b. Consolidated information going from 13 to 5 chapters.

   c. Added process for Tower Climbing certification.

   d. Reintroduce the certification requirement for C5I system installations.

8. SCOPE AND AUTHORITIES. It is recommended the reader become familiar with the directives and publications noted as References (a) through (o) of this Instruction.

9. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS. The Office of Environmental Management, Commandant (CG-47) reviewed this Commandant Instruction and the general policies contained within, and determined that this policy falls under the Department of Homeland Security (DHS) categorical exclusion A3. This Commandant Instruction will not result in any substantial change to existing environmental conditions or violation of any applicable federal, state, or local laws relating to the protection of the environment. It is the responsibility of the action proponent to evaluate all future specific actions resulting from this policy for compliance with the National Environmental Policy Act (NEPA), other applicable environmental requirements, and the U.S. Coast Guard Environmental Planning Policy, COMDTINST 5090.1 (series).

10. DISTRIBUTION. Electronic distribution in the Directives System Library. Intranet/Pixel Dashboard: Directives Pubs, and Forms - PowerApps (appsplatform.us). If Internet released: Commandant Instructions (uscg.mil), Coast Guard Forms (uscg.mil) .

11. RECORDS MANAGEMENT CONSIDERATIONS. Records created as a result of this Instruction, regardless of format or media, must be managed in accordance with Records & Information Management Program Roles and Responsibilities, COMDTINST 5212.12 (series) and the records retention schedule located on the Records Resource Center Microsoft SharePoint site at: https://uscg.sharepoint-mil.us/sites/cg61/SitePages/CG-611-RIM.aspx .

12. FORMS. None.

13. SECTION 508. This policy is created to adhere to accessibility guidelines and standards as promulgated by the U.S. Access Board with consideration of Information and Communications Technology (ICT) requirements. If accessibility modifications are needed for this artifact, please communicate with the Section 508 Program Management Office (PMO) at Section.508@uscg.mil. Concerns or complaints for non-compliance of policy and/or artifacts may be directed to the Section 508 PMO, the Civil Rights Directorate (https://www.uscg.mil/Resources/Civil-Rights/) for the Coast Guard, or to the U.S. Department of Homeland Security at accessibility@hq.dhs.gov.

14. REQUEST FOR CHANGES. Units and individuals may formally recommend changes through the chain of command using the Coast Guard Memorandum. Comments and suggestions from users of this Instruction are welcomed. All such correspondence may be emailed to Spectrum Management and Communications Policy Division (CG-672) at: HQS-SMB-CG-672@uscg.mil.

/BRIAN D. CAMPO/
Senior Executive Service, U. S. Coast Guard
Deputy Assistant Commandant for C4 &
Information Technology

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1. ELECTRONICS SUPPORT PHILOSOPHY AND ORGANIZATION

A. General. This Chapter outlines the US Coast Guard's (CG) electronics support philosophy, objectives, and organizational responsibilities as they pertain to CG electronic assets applicable to all personnel involved in electronics repair and maintenance.

B. Support Philosophy.

1. The CG electronics support philosophy is derived directly from the Deputy Commandant for Mission Support's (DCMS) Strategy. Achieving readiness and sustainability objectives necessitates a mission-focused, unified, and disciplined approach to electronics maintenance. This approach is supported by an organization designed to attain the required levels of performance, safety, and reliability. This is accomplished through the maintenance of accountability, the establishment of a proactive support posture, and the reduction of the burden placed on operational units. These practices not only enhance mission effectiveness but also foster trust, respect, and transparency by maintaining controlled processes grounded in proven maintenance practices. Ultimately, electronics maintenance plays a vital role in optimizing readiness, operational availability, performance, and safety. Figure 1-1 depicts the Cornerstones of Electronic Maintenance.

Figure 1-1 The Cornerstones of Electronic Maintenance

a. Product Line Management is an organizational design concept that provides a single support team that is responsible and accountable for the performance of specific capabilities and sustainment. Product Lines (PL) and Service Lines (SL) serve customers as a single point of accountability for enterprise-wide service, providing integrated, one-stop, customer service, technical support, and assistance for all matters that go beyond the expertise of the unit. PLs/SLs have three main roles: requirements management, asset accountability, and resource and work allocation/prioritization.

b. Configuration Management is the discipline through which Mission Support documents, communicates, and controls the details of the CG's capabilities. Its purpose is to establish and maintain consistency of performance, functional and physical design attributes, requirements, and operational information throughout the equipment life cycle. Configuration Management also applies to training, to maintain required competencies at a specific unit. The CG Configuration Management policy and associated guidance is outlined in Reference (a).

c. Reference (b) states all maintenance programs must implement Bi-Level Maintenance. The CG's Bi-Level maintenance concept consists of Organizational (O-level) and Depot (D-level).

(1) O-Level maintenance is maintenance normally performed by an operating unit on a day-to-day basis in support of its own operations. Operating units are responsible for completing all O-Level planned and corrective maintenance. Typical maintenance tasks falling under this category involve:

(a) All planned maintenance except that requiring tools or other resources not held within the asset or requiring technical skills of personnel beyond those available in the asset's operating crew.

(b) All corrective maintenance except that requiring tools, parts, or other resources not held by the operational unit requiring technical skills of personnel beyond those available in the asset's operating crew.

(2) D-Level maintenance requires the overhaul, upgrading, or rebuilding of parts, assemblies, or subassemblies, and the testing and reclamation of equipment as necessary, regardless of the location at which the maintenance or repair is performed. Typical maintenance tasks falling under this category involve:

(a) All planned maintenance requiring removal of affected equipment from the asset for repair in an industrial facility ashore.

(b) Corrective maintenance requiring overhaul or replacement of major components requiring resources or skills beyond that normally available to the unit and not assigned at the O-Level.

d. Total Asset Visibility provides the ability to get timely and accurate information on the location, movement, status, and identity of units, personnel, equipment, and supplies, and have the ability to act on that information in order to direct resources in the accomplishment of mission objectives. Making mission record, operational status, asset status, and maintenance record entries in the Electronic Asset Logbook (EAL) provides total asset visibility to the CG enterprise. Examples of a compliant asset status classification IAW Reference (b) are:

(1) Fully Mission Capable (FMC);

(2) Partially Mission Capable (PMC) (a reason for this status must be provided);

(3) Not Mission Capable Maintenance (NMCM);

(4) Not Mission Capable Supply (NMCS);

(5) Not Mission Capable Depot (NMCD); and,

(6) Not Mission Capable Lay-up (NMCL)

C. Mission Support Organization.

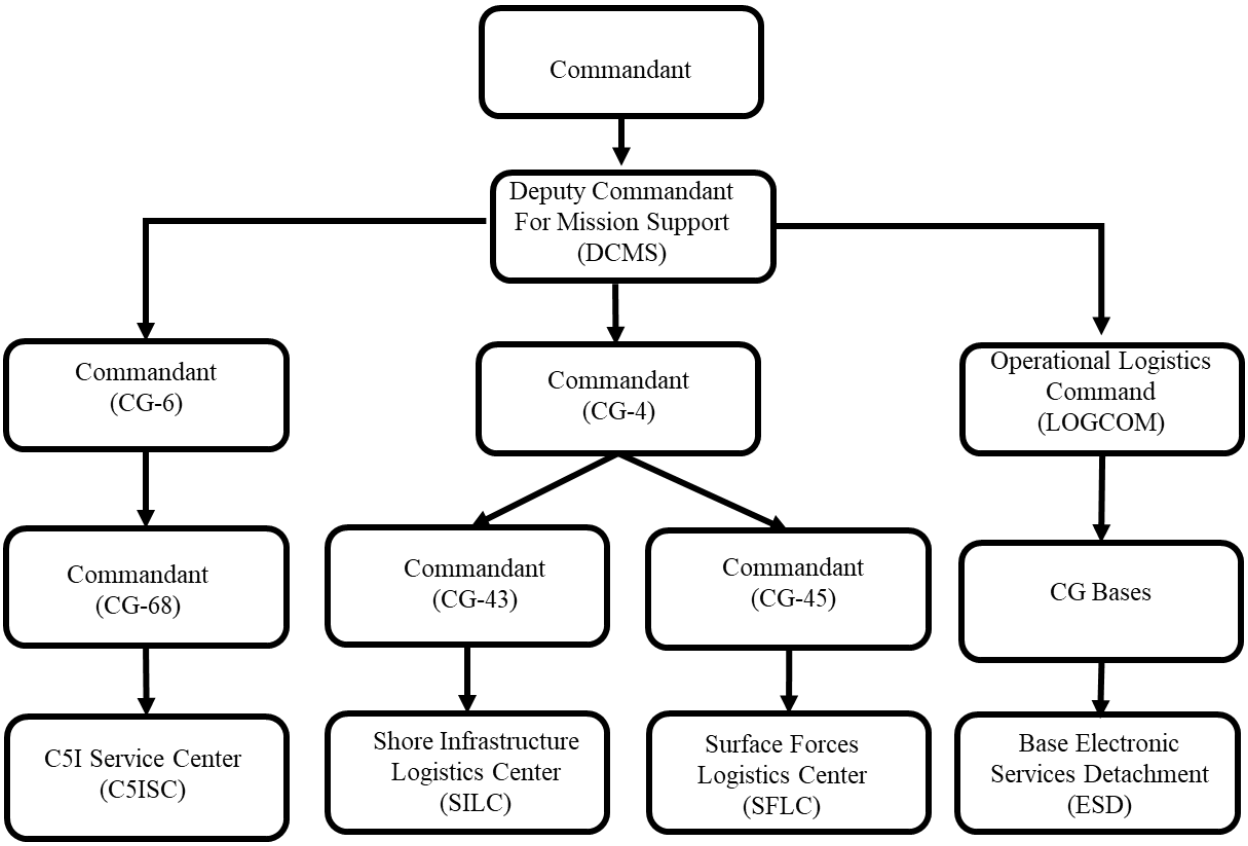


Figure 1-2 Mission Support Organization

1. DCMS. At the Headquarters Level, DCMS is responsible for all facets of life-cycle management of CG assets, from acquisition through decommissioning. This includes ships, planes, buildings, information technology (IT) and electronics systems.

   a. Assistant Commandant for Command, Control, Communications, Computers, and Information Technology (CG-6) (C4IT) and Chief Information Officer (CIO). The mission of Assistant Commandant for C4IT (CG-6) is to enhance C4IT's value in the performance of CG missions by developing and aligning enterprise strategies, policies, and resource decisions with CG strategic goals, mandates, and customer requirements. The CIO serves as the principal staff assistant and senior advisor to the Commandant on matters related to IT systems and architecture, information resource management and efficiencies, cyberspace workforce standards, and cybersecurity standards. This role is carried out in coordination with the Commander, CG Cyber Command. Specific roles and responsibilities associated with Assistant Commandant for Command, Control, Communications, Computers, and Information Technology (CG-6) are listed in Reference (c). The following section describes CG-6's organization as it relates to electronics management.

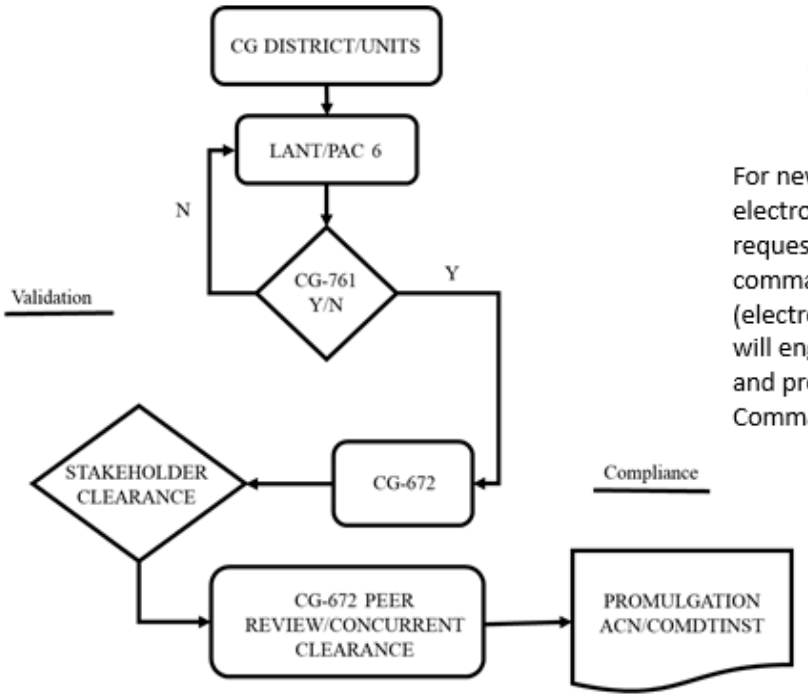
(1) Office of Privacy Management (CG-6P). Manages the CG Privacy Program to ensure compliance with the Privacy Act and implementing regulations, developing privacy policy, and managing privacy risk.

(2) Office of Information Management, Commandant (CG-61). Responsible for program oversight and management of the CG Information Management program as established by laws and regulations, to include the development and administration of policy for communications records retention.

(3) Cybersecurity Program Management, Commandant (CG-62). Responsible for directing and coordinating the CG cybersecurity program, which includes the establishment and management of the CG Risk Management Framework in alignment with Department of Defense (DoD) policies and standards to ensure compliance.

(4) Office of Enterprise Architecture Technology Innovation, Commandant (CG-67). Responsible for managing and maintaining program oversight of the CG Enterprise Architecture Program. This office directs and leads communication and electronics technology innovation for the CG, including supporting development of innovative concepts, adaptation of new technology, policy oversight, and improvement of capability delivery in support of CG mission execution.

(5) Office of Command, Control, Communications, Computers, Cyber and Intelligence Systems (C5I) Program Management (CG-68). This office is responsible for programming, planning, resource management, governance, program, and business case management of C5I capabilities for the CG. This includes oversight of the C5I Service Center (C5ISC). The C5I Sustainment Policy is outlined in Reference (c).



Electronics Policy Example

For new changes or waivers to existing electronics policies, units initate a requests and route via chain of command. Once validated by CG-761 (electronics requirements), CG-672 will engage appropriate stakeholders and promilgate the policy via Commandant Notice or Instruction.

Figure 1-3 Electronics Policy Changes

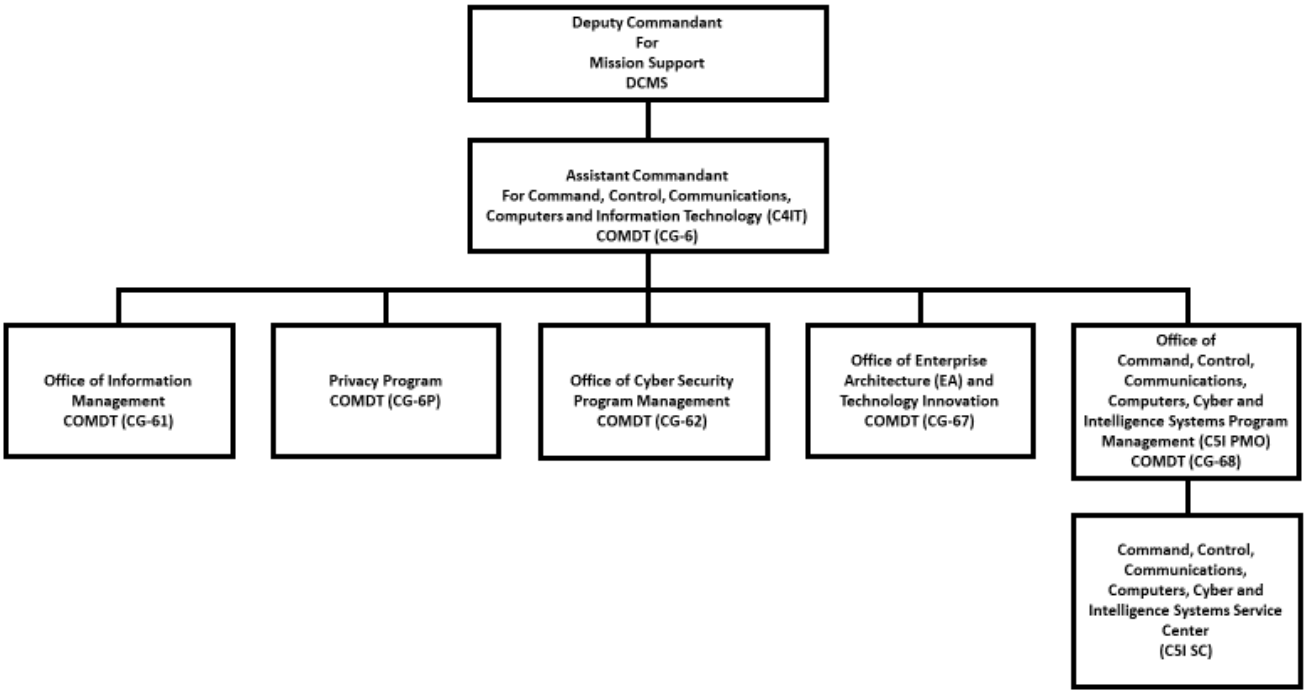


Figure 1-4 Coast Guard Electronics Support Organization

2. Office of C5I Capabilities (CG-761). As a directorate under the Deputy Commandant for Operations (DCO), the Office of C5I Capabilities (CG-761) plays a critical role in Coast Guard electronics capabilities. This office is responsible for C5I requirements and capabilities and acts as an advocate to the Assistant Commandant for C4IT (CG-6) on behalf of the operational users.

3. C5ISC. The mission of the C5ISC is to enhance C5I value in the performance of CG missions by providing and supporting C5I services that meet mission requirements. The Key Functions of the Service Center are as follows:

   a. Provide the C5I infrastructure and applications for the execution and support of CG missions, in accordance with direction, prioritization and guidance from Office of C5I Program Management (CG-68).

   b. Manage C5I products over the entire service life cycle, from conceptual planning through disposal.

   c. Develop, test, deliver, and support all C5I systems, applications, and services, to include depot level maintenance planning, execution, reporting, and analysis, in coordination with CG Cyber Command (CGCYBER).

   d. Interface with Logistics and Service Centers and CGCYBER for the installation, maintenance, and support of C5I services, as required.

   e. Analyze maintenance data to improve reliability, efficiency, effectiveness, and

cybersecurity.

f. Ensure C5ISC compliance with the DCMS Mission Support Business Model, including the four pillars of PL management, configuration management, total asset visibility, and bi-level maintenance.

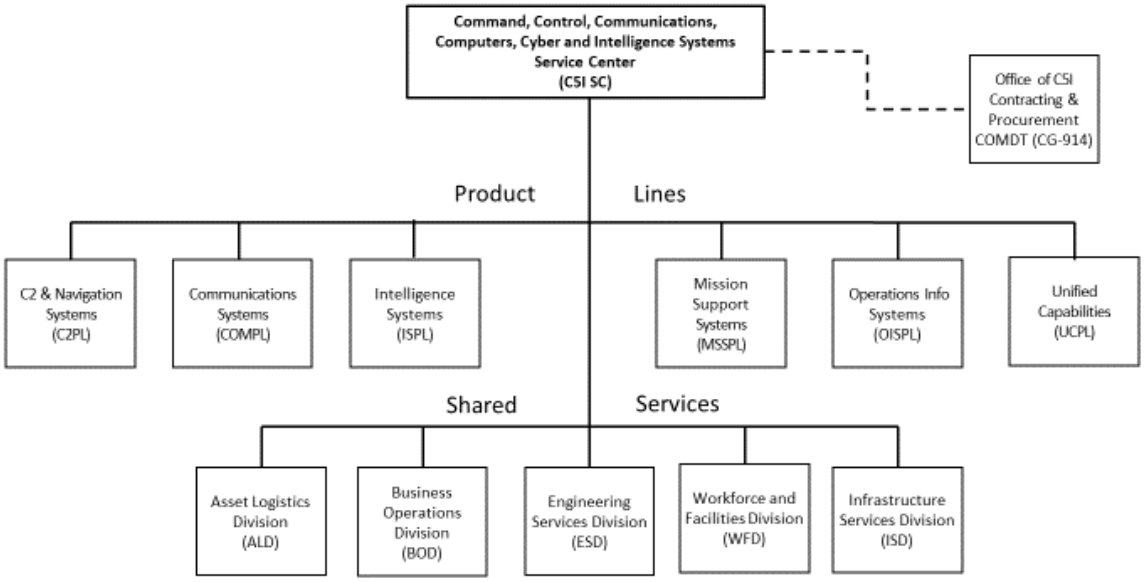


Figure 1-5 C5I Service Center Organizational Hierarchy

4. C5I PLs. The C5I PLs serve as the Service Owner and single point of accountability to provide service development, delivery, support, and technical expertise for product line services. The Key Functions are to manage services in accordance with Service Level Agreements. If service levels cannot be met, each PL determines the cause(s) and proposes solutions. They oversee and approved all engineering changes published as Time Compliance Technical Orders (TCTO) and oversee configuration management at the system level for surface assets and for all of shore installations. Further, they coordinate implementation of new or changed services and support Engineering Analysis Board investigations for services as appropriate to determine root cause for failures and to disseminate lessons learned when mishaps and casualties suggest the possibility of being prevented. The C5I PLs are as follows:

   a. Command & Control and Navigation Systems. Command, Control, Navigation, and Combat and Optics Systems integration.

   b. Communications Systems. Long Range, Short Range, and Integrated Communication systems.

c. Intelligence Systems. Intelligence Mission and Intelligence Tactical Systems.

d. Mission Support Systems. Human Resources, Decision Support, Finance, and Logistics.

e. Operations Information Systems. Operational Missions and Maritime Transportation Systems.

f. Unified Capabilities. Workstations, Office Automation, Voice, Video Teleconference, and Mobile/Cellular.

5. C5I Shared Services Divisions. Shared services provide the functions and infrastructure that are common across multiple product lines. The following divisions make up the remainder of the C5ISC:

a. Asset Logistics Division (ALD). ALD serves as the principal advisor to the C5I Resource Council and first point of contact for budget, logistics, asset and property management and internal controls over financial reporting matters at the C5ISC.

b. Business Operations Division (BOD). The BOD leads the C5ISC's Service Strategy, Business Analysis, Business Process, and Measurement Management development and implementation programs.

c. Engineering Services Division (ESD). The ESD offers engineering expertise and exercises technical authority oversight for the life cycle management functions conducted by C5ISC PLs. The ESD's responsibilities include the establishment and enforcement of architectural roadmaps and governance, engineering processes, standards, and principles, as well as configuration and change management. Additionally, the ESD manages engineering resource allocation and prioritization.

d. Work Force and Facilities Division (WFD). WFD provides general support to C5ISC Command, PLs and Shared Services Divisions including personnel and administration, C5I technical support, and command security support to include physical and industrial security programs.

e. Infrastructure Services Division (ISD). Serves as the Service Owner and the sole point of accountability for providing service development, delivery, support, and technical expertise for C5I infrastructure services. These services encompass data center infrastructure, enterprise networking and mobile connectivity, server and cloud services, infrastructure security, and infrastructure test environments. In addition, ISD delivers service development, support, and technical expertise that empower direct control and management of the Enterprise Mission Platform infrastructure. This is achieved through the collection, consolidation, fault normalization, performance monitoring, and configuration data from network, server, and workstation elements.

D. Electronics Operational Hierarchy.

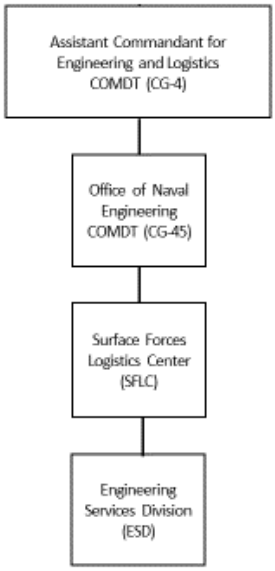


Figure 1-6 Operational Support Organizational Hierarchy

1. Assistant Commandant for Engineering and Logistics (CG-4) provides engineering and logistic support for CG missions. Specific support includes design, construction, maintenance, outfitting and alteration of vessels, aircraft, aids to navigation, shore establishments, machinery, and utilities.

2. The Office of Naval Engineering (CG-45) ensures that safe, reliable, and properly configured cutters and boats are available to meet CG mission requirements. The office establishes program objectives and policy, and advocates for the resources (funding and personnel) to properly operate and maintain all new and in-service surface assets. In addition, the Office of Naval Engineering provides oversight for the Surface Force Logistics Center (SFLC), which includes the CG Yard.

3. SFLC provides the surface fleet and other assigned assets with bi-level maintenance, engineering, supply, logistics, and information services to support CG missions. Individual SFLC PLs establish and manage Operational Level Agreements with any service delivery partners.

4. The SFLC ESD is a shared service division that supports all surface assets through the surface product lines and supports the Assistant Commandant for Engineering and Logistics (CG-4), Assistant Commandant for Capability (CG-7), and Assistant Commandant for Acquisition (CG-9) directly with acquisition-related work. Additionally, ESD offers support to the Assistant Commandant for C4IT (CG-6) in processing TCTOs, along with conducting Reliability Centered Maintenance (RCM), developing Maintenance Procedure Cards (MPC), providing Electronics Load Analysis, and offering Electronics technical drawing support. The ESD serves as the technical

warrant holders for naval architecture, main propulsion, auxiliary, electrical and ordnance systems, configuration management, maintenance programs, damage control, corrosion prevention, hazardous material control, environmental compliance and technical information management. The Technical Information Management Branch within the ESD is the Technical Warrant for all CG technical publications.

E. Base Organization. Supporting Commanding Officer/Officer-in-Charge (CO/OIC), the Base C5I Department (BCD) Head is responsible for the daily performance of the BCD. The BCD Department Head must ensure the BCD is organized and follows direction and guidance found in the BCD Maintenance Management Process Guide CGTO PG-85-00-110-T (series).

F. Unit Organization. Responsibilities of COs and OICs, Electronic Material Officer (EMO), unit safety officers, and unit supervisors.

1. CO and OICs. The CO or OIC is responsible for ensuring the safety and health of all personnel under their command or authority. The responsibility includes issuing of orders as necessary to ensure the safety and health of personnel and, requiring that EMOs, Electronic Technicians (ET)s, and other personnel authorized to engage in electrical and electronic repair and maintenance, are thoroughly trained in the safety practices contained in this Instruction.

2. EMO. The EMO is responsible for all C5I equipment casualty tracking and resolution. EMOs are responsible for the return and tracking of all CG/Navy Mandatory Turn In equipment. EMOs schedule and coordinate all dockside/dry dock work requests with C5ISC Port Engineer. The EMO coordinates with the shore support entity and/or the local Electronic Systems Support Detachment to conduct maintenance.

3. Unit Safety Officers. The Unit Safety Officer is responsible for ensuring that all new reporting personnel receive safety and familiarization training before engaging in the operation, repair, and maintenance of electrical and electronic equipment.

4. Unit Supervisors. The Unit Supervisor must be thoroughly familiar with the safety policies contained in this Instruction and is responsible for ensuring that all safety and health precautions are strictly observed in work areas.

CHAPTER 2. ELECTRONICS SAFETY POLICY

A. General. This Chapter establishes safety policies pertaining to electronics maintenance of CG assets and general safety information applicable to all personnel involved in electrical and electronics repair and maintenance, including safety responsibilities and personal protective equipment. When the safety policies contained in this part conflict with other directives or publications, personnel must verify policies with their Unit Safety Officer (see below) and notify Office of Spectrum and Communications Policy (CG-672) through appropriate means.

B. Safety Responsibilities. This section details the safety responsibilities of unit supervisors, and unit technical personnel. For the frequency of training refer to the Performance, Training, and Education Manual, COMDTINST M1500.10 (series).

1. Unit Safety Officer. The Unit Safety Officer must ensure that unit supervisors and safety observers are provided with the necessary information and instructions.

2. Unit Supervisors. Unit supervisors must be thoroughly familiar with the safety policies contained in this Instruction and are responsible for ensuring that all safety and health precautions are strictly observed in work areas. Unit supervisors shall;

   a. Familiarize personnel with safety and health precautions and ensure that unit personnel are familiar with the location and proper use of;

      (1) personal protective equipment;

      (2) safety equipment and devices;

      (3) equipment disconnects and circuit breakers.

   b. Observe all safety precautions and ensure;

      (1) rubber floor matting is placed around electrical and electronic equipment (see Paragraph E.1.4 of this Chapter);

      (2) all required hazard warnings are posted and properly maintained; and

      (3) that all safety observers are properly trained in the current methods of first aid and cardiopulmonary resuscitation (CPR) and know where the circuits and switches are that control the equipment and have instructions to disconnect the controls immediately if necessary.

   c. Immediately and properly report injuries (even if minor) and hazardous conditions in a work area to their immediate supervisor.

3. Unit Personnel. Unit personnel who engage in electrical and electronics repair and maintenance work must be thoroughly familiar with the safety policies contained in this

Instruction, and constantly aware of health and safety practices and precautions to protect themselves from injury or possible death.

C. Safety Practices Policies.

1. Most injuries and fatalities that occur when working on or near energized electrical equipment can be attributed to human error. Some of the major causes of accidents include: not adhering to posted safety precautions, delaying the repair of unsafe equipment, using unauthorized test equipment for repairs, making unauthorized equipment modifications, neglecting to test equipment after repairs to ensure its safety, and failing to remove unused or obsolete cabling and equipment hardware after new installations or field changes are completed.

   a. Training. Before personnel are permitted to work on electrical and electronic equipment, Unit Safety Officers must ensure that maintenance personnel have received documented training in the hazards inherent in working with electrical and electronic equipment, accident prevention, CPR, and first aid procedures. Units shall conduct annual command safety training on all safety policies and procedures detailed in this Instruction. All personnel whose work exposes them to electrical hazards will take CPR certification training and maintain the qualification as long as they work around electrical shock hazards.

   b. Personal protective equipment (PPE). Personal protective equipment required for working on electrical and electronics equipment as detailed in Paragraph D.

   c. Personal apparel. Restrictions on personal apparel must be observed when conducting maintenance of electrical and electronic equipment:

      (1) Loose or wet clothing or clothing with exposed metal zippers, buttons, or fasteners must not be worn;

      (2) Electrically safe shoes/boots must be worn at all times and meet American Society for Testing and Materials (ASTM) F2413-05;

      (3) When working within four feet of exposed energized circuits, do not wear metal items, such as rings, watches, bracelets, earrings, other metal piercings, dog tags, or metal-framed eyewear

   d. Repair and maintenance safety rules. When working with electrical and electronic equipment, the following must apply:

      (1) Do not work alone. A safety observer, qualified in CPR and first aid, must always be present and have unobstructed access to the power panel circuit breakers for the equipment being repaired or maintained.

      (2) Personnel must notify their supervisor, or appropriate authority, of the location of the work to be done, equipment to be repaired or maintained, the name of the designated safety observer, estimated length of time to complete the work, actual

time work begins and when completed

e. Wire and antenna safety. When working with wires and antennas, the following safety rules must be observed:

(1) Wires.

(a) Insulate all wires and lead-ins;

(b) Verify correct signage (see para E.2 below);

(c) Ensure that screw threads, label plates, hinges (and so on) on electrical fittings are paint-free in order to maintain electrical contact and keep information readable;

(d) Do not place energized bare wires near flammable fuels and chemicals or in the path of personnel; and,

(e) Do not use metal pike poles, pruning poles, or ladders in the vicinity of energized open wires or antennas.

(2) Antennas. All personnel working on antennas must NOT:

(a) Lean against or grasp an antenna;

(b) Touch a radio or television antenna lead-in;

(c) Touch an antenna lightning arrestor while in contact with electrical ground; or

(d) Pass under power lines when operating vehicular equipment if the antenna on the vehicle does not have adequate clearance.

Note: Refer to Chapter 2, Paragraph L, Radio Frequency (RF) Radiation Hazards for additional guidance while working around antennas.

2. Prevention of high voltage and power line filter electrical hazards. To prevent high voltage and power line filter electrical hazards when working in the vicinity of high voltage circuits, or ship riggings and structures where RF voltages may be induced, the above safety rules must be followed. Personnel must:

a. Provide bleeder circuitry to prevent an electrical hazard when filtering primary power lines to reduce electromagnetic interference (EMI).

Note: Unless bleeder circuitry is provided, power line filter capacitors remain charged after power is withdrawn, thereby creating an electrical hazard.

b. Personnel must ensure that terminals are shorted before handling capacitors in accordance with (IAW) Reference (d).

c. Safety decals must be affixed to and clearly visible on all power line filters.

3. Required use of electrical equipment lock out/tag out procedures. Reference (e) dictates policy and expectations that must be followed to prevent the inadvertent energizing or startup of machinery, equipment, or systems, or the release of hazardous energy that could endanger personnel or equipment.

    a. For specific detail on the standard procedures and caution and danger tags, refer to the Equipment Lockout/Tags-Plus Tactics, Techniques, and Procedures, CGTTP 4-07.1 (series).

D. Personal Protective Equipment (PPE).

1. PPE use aboard CG vessels and shore stations must comply with Occupational Safety and Health Administration (OSHA) safety regulations and the Electrical Safety Program. For specific details on the Electrical Safety Program, see Reference (f), Chapter 08.

    a. Protective Face Shield. A protective face shield must be worn when handling, cutting, or grinding hazardous materials.

    b. Safety Goggles. Safety goggles must be worn when working with hazardous materials.

    c. Gloves. Rubber insulating gloves must be used to protect against electric shock and must be rated for:

        (1) Low voltages of less than 5,000 volts alternating current (VAC) to ground; or high voltage up to 17,000 VAC to ground.

        (2) Gloves rated for high voltages must be at least 14 inches in total length with a 4-inch gauntlet.

        (3) Leather protective gloves, or glove shells, must be used over rubber insulating gloves to protect them from physical damage.

        (4) Rubber insulating gloves must be carefully inspected before each use. If any defect or damage is found, gloves must be discarded and replaced. See OSHA standard 1910.137, Electrical Protective Equipment (29 C.F.R. § 1910.137) for glove classification and inspection procedures.

    d. Footwear. Electrically insulated boots/shoes must be worn when working with electrical and electronic equipment. When working on live electrical circuits of 30 volts or more, non-conductive shoes that meet ASTM International Standards F 2412-05, Standard Test Methods for Foot Protection, and F 2413-05, Standard Specification for Performance Requirements for Foot Protection must be worn.

    e. Jewelry. Technicians should not be wearing any rings, watches, necklaces (to include badge lanyards), or similar items while performing maintenance work.

E. Safety Equipment, Devices, and Signs.

1. Safety Equipment and Devices. The following policies apply:

   a. Safety equipment and devices must always be readily available and maintained in a ready-to-use state. Where practical, the use of safety boards for the mounting of safety equipment in electronics spaces is preferred.

   b. Shorting probes, rated at 25,000 volts, must be located conspicuously in all spaces where electronic equipment is installed.

   c. Various safety devices (such as interlock switches) are incorporated in some electrical equipment. These devices automatically interrupt the power source to the equipment when the access door, cover, or plate is removed. Safety devices must be periodically inspected and tested as per preventive maintenance instructions to ensure that they are functioning properly. *It is prohibited to disable safety interlocks.*

   d. Rubber Floor Matting. The Commandant, Office of Naval Engineering (CG-45) approves the type of rubber floor matting used by the CG.

      (1) Rubber floor matting must be approved and in compliance with the specifications contained in Matting or Sheet, Floor Covering Insulating for High Voltage Application, MIL-DTL-15562 (series).

      (2) Rubber floor matting must be properly installed and maintained in open spaces around electrical and electronic equipment aboard ships and at shore facilities and must not be waxed as the wax serves as a conductor. Matting with cracks, tears, or any type of deterioration must be replaced. The covering of high traffic areas within electronics spaces with runner strips of matting of the same type as the permanently installed matting is highly encouraged.

      (3) The seams between the matting must be sealed according to manufacturer instructions. At a minimum, four-inch-wide electrical insulating tape must be used for sealing the seams.

      (4) Testing of rubber floor matting must be done in accordance with the ASTM D178 (Standard Specification for Rubber Insulating Matting) requirements or manufacturer instructions.

   e. Safety canes must be available in all electronic spaces, must be clean and free of dirt, oils and coatings that can conduct electricity.

2. High Voltage, Danger, and Warning Signs. Must be posted where appropriate, aboard ships and at shore facilities.

   a. A labeling plate must be affixed to equipment with more than one power source that is 12 volts VAC or 30 volts direct current and higher. The labeling plate must indicate that the equipment has multiple power sources and be affixed to the

equipment in a conspicuous place.

b. A 7 ½ inch by 4-inch cardboard safety tag, with an attached cord, must be attached to equipment when personnel are working on circuits. An example, the required wording for safety tags is, "*Do Not Throw Switch, Tech at Work on Circuits*".

c. A danger sign for working-at-heights must be posted whenever personnel are servicing equipment on masts or towers.

d. A warning sign must be posted in all spaces where explosive vapors (such as fuel vapor, paint fumes, cleaning primers, and battery gases) may accumulate.

e. A description of CPR techniques must be posted in all electrical and electronic work areas.

F. Working-At-Heights.

1. General. Safety Policy and Requirements. Safety is a primary consideration to which all CG personnel must devote their complete attention whenever they are working on any elevated structure. The elevation and potential electrical hazards associated with tower and mast inspection, maintenance, and repair require adoption of extraordinary safety measures to protect the climbers from avoidable accidents. Cutter personnel must refer to local unit instruction or standard operating procedure before working aloft.

2. Towers. Towers are classified as elevated structures as defined by OSHA. All personnel engaging in construction, maintenance, repair, or inspection must use fall protection when working on any CG structure. Safety precautions also include the use of appropriate protective clothing to include the wearing of safety helmets, safety footwear, and eye protection, and protective clothing to protect personnel from injury while in the vicinity of a tower. A safety helmet is required to be worn by any person entering the tower drop zone, which is an area whose radius is 1/2 the height of the tower and centered on the tower axis.

a. When climbing to a height of 150ft or less a safety observer is required on the ground.

b. When climbing towers greater than 150ft in height the safety observer must join the primary climber on the tower and stay within 150ft of the primary climber, at all times.

c. The following are the minimum requirements to qualify an individual to climb elevated structures.

(1) The climber must be a responsible volunteer;

(2) The climber must be physically qualified and physically capable;

(3) The unit CO or OIC must recommend the climber in writing;

(4) The climber must have completed climbing certification training;

(5) On the first climb the climber must be accompanied by a current qualified CG climber and is familiar with the safety requirements and hazards outlined in this Instruction.

d. The climber must be issued a written qualification letter from the Strategic Operations Product Line overseeing the CG climbing certification program.

e. When using a ladder for ascent or descent, the climber must use a ladder safety climbing device, if installed.

f. Climbers must always be physically connected to the tower structure itself to include ladder side rails and not objects attached to the tower (e.g., antennas, cableways, etc.).

g. All PPE used must meet the standards of 29 C.F.R. § 1926.502, Fall Protection System Criteria and Practices, Subpart M. Fall protection anchorages are secure points of attachment for lifelines, lanyards, or deceleration devices, and are independent from the means supporting the worker.

h. Full body harness must meet requirements of Reference (g).

i. Shock absorbing fall restraint lanyards (also called deceleration lanyards) must meet requirements of Reference (g) and American National Standards Institute (ANSI) A10.32-2012. The lanyards are 6 ft. in length, thereby limiting free-fall to 6 ft. The shock absorbing portion of the lanyard must be attached closest to the wearer's body.

j. Connecting Hardware must have double-acting or 2-step safety locks. Shackles, clevis, carabineers, and hooks are the four common hardware connecting devices. All connecting hardware must have a minimum tensile strength of 5000 pounds and must be proof tested to a minimum of 3600 pounds.

3. Pre-Climb Safety.

a. Pre-mobilization planning; Prior to any work on an elevated structure the following must be evaluated by the supervisor:

(1) Inspection and evaluation of structure integrity for a safe ascent.

(2) The skill and experience of each member of the crew assigned to perform the work.

(3) Any special equipment that will need to be acquired and any special training or training reviews that must be performed before work begins.

(4) Select the type of equipment that will be required and the individual worker's training and skill with that equipment. All equipment must be inspected by the climbing supervisor and climber prior to ascending any elevated structure. Any

damaged or defective equipment must be disposed of and replaced accordingly.

(5) Any special fabrication required for safety before work begins.

(6) The emergency services available near the site and whether emergency services can respond in a timely manner.

(7) Ask available emergency services to establish that they have the equipment, skills, and response time to rescue a climber in the expected environment. These services should be given directions to the site.

(8) The location of the nearest medical facilities. Every member of the crew should have access to a route map.

(9) The phone numbers of emergency facilities, accessible to all members of the ground crew. Work at remote locations require a means of positive communications.

(10) The familiarity of each climber regarding the location AND operation of any rescue equipment and location of a first aid kit.

(11) The tower should not be climbed in inclement weather, when electrical storm activity is forecast, or when fog obscures that portion of the tower to be climbed, unless unit CO deems it necessary (see F.3.a.12).

(12) In locations where fog is present, unit CO approval must be obtained. Extreme caution must be exercised during such climb. The climber and safety observer are must be equipped with working two-way radios and radio checks must be conducted at 5 minutes intervals.

(13) The tower must be de-energized for mounting, climbing, and dismounting.

(14) Real-Time Risk Assessment: All units shall use GAR 2.0 to conduct a real-time risk assessment prior to engaging in operations or activities that expose personnel to hazards and conduct updates throughout executions if conditions change as per Reference (h).

(a) Supervision – considers how qualified the supervisor is and whether effective supervision is taking place (i.e. a supervisor who is actively involved in the task may be more distracted and should not be considered an effective safety observer).

(b) Planning – should consider how much information you have, how clear it is, and how much time you have to plan the evolution.

(c) Team Selection – should consider the qualifications and experience level of the personnel involved in the evolution.

(d) Team Fitness - should consider the physical and mental state of the crew.

(e) Environment – should consider factors such as time of day, temperature, humidly, precipitation, wind conditions, etc.

(f) Event/Evolution Complexity – should consider both required time to complete evolution and the situation (i.e. environmental exposure).

G. Working with Energized Electrical Equipment.

1. General. A maximum degree of alertness and care is required when working on energized electrical equipment or circuits. The equipment or circuits may be internally damaged and create a potentially deadly safety hazard. Therefore, personnel must observe all safety precautions for working on electrical equipment, and refrain from working on energized equipment until it is verified that all portions of the circuit are de-energized.

2. Circuits above 300 Volts AC/DC. Appropriate tests to measure the voltages must be performed as per Reference (d) before working on energized circuits rated at more than 300 volts.

3. Cardiopulmonary Resuscitation (CPR) training. The EMO, senior technician, or supervisor is responsible for ensuring that all personnel who work with energized electrical equipment receive annual CPR and automated external defibrillator (AED) training as per Reference (i).

H. Safety Standards for Electronic Workbenches.

1. The Unit Safety Officer and Shop Supervisor are responsible for jointly determining the most practical and safe workbench installation in specific situations.

2. All electronic workbenches must comply with, or exceed, the standards contained in Reference (d).

3. All electronic workbenches must have a means of disconnection that is easily accessible from each workbench and piece of electronic equipment.

4. If power panels or circuit breakers are not located in the same room and easily accessible from the workbench, power kill switches or disconnects must be installed and conspicuously marked.

I. Safe Handling of Batteries.

1. Lead Acid Batteries. These batteries normally come under the cognizance of the Engineering Department. In some instances, however, ETs may be responsible for working with, or around, lead acid batteries.

a. Lead acid batteries are an explosive hazard and stored in a fully charged state.

Hydrogen gas, which is highly explosive, is released when lead acid batteries are charged. The following safety rules apply:

(1) No smoking, open flame or radio usageuse of equipment that emits a radio frequency (to include personal cellular devices);

(2) Do not generate sparks from electric/hand tools;

(3) When handling or filling lead acid batteries personnel must use appropriate protective equipment to include, but not limited to the following: safety goggles, insulated rubber gloves, and a rubber apron.

b. Personnel must ensure any sealed compartment is appropriately ventilated before turning on a light, making or breaking electrical connections, or performing other work in the compartment.

2. Nickel Cadmium (NiCad) Batteries.

a. In general, the safety practices for handling lead acid batteries described above apply to NiCad batteries.

b. When servicing NiCad batteries, do not wear metal jewelry or watches, metal-framed eyewear, or other similar metal items.

c. Units must store Lead Acid and NiCad batteries as per U.S. Naval Ships' Technical Manual Chapter 400.

3. Lithium Batteries. Lithium batteries or cells are potential hazards if tampered with or misused before, during, and after discharge. Lithium batteries can explode while rapidly discharging and up to thirty minutes after discharge. Personnel must take the following precaution:

a. Carefully handle.

b. Do not pierce, crush, burn, or intentionally drop.

c. Do not dismantle, cannibalize, or modify.

d. Do not short circuit or use in equipment other than that specified.

4. Disposal. Additional information on safe handling and disposition of batteries is found in Reference (j).

J. Chemical and Explosive Hazards.

1. General. Personnel who work with electrical and electronic equipment may come into contact with various dangerous chemical and explosive hazards. If not handled properly, these hazards can be deadly. Electronic personnel must be familiar with and follow all safety and health practices when working with, or around, these hazards and must

familiarize themselves with References (i) through (k).

2. PPE. PPE must be used, as applicable, when working with chemical and explosive hazards. PPE used in specific situations is described in Table 1 below.

When working…	**Then use…**
With acids and alkalis	Safety goggles and a face shield Corrosion-resistant rubber gloves, and rubber apron
Around potential flying hazards such as glass, metal, or other particles (e.g., grinding, sanding, or chipping paint)	Safety goggles and a face shield
Any vacuum tubes, particularly high voltage vacuum tubes (The plate (anode) voltages can easily pass through skin and there are heater elements inside the tube)	rubber insulating gloves rated at 5,000 volts, and leather protective gloves (glove shells).
On a job that requires you to immerse your hands in a solvent	synthetic rubber or plastic-coated gloves.

Table 2-1 – Required use of PPE

3. Safety Equipment. The following details safety equipment that must be used for protection from chemical and explosive hazards.

   a. Ventilating equipment. Ventilating equipment must be used to remove dangerous gases and vapors from confined or unventilated work areas, and rooms or spaces. Ventilating equipment must be always maintained in good working order. A Gas Free Engineer authorization may be required for certain sealed or confined spaces.

   b. Intrinsically safe, non-sparking equipment and tools. The use of portable electric tools or spark producible hand tools may cause a fire and/or explosion. Therefore, when working in the vicinity of volatile gases or other combustibles, personnel must use equipment designated as explosion-proof or non-sparking.

   c. Chemical neutralizers must be locally stocked and made readily available to neutralize a corrosive liquid that may come into contact with the body (e.g., battery acid).

4. Emergency Eyewash Facilities. Emergency eyewash facilities that meet ANSI Z358.1 (American National Standard for Emergency Eyewash and Shower Equipment) requirements must be provided in all areas where chemicals are used and stored.

5. Handling PCBs. Transformers and capacitors that contain PCBs may be installed in operating equipment or stored as spares. These items may continue to be used until they fail.

a. Transformers and capacitors must be identified as containing PCBs and inspected weekly for signs of leakage.

b. PCB-contaminated transformers and capacitors that have failed must be properly disposed of and replaced IAW Reference (j).

6. Handling Cathode Ray Tubes (CRTs). Larger CRTs increase the danger of implosion, flying glass, and the possibility of injury or severe shock from high voltages. In addition, some CRTs use phosphors, which contain small amounts of the harmful chemical beryllium. Further, the coating on some tubes is poisonous when absorbed into the blood stream. CRTs are not dangerous if handled properly. However, when mishandled they may cause severe injury or death.

a. PPE. When handling CRTs, the following personal protective equipment is required:

(1) face mask or shield with side and front protection and clear glass lenses, and

(2) rubber insulating gloves rated at 5,000 volts with leather protective gloves (glove shells).

b. Personnel must ensure that clothing leaves no part of their body exposed to glass splinters in case the CRT implodes

c. Disposal. Contact the United States Environmental Protection Agency for procedures on safe handling and disposition of CRTs.

K. Radioactive Material Hazards.

1. General. Radioactive materials are sources of ionizing radiation. Gamma rays, X-rays, and the higher energy ultraviolet part of the electromagnetic spectrum are ionizing radiation, whereas the lower energy ultraviolet, visible light, nearly all types of laser light, infrared, microwaves, and radio waves are non-ionizing radiation. Ionizing radiation exists in two forms - electromagnetic radiation (consisting of photons) and particulate radiation (consisting of particles). Exposure to ionizing radiation can occur externally from a source in the environment, or internally by inhaling, ingesting, or absorbing airborne particles of radioactive material into the body. The biological damage to body cells and tissues is the same whether radiation exposure is external or internal. Non-ionizing radiation can still cause burns and other minor health issues. Radioactive materials are used in some components of electronic equipment and the most common source of ionizing radiation is the radioactive electron tube. If a tube breaks, the radioactive material is released into the environment. The types of radioactive materials contained in tubes include carbon (C4), cobalt (Co60), cesium (Cs37), nickel (Ni63), and radium (Ra226).

2. Handling of Radioactive Electron Tubes. Intact radioactive tubes do not present a radiation hazard. Therefore, personnel must exercise extreme care when handling radioactive electron tubes to prevent damage and protect themselves and others from exposure to radiation.

a. Radioactive electron tubes must be labeled as a radiation hazard IAW MIL-HDBK-600, Military Standardization Handbook: Guidelines for Identification, Marking, Labeling, Storage, and Transportation of Radioactive Commodities.

b. The following supplies must be available in all spaces where radioactive electron tubes are handled:

(1) First aid supplies for treating wounds from a broken tube; and

(2) Radioactive tube cleanup kit to decontaminate an area in which a tube has broken.

3. Working with Radioactive Electron Tubes.

a. The procedures for responding to radioactive contamination are contained in Reference (i).

b. Disposal. Radioactive electron tubes containing radium are retained locally to determine whether they contain a less hazardous form of radium (Ra226).

(1) Tubes containing Ra226 are exempt from disposal as radioactive material and may be disposed of as normal solid waste, as long as the rules for disposal listed below are followed:

(a) No more than ten tubes per year may be disposed of as normal solid waste; and

(b) The radioactive hazard warning labels on the tubes must be removed or completely obscured before disposal.

(2) Tubes containing radioactive materials other than Ra266 are to be dispose of as per Reference (j).

L. RF Radiation Hazards; HERP, HERF and HERO.

1. General. Personnel who work with RF equipment may be exposed to low levels of RF radiation with little effect. However, exposure to high levels of RF radiation can cause significant biological tissue damage and may be deadly. The hazards of electromagnetic radiation to personnel (HERP) are the thermal effects on the human body from high levels of RF radiation such as tissue damage. Tissue damage results primarily from the body's inability to cope with or dissipate excessive heat. The eyes and reproductive organs are particularly susceptible to tissue damage from high frequencies. Further, RF radiation can induce a current on improperly grounded or ungrounded conductors, such as metal objects (poles, fences, or wires) or wet objects. Touching a conductor with an induced current, a discharge path (shock) could occur and result in RF burns. Therefore, personnel working with, or around RF hazards must be familiar with and follow all safety and health practices and must familiarize themselves with the following references:

a. DoD Safety and Occupational Health (SOH) Program, DoDI 6055.01. The

Instruction contains updated policies, procedures, and responsibilities for administering a comprehensive DoD SOH program.

b. Federal Communications Commission (FCC) Office of Engineering and Technology (OET) Bulletin 65, Edition 97- 01, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. This bulletin contains complete information on FCC policies, guidelines, and compliance-related issues concerning human exposure to RF fields. Users of this resource should also refer to, FCC OET and Technology Publication KDB 447498 D03 RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices.

c. FCC OET RF Safety Frequently Asked Questions. This document addresses frequently asked questions about the safety of RF and microwave emissions from transmitters and facilities regulated by the FCC.

2. Maximum Permissible Exposure (MPE) Limits. MPE limits define the maximum time and intensity of RF fields that an individual can be exposed to without sustaining injury. The published guidelines for evaluating human exposure to RF emissions can be found in the Institute of Electrical and Electronics Engineers (IEEE) Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz (IEEE Standard C95.1 (series)) and is also referenced in DoDI 6055.11. The MPE limits are based on recommendations of the National Council on Radiation Protection and Measurements, and limits developed by the IEEE that were adopted by ANSI.

a. The average exposure time limits—that is, the maximum time that an individual can be exposed to RF radiation before probability of tissue damage is detailed in References (f) and (g).

b. Compliance with Averaging Exposure Time Limit for Occupational Population. Because MPE time limits are very restrictive for higher powers and frequencies, extensive work cannot be accomplished while equipment is energized. The Planned Maintenance System (PMS) procedures must be adapted to comply with the MPE time limits.

Example: The procedure could be adapted to restrict the time near the RF field or require that work on or near the RF field is performed when the power is appropriately reduced.

c. Exposure to an electric or magnetic field or power density higher than the occupational population MPE limits must not exceed 6 minutes as per DoD SOH Program, DoDI 6055.01

d. Compliance with Averaging Exposure Time Limit for General Population. In areas accessed by the public, exposure to an electric or magnetic field or power density must never be higher than the general population MPE unless time averaged over a period of less than 30 minutes. For example, maximum exposure could be reached in 15 minutes if individuals were exposed to a field twice the MPE limits. When CG

personnel in the general population category are in areas where they may be exposed (such as passage and transit areas), their time in the area must not exceed 30 minutes or a fraction there of as the example above indicates.

3. Permissible Exposure Limit (PEL) Boundaries. A PEL boundary physically marks an area as a radiation hazard zone and is used to define and restrict areas where RF radiation may exceed the general population MPE limits, and ensures technicians are aware of their averaging time limits.

   a. Radiation Hazards (RADHAZ) warning signs must be posted at all PEL boundaries.

   b. Establishing PEL boundary distances.

      (1) CG-9 shall establish a contract with U.S. Naval Surface Warfare Center Dahlgren, Virginia for the purpose of establishing the PEL limits and boundaries for any new vessel or facility acquisitions.

      (2) C5ISC ESD Architecture and Standards Branch (ASB) shall ensure that any changes to the PEL boundaries due to equipment changes are included within the project scope and detailed in updated ships class drawings or shore installation drawings.

      Note: The distances for existing transmit antennas can be found in ships class drawings or shore installation drawings.

   c. PEL Boundaries at Shore Units. The boundaries at shore units must restrict access to areas where exposure exceeds the MPE limits for the general population. The methods for restricting access include:

      (1) Locking doors to the restricted areas.

      (2) Installing a PEL fence with a lockable gate.

      (3) At remote sites, not generally visited by the general population, an RF RADHAZ sign may be considered as the PEL boundary.

      (4) PEL fences are generally used at shore-based broadcast sites, such as Vessel Traffic System radar sites, remote fixed facilities, and remote communication facilities.

      (5) PEL Boundaries at Broadcast Sites. CG broadcast sites to include remote communications facilities (formerly Communications Stations) use different antenna types due to varying environmental conditions, specific broadcast requirements, and surrounding structures. Therefore, generic radiation hazard controls cannot be established at these sites and unit commanding officers in conjunction with C5ISC and CEU Miami must establish appropriate PEL boundaries for each site and periodic radiation hazard surveys based on equipment changes.

(6) PEL Boundaries at Radar Sites. Most CG radar sites operate in the super high frequency band with output powers as high as 30 kW and antennas with very high gains (+25 dB). However, due to the narrow bandwidth and pulse nature of radar operations, the radiation hazard from radar antennas is relatively small. A PEL boundary is generally determined by measuring the distance of the radiation hazard when the radar antenna is rotating. The exact level of RF energy and data used to establish PEL boundaries for radar antennas are determined by C5ISC-ESD-ASB using a radiation hazard meter and induced current meter and probe. The established PEL boundary must ensure that affected personnel can work within the area during normal radar operations.

(7) PEL Fence Requirements. The requirements for PEL fences are as follows:

(a) Proper installation of a PEL fence is essential to reduce the potential for RF burns and electric shock and limit unauthorized access on the broadcast site. Therefore, all PEL fences must be properly grounded or made of non-conducting material.

(b) Warning signs must be appropriately posted on PEL fences. At a minimum, the following signs must be posted on a PEL fence:

1. Type 1 RF RADHAZ warning signs posted on each face of the fence; and

2. Type 2 RF RADHAZ signs posted on each gate or entry way.

d. Radiation Hazard Policy.

(1) A radiation hazard policy for each ship must be established as a unit instruction. The instruction may encompass various measures, depending on the extent and level of the radiation hazard. These measures can include temporarily restricting access to a section of the ship where equipment is operating or limiting the power or frequency range when the general population is in the area. Due to the distinct layout and equipment of each unit, the PEL boundaries for ships vary, even among ships within the same class.

(2) To mark a PEL boundary as a restricted area on a ship it must be a painted red line or circle, four inches in width, with white lettering, warning of the presenceents of possible radiation hazards. Reference the ships drawings for a specific class to find the PEL boundary descriptions.

(3) When an antenna is used for more than one frequency range, differing power levels, or there are overlapping PEL boundaries, the PEL boundary must mark the largest area of the restricted zone.

4. Hazards of Electromagnetic Radiation to Fuel (HERF) and Hazards of Electromagnetic Radiation to Ordnance (HERO). HERF and HERO occur when the operation of electronic transmitters used for radio and radar induce RF voltages in the standing rigging, parts of the superstructure, and other antennaes and/or cables, it can arc between

closely spaced conductive metal objects or cause sparks when contact is made or broken. It can also contain sufficient energy so that the heat of the arc (or spark) ignites fuel vapors or other explosive mixtures.

a. Each unit must maintain HERF safety instructions to prevent explosions or fires in areas where gasoline vapors are present, during fueling of aircraft, and when handling volatile liquids or gases.

b. Each unit must maintain a HERO safety plan to limit the exposure of ordnance to RF energy. During loading and unloading of ordnance, RF energy can enter a weapon as a wave radiated through a hole or crack or can be conducted into the weapon by the firing leads or other wires penetrating the weapon enclosure.

c. The following HERF and HERO safety practices apply.

(1) Inform personnel involved with the evolution of the potential hazards of HERF/HERO.

(2) Unit personnel must ensure an electrical, static ground wire, tie-down, or other metallic connection is made before an aircraft or vehicle on deck is fueled and that this connection is maintained until fueling operations are complete.

(3) Units must secure all RF transmission (radio and radar) onboard the vessel or aircraft during fueling operations along with transmissions from transmitters on adjacent vessels, aircraft or vehicles.

(4) Units must install and maintain HERF/HERO RADHAZ warning signs as appropriate. These signs are used to ensure that personnel follow the HERO safety practices.

5. Command Responsibilities for HERP, HERF and HERO Training and Compliance.

a. The Command is responsible for the following:

(1) Each unit must conduct RF radiation hazard awareness training IAW Reference (k).

(2) Ensuring that RF radiation levels are measured as per Reference (k).

(3) Ensuring PEL boundaries are established, clearly marked, and consistently maintained.

b. Training. All units with identified RF radiation hazards must provide training to CG personnel and contractors before being assigned to areas where RF radiation levels exceed the MPE limits. The training must provide information on the potential hazards of RF radiation exposure, established procedures and restrictions to control exposure, and responsibility of personnel to limit their own exposure. Annual refresher courses must be conducted and may be incorporated in other safety training

programs.

6. Requirements and Specifications for RF RADHAZ Warning Signs. Units must post RF RADHAZ warning signs in locations where they are clearly visible and mark, as precisely as possible, the area of the radiation hazard. In areas where multiple hazards exist, it may be necessary to post more than one type of warning sign.

Note: Do not post warning signs indiscriminately. The effectiveness of the warning is reduced when there are an excessive number of signs.

a. Determining Types of RF RADHAZ Warning Signs to Post at PEL Boundaries. To determine which types of RF RADHAZ warning signs to post at a PEL boundary, all entries to restricted areas from the PEL boundary (such as scuttles or hatchways from inside the superstructure of the ship or ladders installed topside) must be inspected.

Note: Metallic Type 3 signs are a burn hazard. Use only *nonmetallic* Type 3 signs within a PEL boundary or in the near field of antennas.

b. Specification Description.

(1) Base material outdoor white vinyl, 0.004 inches thick, with permanent acrylic adhesive backing or mechanical methods.

(2) Shape: Diamond

(3) Colors: Red and yellow checked border on upper section of triangle, and Black lettering on lower section of triangle.

(4) Sizes:

(a) Five-inch size for normal shipboard use.

(b) Twelve-inch size for shore installations and flight decks.

(5) Print process:

(a) Black ink for lettering.

(b) Ultraviolet ink for screen printed labels (for maximum durability).

c. Requirement for Procuring RF RADHAZ Warning Signs. RF RADHAZ warning signs must be procured through the appropriate government program.

Note. The national stock number (NSN) for each type of RF RADHAZ warning sign can be found in this section and in the Federal Logistics system.

d. Type 1 RF RADHAZ Warning Sign.

(1) Use. Type 1 RF RADHAZ warning signs are used in areas surrounding RF antennas to advise personnel not to remain within the PEL boundary longer than

the MPE time limit allows.

(2) Placement:

(a) Outside the PEL boundary at eye level (or where they can be seen easily); and,

(b) at each end of the boundary, if applicable.

(3) NSN for ordering Type 1 RF RADHAZ Warning Signs.

(a) Five-inch: 101/5 7690-01-377-5893

(b) Twelve-inch: 101/12 7960-01-377-5894

Figure 2-1 Type 1 RADHAZ Sign

e. Type 2 RF RADHAZ Warning Sign.

(1) Use: Type 2 RADHAZ warning signs are used to restrict personnel from proceeding past a designated point unless they are following established radiation hazard safety procedures.

Note: Units are responsible for instituting radiation hazard safety procedures.

(2) Placement: Type 2 RF RADHAZ warning signs should be posted at eye level on doors or between handrails of inclined ladders. When used as a temporary barrier, Type 2 signs should be posted at waist level on a non-metallic rope.

(3) NSN for ordering Type 2 RF RADHAZ Warning Signs:

(a) Five-inch: 102/5 7690-01-377-5895

(b) Twelve-inch: 102/12 7960-01-377-5082

Figure 2-2 Type 2 RADHAZ Sign

f. Type 3 RF RADHAZ Warning Sign.

(1) Type 3 RF RADHAZ warning signs are used to advise personnel of an RF burn hazard source and not to touch metal objects or use special handling procedures when touching metal objects.

(2) Placement: Type 3 RF RADHAZ warning signs should be posted on, or in the vicinity of, an RF burn hazard source where it can be seen easily. If the burn hazard source is large, additional signs should be posted around the source from each direction. When Type 3 signs are used on cargo railing or running rigging, the signs should be mounted on the hook insulator to warn personnel not to touch the wire or rigging above the insulator.

(3) NSN for ordering Type 3 RF RADHAZ Warning Signs:

(a) Five-inch: 103/5 7690-01-377-5896

(b) Twelve-inch: 103/12 7960-01-377-9905

Figure 2-3 Type 3 RADHAZ Sign

g. Type 4 RF RADHAZ Warning Sign.

(1) Use: Type 4 RF RADHAZ warning signs are used to warn personnel of HERF;

(2) Placement: Type 4 RF RADHAZ warning signs should be posted above aviation and automotive gasoline fueling stations;

(3) NSN for ordering Type 4 RF RADHAZ Warning Signs:

(a) Five-inch: 104/5 7690-01-377-5899

(b) Twelve-inch: 104/12 7960-01-377-5900

Figure 2-4 Type 4 RADHAZ Sign

h. Type 5 RF RADHAZ Warning Sign.

(1) Type 5-"WARNING RADIO FREQUENCY HAZARD (SPECIAL CONDITION)" The type 5 sign has a blank area for filling in special safety precautions. Its purpose is to advise personnel of procedures to follow when other RADHAZ warning signs are not appropriate. Examples of directions that can be filled in on a type 5 sign include:

(a) Inform the Officer of the Deck (OOD) before placing system in radiate mode.

(b) In manual mode, do not depress below horizon between __ and __ degrees relative.

(c) Ensure that temporary exclusion barriers are in place before radiating.

(d) Do not stop antenna between __ and __ degrees when radiating. (2) Placement: Type 5 RF RADHAZ warning signs should be posted near the applicable controls (such as the radiate switch or antenna control switch) where they be seen easily by the system operators during normal operations.

Note: Do not cover or obscure switch labels, meters, indicators, or nameplates when posting Type 5 signs on system cabinets or control panels.

(2) NSN for ordering Type 5 RF RADHAZ Warning Signs:

(a) Five-inch: 105/5 7690-01-377-5374

(b) Twelve-inch: 105/12 7960-01-377-5375

Figure 2 -5 Type 5 RADHAZ Sign

i. Type 6 RF RADHAZ Warning Sign.

(1) Use: Type 6 RF RADHAZ warning signs are used to advise personnel not to operate transmitters, cellular telephones, or other wireless communication devices within a designated area.

Note: Personnel who are not familiar with Command requirements for transmitter operation should check with the OOD before operating transmitters.

(2) Placement: Type 6 RF RADHAZ warning signs should be posted at eye level on the door to a space, and at various places inside the space, where classified information is processed.

(3) NSN for ordering Type 6 RF RADHAZ Warning Signs:

(a) Five-inch: 106/5 7690-01-377-5444

(b) Twelve-inch: 106/12 7960-01-377-5447

Figure 2-6 Type 6 RADHAZ Sign

j. Type 7 RF RADHAZ Warning Sign.

(1) Use: Type 7 RF RADHAZ warning signs are used to ensure that personnel follow the HERO safety practices.

(2) Placement. Type 7 RF RADHAZ warning signs should be posted in areas where ordnance is loaded and near unit magazines.

(3) NSN for ordering Type 7 RF RADHAZ Warning Signs:

(a) Five-inch: 107/5 7690-01-377-5901

Figure 2-7 Type 7 RADHAZ Sign

k. Type 8 RF RADHAZ Warning Sign.

(1) Use: Type 8 RF RADHAZ warning signs are used to advise operators to refer to the unit Hazards of HERO Emission Control Plan before operating a transmitter and ensure that the procedures for restricting RF emissions are followed.

(2) Placement: Type 8 RF RADHAZ warning signs should be posted at eye level near transmitting equipment in the radio room and combat center.

(3) NSN for ordering Type 8 RF RADHAZ Warning Signs:

(a) Five-inch: 108/5 7690-01-377-5902

Figure 2-8 Type 8 RADHAZ Sign

CHAPTER 3. MAINTENANCE AND LOGISTICS

A. General. The goal of maintenance is to ensure acceptable material availability to perform assigned missions at the optimal life-cycle cost to achieve affordable readiness. The objective of maintenance is to ensure systems can meet all scheduled operational requirements while being fully functional within the confines of the resources and funding available. Optimization of system readiness is accomplished by preventing or mitigation of equipment casualties that degrade mission capability. The most effective maintenance programs are achieved through the efficient use of available resources and processes (e.g., time, people, funding, pooling, etc.). In those instances where it is not possible to achieve full mission capability status, risk management must be employed by the maintenance supervisor to make decisions concerning as to when specific repairs must be accomplished and advise the command on its impact to mission effectiveness. Policies in this Chapter are guided by Reference (a).

B. Maintenance Procedure Card (MPC). MPCs are formulated through a well-defined process that incorporates RCM. This process is guided by Original Equipment Manufacturer technical information and substantial technical expertise, and the final content is subject to approval by the specific SFLC PL and the C5ISC. See Joint MPC Development Process Guide, CGTO PG-85-00-230-G. Field units are a critical part of this development process by providing field validations as well as necessary feedback via the Coast Guard Logistics Information System (CG-LIMS) Surface Technical Information Portal (STIP) CG-22 submission entry which can be entered and submitted electronically via CG-LIMS. Note: STIP CG-22 submission entries must be submitted individually. Do NOT list multiple documents in a single STIP CG-22 submission entry. Additionally, if there are errors in any field of the STIP CG-22 submission entry, you may NOT receive notification due to the volume of the STIP CG-22 submission entries being processed.

1. Recurring maintenance must not be conducted without a MPC approved by the applicable C5ISC PLM and associated SFLC PL.

2. MPC development consists of three maintenance phases before implementation on applicable equipment:

   a. Maintenance Planning Phase. The Maintenance Planning Phase begins with an originator's request to develop maintenance by submitting an STIP CG-22 submission entry, it may entail an RCM and the compilation of a Maintenance Requirements List and ends with the assignment of a task MPC number and being entered into the MPC development process workflow.

   b. Maintenance Development Phase. This phase is where the MPC is drafted in coordination with subject matter experts and system owners. MPCs drafted for new acquisition systems must be validated in the field by the cognizant subject matter experts.

   c. Maintenance Publication Phase. The Maintenance Publication Phase is a formal review which ensures the MPC meets CG specific format and standards. Then

officially published and put into the CG authorized technical information portal.

C. Levels of Maintenance. O-level and D-level maintenance are separated into two types of maintenance: Preventative (Scheduled) and Corrective (Non-scheduled).

1. Preventive Maintenance (PM). PM outlines minimum maintenance requirements and procedures to support electronic system operational availability. PM procedures are prescribed for inspecting, cleaning, testing or renewing equipment to counter the effects of age and the environment. Accomplishment of PM increases both system reliability and availability. The use of the PM is mandatory. CO/OICs must ensure that their personnel remain fully aware of PM requirements and that these mandatory procedures are thoroughly and properly carried out.

2. Corrective Maintenance (CM). CM is a maintenance task designed to restore equipment after a failure has occurred.

   a. If resources and authority exist, CM must be performed at the O-Level.

   b. In most cases, a failure will have a detrimental effect on the unit's mission capabilities, the unit's operating environment, or the safety of the unit's personnel. In this case, a Discrepancy Report in EAL must be used to document corrective maintenance needs that cannot be immediately resolved by the operating surface asset or in REMEDY for a shore asset.

Note: When a CG Cutter is deployed with a Navy Battle Group, the Cutter is required to not only log the discrepancy within EAL, but also must generate a Casualty Report as per CGTTP_6-01_3 Rev A.

3. Engineering Advisories and Technical Advisories. Are guidance provided to the surface fleet and CG shore support communities that have cutter/boat class or multi-class applicability and is temporary in nature. This temporary guidance will either be incorporated into new program policy documents, revisions to existing program policy documents, be the subject of a future Time Compliance Technical Orders (TCTO), expire when certain criteria are met, or the information contained is no longer applicable.

   a. PL Engineering Advisories are Engineering Advisories for a specific asset class or product line issued by the SFLC Product Line Manager.

   b. SFLC Engineering Advisories are Engineering Advisories whose applicability crosses PL boundaries. These Advisories are issued by the Engineering Board, chaired by the Chief of the ESD.

   c. Engineering Advisory may be proposed at any level in the organization through communications to the appropriate SFLC PL Manager or C5ISC PL Manager.

   d. All Engineering Advisories issued by SFLC will be maintained and stored on the SFLC Advisories site.

e. C5ISC issues Technical Advisories and are maintained and stored by C5ISC.

4. TCTO and Engineering Changes (ECs).

   a. TCTOs are the scheduling and deployment mechanisms used to accomplish ECs. A TCTO is a scheduled, one-time maintenance action assigned by vessel class and is applicable only to those units that are identified.

      (1) CG Message TCTOs are maintenance actions, issued in message format, used for rapid dissemination of information, generally of an urgent or safety-of-operation concern and is applicable to only one hull number per message. Message TCTOs that direct completion of an urgent EC must be followed up by a final EC to ensure all elements of the EC are completed prior to installation on the entire asset class.

      (2) SFLC is the issuing authority for surface TCTOs.

      (3) C5ISC and Shore Infrastructure Logistics Center (SILC) are issuing authorities for shore TCTOs.

      (4) SFLC maintains a centralized, web-based repository for all TCTOs issued. TCTOs are published in the CG authorized Technical Information Management portal.

   b. An EC is necessary to maintain configuration control on all assets and documents the physical changes, associated technical information, and the logistics that follow. An EC is implemented by issuing a TCTO to direct the asset to make the EC. Completion of the EC is indicated by the unit responding to the TCTO as completed. As per Reference (a), no member of the CG is authorized to change the configuration of any configuration item and respective configuration information without approval. Any equipment installed without an EC or associated TCTO is UNAUTHORIZED and must be removed until an approved EC or TCTO is issued.

5. Time Critical Maintenance Action (TCMA). A TCMA is a special type of Message TCTO that doesn't derive from an EC but may be a precursor to an EC being developed and deployed as a TCTO. A TCMA is used to obtain information or status of a specific system, component or part but are not a mechanism to implement any change to an assets configuration.

   a. A TCMA is issued in a message format used for the rapid dissemination of information generally of an urgent or safety-of-operation concern. TCMAs may be used to carry out the following maintenance actions:

      (1) AUDIT. An audit is used to examine engineering records for purposes of verification. It is not for use during initial component development.

      (2) CHECK. A check procedure is used to verify an operational standard for a system in place such as a Life Raft Release Mechanism or operational testing of a

Fire Extinguisher System.

(3) INSPECT. Inspect messages are used to determine the condition of a component or system by sight, feel, measurement or other means.

(4) REPORT. Report messages are used to direct a formal accounting or statement in detail of equipment or system. A formal account of the proceedings or transactions of equipment.

(5) SFLC maintains a centralized, web-based repository for all TCMAs issued. TCMAs are published in the CG authorized Technical Information Management portal.

(6) SFLC is the issuing authority for all surface TCMAs.

(7) The C5ISC and SILC are the issuing authorities for shore TCMAs.

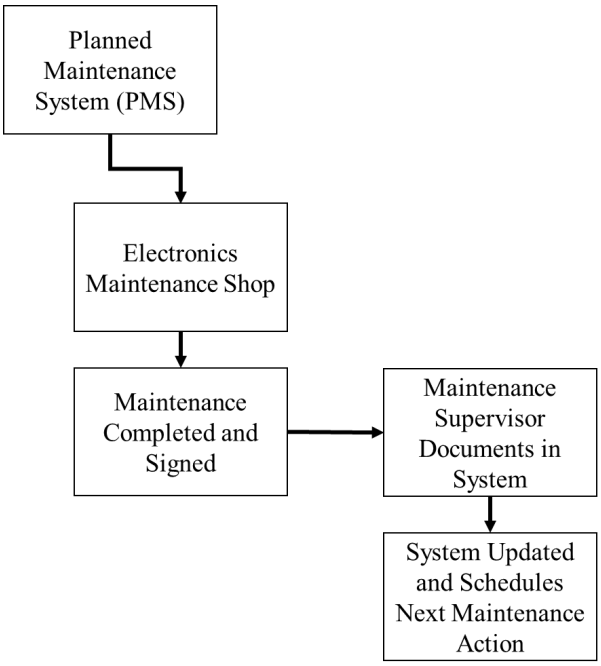
D. Maintenance Management. Documentation plays a vital role in maintenance management. The goal of maintenance documentation is to supply the CG with timely, comprehensive, and precise maintenance production data for planning, control, and analysis, while also creating an accurate record of completed work. It serves to provide performance data to managers at all levels and is crucial in the life cycle management of a maintenance information system. Furthermore, it assists in identifying problematic parts or items and in the development of annual budgets.

1. ETs must use the appropriate maintenance information system as a tool to obtain, track and execute maintenance schedules, create work lists, and identify and report problems with PMS.

   a. All maintenance records must be associated with a configuration record.

   b. The SFLC PL designates which maintenance scheduling tools must be used by all afloat units and is responsible for publishing procedures as per approved joint maintenance development standards.

   c. The C5ISC is responsible for designating the maintenance scheduling tools used by supported shore-side units. Additionally, they are responsible for publishing procedures in accordance with approved joint maintenance development standards.



Planned Maintenance Example

The Planned Maintenance System (PMS) automatically generates a planned maintenance action. This action is then distributed to the technicians for service on the specified equipment. Once completed, the technician returns the signed completion sheet to the maintenance supervisor. The supervisor then updates the information into the system which then automatically schedules the next maintenance action on that equipment.

Figure 3-1 Planned Maintenance Example

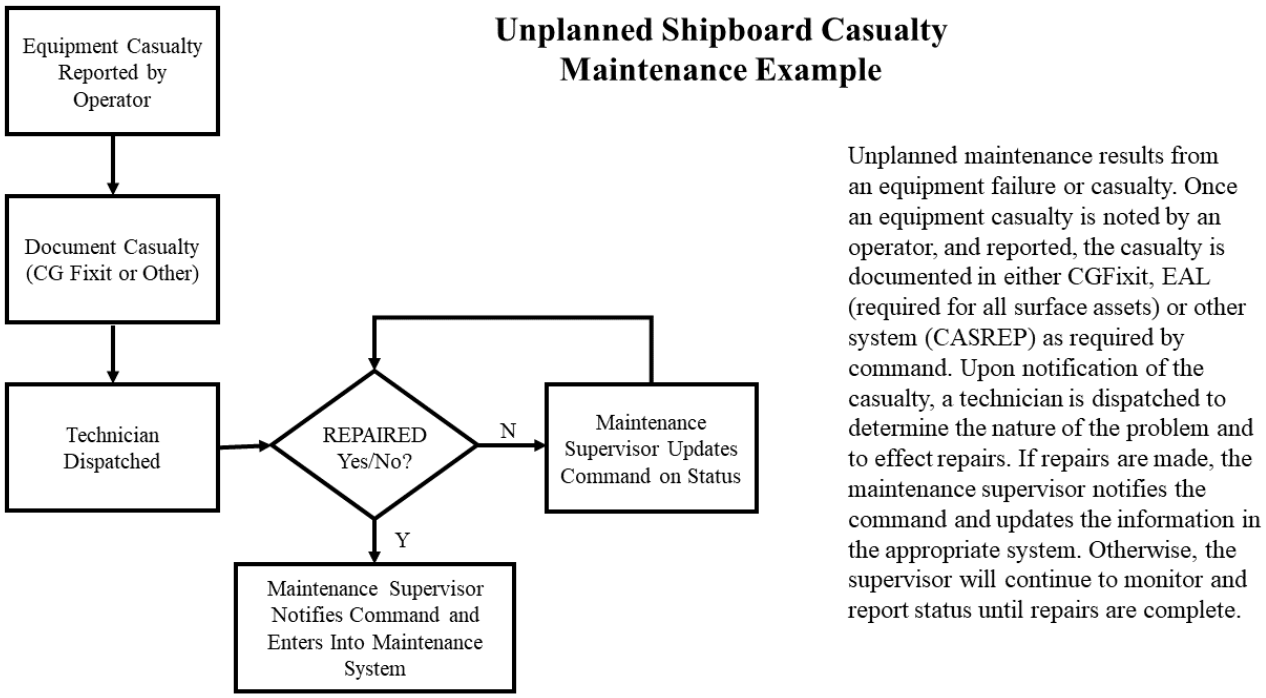


Figure 3-2 Unplanned Maintenance (Casualty) Example

E. Engineering Waivers. An engineering waiver MUST be authorized by the SFLC Command PL or the Operational Commander when maintenance is deferred due to supply, manpower, or operational necessities. Engineering waivers are issued only after a thorough assessment of the risk to equipment, personnel, performance of its missions, or operating limitations must be placed on the asset. Engineering waivers will be limited in scope and provide definitive criteria when the waiver will no longer apply.

F. Electronic Systems Support Detachment Supervisors. Electronic Systems Support Detachment Supervisors must develop organizational maintenance schedules and coordinate accomplishment of D-Level maintenance during availability for their maintenance assets.

G. U.S. Navy (USN) Electronics.

1. General. This section establishes policies as they pertain to maintenance of USN electronics equipment aboard CG assets. USN electronics are classified as either Navy Type/Navy Owned (NT/NO) or Navy Type/Coast Guard Owned (NT/CGO) in order to establish the appropriate funding used for maintenance and capability sustainment.

2. NT/NO Electronic Equipment. In order to execute the CG's Defense Readiness Mission, many classes of CG cutters and aircraft are equipped with NT/NO electronic equipment, including combat weapons systems, sensors, and communication equipment, during their initial acquisition and throughout their lifecycles. All CG units with installed NT/NO equipment must adhere to relevant USN standards for the maintenance of such

equipment.

3. Reference (l) requires the USN to supply the CG with combat weapons systems, sensors, and communications equipment as government-furnished equipment (GFE). This includes providing sustainment funding for logistical support to fulfill the CG/USN Naval Operational Capabilities War Time Readiness requirements.

   a. While the Navy provides equipment as GFE, the Coast Guard is responsible for the development of required Engineering Changes (ECs), including the development of drawings and integrated logistics artifacts (leveraging USN logistics as available and appropriate), as well as installations, testing and certifications (TEMPEST, Integration, System Operation & Verification Tests (SOVTs), and Cybersecurity approvals (e.g., ATOs). These activities are funded by Coast Guard financial Program, Project, or Activity and executed by Coast Guard sponsored billets.

   b. The Coast Guard performs Life-Cycle Management (LCM) of its assigned NT/NO systems. CG-68 and the C5ISC are working with the Navy Type/Navy Owned (NT/NO) Combat Systems Management Division (CG-453) to define requirements and resource needs to reestablish NT/NO C5I LCM roles, functions, and staff elements, that were eliminated through the CG-453, CG-6, and C5I Service Center Organization Modification Requests.

4. The Navy Type/Navy Owned (NT/NO) Combat Systems Management Division (CG-453) functions as the Portfolio Manager for all NT/NO Combat Weapons Systems through its NT/NO Program Office. The following CG policies apply:

   a. Reference (m) for all NT/NO funding policies and procedures.

   b. Reference (n) for all 2M/MTR guidance to locally repair equipment.

   c. Reference (o) for the management of NT/NO equipment.

5. NT/CGO Electronic Equipment. USN equipment that has been procured by the CG for reasons other than to fulfill a PJWG established requirement is defined as NT/CGO and sustained through CG funding. Maintenance on equipment must follow CG maintenance procedures.

CHAPTER 4. SYSTEMS ENGINEERING LIFE CYCLE

A. General.

1. Often technicians come across equipment that they cannot fix; this is not due to their own lack of skills or the collective skills of a supporting electronics unit. Technicians can run into obstacles preventing them from properly restoring equipment to working condition. Some of these obstacles include a lack of parts, missing technical documentation, or a central point for requesting depot level support. The root cause for these difficulties often being systems fielded without complete adherence to the principals of life cycle management.

2. Reference (c), follows the Department of Homeland Security (DHS) Directive for Systems Engineering Life Cycle (SELC). The DHS Directive (MD 102-01-103) for SELC, establishes a common technical framework for all DHS agencies to follow for acquisition, support, and delivery of capabilities. This enables consistent management practices and supports the efficient and effective delivery of capabilities to end users. It is flexible and can be modified, or "tailored," to suit program characteristics and development methodology. The DHS policy closely follows DoD practices and commercial industry for life cycle management. All of which utilize a cradle to grave model for an equipment's life cycle. The Department of Homeland Security, DHS Directives System Instruction Number: 102-01-103, Systems Engineering Life Cycle provides detailed SELC methodology.

B. Requirements and Funding.

1. Before a project can be started it must have a documented requirement and sponsorship. CG Directorates (e.g., CG-1, CG-2, CG-SAR) are typically the sponsors of a requirement after they have identified a capability gap, including possible future gaps. The Assistant Commandant for Capability (CG-7) provides oversight and management of the operational requirements generation process. CG-7 acts as the gatekeeper coordinating with sponsors during requirements development and appropriate CG-68 program offices during development. Requirements are derived from the Operational Requirements Document (ORD). The ORD is developed from the Concept of Operations Document (CONOPS).

   a. A CONOPS is developed as the overarching high-level document for conceptual/future mission operations. This is used by the project sponsors, developers, planning and design teams, testers, and other stakeholders. It describes the operational tasks, processes, and associated roles and responsibilities of operators. It also allows stakeholders to visualize how the proposed solution operates in the real-world operational environment and understand the associated organizational impacts. Some of the outputs from the process include the ORD and knowledge about the fit and suitability of alternative solution concepts.

   b. The ORD captures the top-level operational user needs without regard to technical aspects of the solution. Operational requirements are typically 15 to 20 high-level

requirements that describe the mission, objectives and operational capabilities that are desired in the purposed solution. Operational requirements trace to one or more of the capability gaps identified during Needs Analysis.

C. DHS SELC Methodology. The DHS SELC methodology is composed of eleven process stages, not including Mission Analysis, as shown in Figure 4-1. The major SELC phases represent the activities that all programs need to consider, regardless of the program's development methodology. Each major SELC phase (Figure 4-1) has associated artifacts to record or document the results of the activities performed.

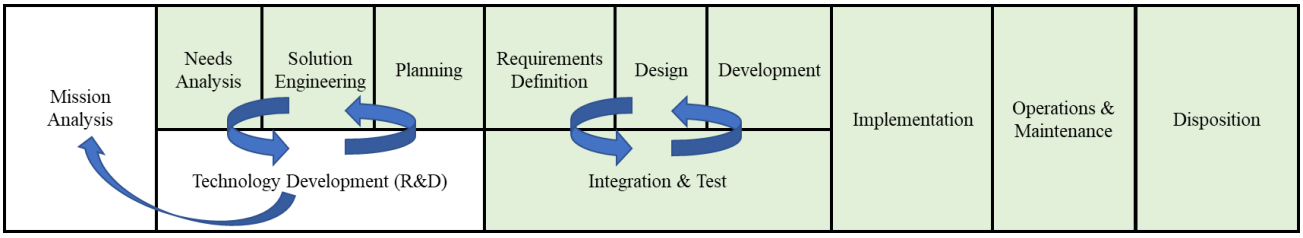


Figure 4-1 SELC Phases

1. Stages of SELC:

   a. Technology Development.

      (1) Needs Analysis: Mission and capability needs are identified and validated by CGHQ (for electronics this is Office of Command, Control, Communications, Computers, Cyber and Intelligence Systems (C5I) Program Management (CG-68) or a Technical Refresh is required (e.g., obsolete hardware or software).

      (2) Solution Engineering: The purpose of Solution Engineering is to conduct front-end systems engineering, provides for analysis of alternatives, risk analysis, affordability, and technology maturity.

      (3) Planning: The purpose of Planning is to conduct an analysis of the program (including its projects) throughout the entire program life cycle. This involves defining and implementing management processes to ensure a cohesive and integrated approach to program execution, as well as planning for key activities. A comprehensive analysis of all aspects of the program is carried out to ensure that the cost, scope, and schedule are both technically feasible and acceptable to stakeholders.

   b. Integration & Test.

      (1) Requirements Definition: The purpose of Requirements Definition is to collect, analyze, and document both functional and non-functional requirements that define the proposed functional design of the system. The activities performed and artifacts created during Requirements Definition result in an approved functional baseline. The functional baseline will be updated as needed throughout Design, Development, and Integration and Test based on various design trades and

knowledge gained through the development and testing of the system. Requirements are refined and documented. Provides for detailed mission capability.

(2) Design: The objective of Design is to transform requirements (developed during Requirements Definition) into system designs and architectures to guide, or contract for, fabrication, assembly, coding, integration, testing, and delivery. System design is the process of defining system subsystems, components, modules, and interfaces that satisfy specified requirements prior to entering development.

(3) Development: The objective of Development is to build, manufacture, code, and begin testing the components, products, and functionality that make up the system/solution that delivers the capability defined in the ORD. Development includes the steps required to transition from the developmental baseline to an implementation of the design. Although much of the effort in Development centers on building, coding, or integrating the system, activities also establish user documentation (e.g., operations and maintenance manuals) and develop end-user training. Development activities are done concurrently with Integration and Test activities and are often done iteratively with Design activities (particularly in incremental software development methodologies). Tasks such as conducting Developmental Testing are included in Integration and Test.

(4) Integration: The primary purpose of Integration and Test is to integrate the systems, subsystems, component, and configuration items that have been built during Development and to demonstrate that the integrated system satisfies all defined requirements.

c. Implementation: Implementation prepares the system, operational environment, organization, and users for the intended use of the new solution and for the remaining operational test events required to fully determine the operational effectiveness and suitability of the system. Environment testing and user training (Operational Test & Evaluation).

d. Operations & Maintenance (O&M): O&M completed deployment of the system to reach full operation capability. Evaluation during operations, provide feedback for system enhancements, support operations analysis and lessons learned. Preventative/planned maintenance and Corrective/casualty response maintenance are conducted. Technical support is shifted to the depot level for life cycle management.

e. Disposition: Disposition and/or decommissioning is the act of eliminating from service all or parts of a system, to include IT (e.g., shutting down databases) and non-IT (e.g., decommissioning helicopters, ships, physical portions of systems) elements. The emphasis in Disposition is to ensure that the system (or parts of the system), data, procedures, records, and documentation are archived, transferred, or disposed of in accordance with DHS and other Federal regulations or policies.

D. O&M during the life cycle. The core SELC phases of Planning, Requirements Definition, Design, Development, Integration and Testing, and Implementation also serve as a framework for project-based system engineering efforts conducted during the O&M phase as shown in Figure 4-2. Engineering activities that occur during the O&M phase address changes in system requirements, system improvements and upgrades, correcting system problems, and implementing configuration item changes (hardware, firmware, and software) for adaptive maintenance.

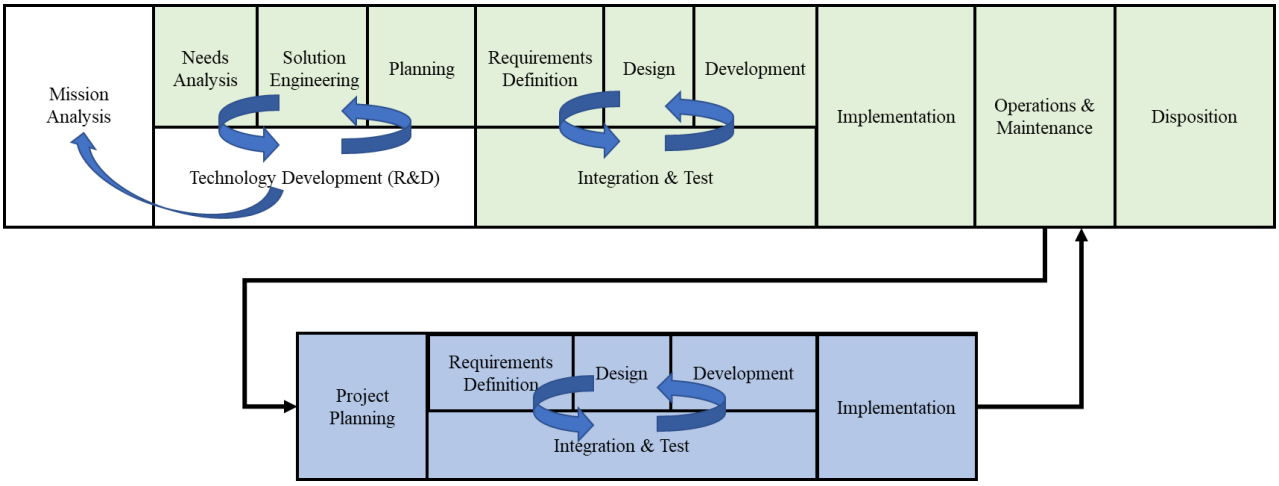


Figure 4-2 SELC Application to System Sustainment Projects

1. Project Review Process.

   a. SELC technical reviews are conducted to assess a program's progress towards planned activities. Engineering reviews focus on project planning, engineering design/development, system integration/test, and implementation depending on what SELC phase the project is in.

   b. Reviews are structured to ensure proper project management and rigor is maintained as a project moves through the life cycle. This rigor ensures that as a product ages, proper support for the field level is maintained to update the product and associated documentation (Allowance Parts List, Equipment Integrated Logistics Support Plan, technical support).

2. Joint Surface EC TCTO Process and SELC. ECs proposed for surface assets by SFLC, C5ISC and CG-9 follow the Joint Surface Engineering Change (EC) Process Guide. Changes during Needs Analysis (new acquisitions) or O&M stages follow this process guide to meld practices and processes. This provides a uniform process for development of changes to the configurations of CG assets. This not only maintains configuration control, but it also ensures that all associated logistics documentation is updated during the entire life cycle.

3. System Engineering Models. Project teams may use a variety of system engineering models to develop new capabilities and to support existing systems. Generally, C5ISC

project teams employ either a Waterfall engineering model or an iterative engineering model, similar to the agile project management method, depending on the system type and project scale. More information on these models may be found in Reference (c).

E. C5I Inspections and Certifications.

1. An inspection and certification will be completed on any new install/overhauled C5I system directed by or reported to another agency, as part of a contract, and/or where operating parameters must be confirmed to ensure regulatory compliance.

2. This certification process will be led, planned, and executed by the C5I Engineering Technical Authority program, and the inspection will verify that equipment arrangement and electronic system installation details conform to current USCG, DoD and industry standards. This certification will align with existing Telecommunications Electronics Material Protected from Emanating Spurious Transmissions, RADHAZ, EMI and Safety inspections. If one or more if those inspections fail, overall C5I certification will also fail.

F. CG TEMPEST Program.

1. Reference (p) establishes Coast Guard policies and procedures in accordance with applicable national policies for the control of Compromising Emanations where National Security Information is involved. TEMPEST is an unclassified short name, which refers to the investigation and study of compromising emanations.

2. C5ISC is the POC for an approved list of TEMPEST equipment..

CHAPTER 5. TEST EQUIPMENT

A. General. Coast Guard Electronic Test Equipment Program (CGETEP) provides total life cycle support for all test equipment under the program. The primary goal of this program is to provide field technicians with calibrated test equipment that meet required technical specifications. Centralized management of test equipment within the C5I support organization is vital to the delivery of timely test equipment calibration, modernization, and disposition. The following policies apply:

1. C5ISC-ESD-TECH-MAO serves as the Program Manager for the CGETEP in cooperation with the Naval Sea Systems Command (NAVSEA) Test, Measurement and Diagnostic Equipment (TMDE) Office as codified in an annual CG/USN, Military Interdepartmental Purchase Request which is referred to as the "CGETEP Office." The services governed and directed by the Program must include configuration management, inventory management, replacement, and calibration of test equipment. The CGETEP Office Help Desk may be contacted via e-mail at coastguard_te_help@us.navy.mil.

    a. Test equipment required for newly acquired CG assets must be funded by CG-9 or the responsible C5I PL as appropriate.

    b. CGETEP must support all General-Purpose Electronic Test Equipment (GPETE), Special Purpose Electronic Test Equipment (SPETE), and equipment listed on a unit's Fleet Supplemental Test Equipment Requirement (FSTER) list as appropriate.

    c. CGETEP may also provide dual-use test equipment that supports maintenance of both electronic equipment and IT equipment.

B. Terms and Definitions.

1. The term "prime equipment" refers to CG-authorized standard equipment currently supported by CG PMS, CG Asset Computerized Maintenance System or USN PMS.

    a. Types of Electronic Test Equipment (ETE):

        (1) GPETE is defined as test equipment that measures or generates a range of parameters of electronic functions common to two or more equipment types. Examples include multi-meters, oscilloscopes, power meters, etc.

        (2) SPETE is test equipment for use with a specific equipment or system. SPETE may be of special design or specially modified GPETE.

        (3) FSTER is the list which identifies Sub-category (SCAT) coded test equipment required for maintenance not captured in the CG PMS. This equipment is generally used for troubleshooting or corrective maintenance. The list is located within a unit's Ship/Shore Portable Electrical/Electronic Test Equipment Requirements List (SPETERL).

    b. Ship/Shore Portable Electrical/Electronic Test Equipment Requirements List

(SPETERL).

(1) The SPETERL contains the established allowance of TMDE for the respective unit.

(2) Only test equipment allowed per the SPETERL is supported by CGETEP for calibration, repair, recapitalization, and disposition.

(3) Test equipment that is not listed on the SPETERL will not receive support services.

(4) The CGETEP Manager oversees the program and must be the final authority for all SPETERL modifications.

(5) The type and quantity of TMDE is based on total configuration of prime electronics and telecommunications system supported. Other factors such as number of technicians, area of responsibility, and hazards to personnel and equipment are also considered.

(6) TMDE is grouped by SCAT code as determined by the measurement requirement of the prime system.

C. Non-SPETERL Test Equipment.

1. Electronic test equipment not listed on a unit's SPETERL is not supported by the CGETEP and must:

   a. Not be utilized to conduct CG "scheduled" maintenance; and

   b. Be stored separately from SPETERL test equipment.

D. CGETEP Funding.

1. The CGETEP must be divided into program management services to include allowancing, configuration management, and the cost involved with replacing faulty test equipment. These services must be funded by the C5ISC-ESD-TECH-MAO at no cost to units.

2. Field units must not procure or acquire test equipment for installed and/or authorized electronics equipment with unit funds. The allowance change request process to obtain new or additional test equipment is discussed in Section K of this chapter.

3. Test Equipment Shipping Costs.

   a. Units are required to pay for costs associated with shipping test equipment for calibration or to the loan pool for repair, replacement, or donation to stock due to excess.

   b. The CGETEP Office must pay the shipping cost of equipment back to the unit.

E. Test Equipment Tracking, Records and Inventory Management.

1. Test Equipment Tracking and Inventory Management. Electronics test equipment is not tracked as part of each unit's general-purpose property; therefore, units must designate a Test Equipment Petty Officer (TEPO) responsible for test equipment tracking, records and inventory management in Fleet Logistics System (FLS). See Coast Guard Electronic Test Equipment Program (CGETEP) Process Guide, CGTO PG-85-00-1200-T (series), for procedures to access electronics test equipment records listed in the FLS.

2. Test Equipment Records Retention. The TEPO must retain the below listed information as they pertain to electronic test equipment and related actions. The retained information supports audits and validations of inventory and calibration status.

   a. Paper records with actual signatures may be retained either as hard copies or as scanned images. Electronic records, such as e-mails, may be retained as a soft copy of the record.

   b. Records must be retained for one year or until after the applicable SPETERL validation or physical inventory count, whichever is longer, including copies of:

      (1) DD Form 1149, Requisition and Invoice/Shipping Document used to record movement of equipment.

      (2) The Ship's Maintenance Action Form (OPNAV 4790/2K), or SFLC Form 47 to record additions, deletions, or configuration changes of equipment.

      (3) Calibration records.

      (4) Shipping records; and

      (5) Naval Supply (NAVSUP) Form 1220-2, Allowance Change Request (ACR), for equipment not found in the SPETERL (CG-specified form is located on CGETEP portal).

F. Labeling and Storing Test Equipment.

1. Labeling Test Equipment. All SPETERL items must have current calibration stickers affixed to the test equipment. All FSTER test equipment must have a label affixed stating "FOR TROUBLESHOOTING ONLY." A calibration sticker may or may not be required; the ACR submitted to add the test equipment to the FSTER would specify if calibration is required. If calibration is required, a calibration sticker must be affixed to the test equipment. If not, a label stating "NO CALIBRATION REQUIRED" must be affixed.

2. Storing Test Equipment.

   a. GPETE and SPETE must be stored separately from FSTER and non-SCAT coded test equipment to eliminate the possibility of using unapproved test equipment to conduct

CG planned maintenance.

b. Test equipment on afloat units must comply with the Test Equipment Stowage Guide, NAVSEA ST000-AB-GYD-001/Portable Electrical/Electronic Test Equipment.

G. Calibration Services.

1. Test equipment calibration is organizational level maintenance and is funded for participating field units. Electronic Systems Support Detachments have funds for calibration provided by C5ISC-ESD-TECH-MAO. All other units receive their funds in their respective budget models. The CGETEP offers the option of administering unit test equipment calibration as an additional service. Participating units (including by default all BCDs and Electronic Systems Support Detachments) are provided all services described within this section. Non-participating units must coordinate and fund their own test equipment calibration services. Requests to participate in the calibration service must be coordinated with C5ISC-ESD-TECH through the respective district, area, service, or logistics center. Questions must be directed to the CGETEP Manager, or the test equipment help desk via e-mail at coastguard_te_help@us.navy.mil.

2. Test Equipment Calibration. The following paragraphs describe what test equipment requires calibration, authorized calibration facilities, calibration intervals, and other issues related to maintaining a unit's test equipment readiness.

a. Test Equipment Requiring Calibration. All test equipment listed on a unit's SPETERL must be calibrated and labeled with a calibration facility's certification sticker identifying whether the equipment passed calibration except for specific equipment items that do not require calibration. The determination whether SPETERL items require calibration is based on the type of equipment and can be addressed by contacting the CGETEP Office or visiting the CGETEP site online.

b. Authorized Calibration Facilities. The CGETEP Office will assign participating units to a specific calibration facility listed on the CGETEP portal website. All other units are required to use a DoD or any calibration facility accredited to International Organization for Standardization/International Electron Technical Commission 17025 (part 1) and ANSI/NCSL Z-540.3 (part 2) standards but are not restricted to the specific facilities listed on the CGETEP site online. To locate an approved calibration facility, contact the CGETEP Office via e-mail.

c. Calibration Intervals.

(1) The TEPO must inform the CGETEP Office via e-mail when they receive test equipment from the calibration facility with the next calibration due date.

(2) The CGETEP Office must monitor test equipment calibration intervals and send a quarterly e-mail to the unit TEPO stating which test equipment's calibration is due.

(3) The Unit TEPO is responsible for the tracking of calibration periods for a unit's

test equipment.

d. Out-of-Calibration Test Equipment.

(1) All equipment out of calibration must be removed from service, returned to the unit TEPO for re-calibration, a CG-5236 Serviceable/Unserviceable Material Tag placed on affected equipment (NSN 7530-01-GF2-9270), and stored separately from calibrated equipment.

(2) CG-5236 must be ordered through SFLC Baltimore until the supply is depleted; after that, DD-1577-2 Unserviceable (Repairable) Tag – Materiel (NSN 0102-LF-016-0700) must be used. Unit personnel may order Serviceable/Unserviceable Material Tags per CG Forms Management Program (FMP), COMDTINST 5213.9 (series) using local base procurement procedures.

H. Calibration Process for Test Equipment.

1. Schedule Test Equipment Calibration.

a. The TEPO must monitor the calibration schedule for all equipment on the unit SPETERL.

b. When the mandatory calibration date for a given piece of equipment approaches, the TEPO must arrange for the transfer of the equipment to the calibration facility that supports the TEPO's unit.

2. Transfer Test Equipment to Calibration Facility.

a. As part of preparing test equipment for transfer to a calibration facility, the TEPO must verify that the equipment is in proper working order. Calibration facilities will generally refuse to repair non-functioning equipment and will return it to the unit in the same condition as it was received.

b. The TEPO must ensure that proper procedures are followed in transferring custody of the equipment temporarily to the calibration facility. This includes utilizing DD-1149 as documentation and any additional procedures established by the individual calibration facility.

c. Equipment must be packaged and shipped as per the P700-Common Naval Packaging website at https://tarp.navsup.navy.mil/p700.nsf as applicable.

d. Units are required to pay for shipping of equipment to the calibration facility.

3. Calibration Services Performed.

a. The calibration facility must perform equipment calibration as promptly as is practical.

b. The TEPO must inform the calibration facility of any deadlines that impose urgency on the calibration process. For operational security reasons, the calibration facility should not be informed of the reason for the urgent calibration.

c. For non-participating units, the TEPO must arrange for procurement of calibration services using unit AFC-30 funds.

d. If any ETE is returned from the calibration facility in a faulty or irreparable condition, any equipment that was recently maintained using the defective ETE must be re-checked/tested using approved, functional, and calibrated test equipment.

4. Test Equipment Returned to Unit. The unit's TEPO must arrange the return of the calibrated test equipment.

a. Upon receipt of newly calibrated test equipment from the calibration facility, the TEPO must verify the equipment's serial number(s) to ensure that the correct equipment has been returned to the unit.

b. The TEPO must also verify that a new calibration tag or an entry on the existing calibration tag has been made and that it properly reflects the recent calibration action.

c. The TEPO must contact the CGETEP Office with the next calibration due date or if there are any failures or discrepancies with the expected calibration action.

d. If temporary replacement equipment was requisitioned from the redistribution facility, the unit's TEPO must arrange for its return to the redistribution facility once the recalibrated equipment has been received at the unit.

I. Replacing Faulty or Damaged Test Equipment.

1. In the event test equipment on a unit's SPETERL is found to be broken, unreliable, or unable to be calibrated, the unit TEPO must tag the item and contact the CGETEP Office via e-mail at coastguard_te_help@us.navy.mil to coordinate an exchange.

2. Equipment returned to the loan pool from the unit must be packaged and shipped as per Chapter 7 of Naval Supply Procedures, NAVSUP Publication 485, Volume III, Ashore Supply and the P700-Common Naval Packaging as applicable.

a. A replacement must be shipped via the fastest available means to the unit and become a permanent part of the unit's inventory.

b. The CGETEP Office must handle all required configuration changes in FLS.

c. For units participating in CGETEP program, CGETEP must have replacement equipment calibrated before it is sent to the unit. For non-participating units, CGETEP may provide uncalibrated equipment and it is then the receiving unit's responsibility to have the equipment calibrated prior to putting it into service.

J. NAVSEA Test Equipment Loan Pool. The NAVSEA test equipment loan pool, under the direction of the CGETEP Office operates as a centralized destination for warehousing services for CG test equipment. The loan pool is a storage depot for test equipment designed to be immediate replacements for damaged or broken equipment. Replacement equipment shipped from the loan pool is not calibrated; however, CG units in the calibration program will receive calibrated items after they are sent from the TMDE calibration facility. The loan pool also receives items that CG units no longer require, such as broken equipment beyond economical repair, unauthorized test equipment identified on a validation or obsolete equipment beyond its life cycle. The validation report and all equipment listed on the report will be sent to the NAVSEA facility for evaluation of future use or disposal.

K. Allowance Change Requests.

1. Existing inventories of ETE should be reduced to only that equipment needed for maintenance requirements codified in an approved maintenance procedure or approved through an ACR.

2. Units requesting new test equipment, or an increase or decrease in allowance for a piece of test equipment must submit an ACR form to the CGETEP Office via e-mail to coastguard_te_help@us.navy.mil.

3. The CGETEP Office must forward all requests to the CGETEP Manager at C5ISC-ESD-TECH-MAO for validation and respond to the requesting unit within 10 working days.

L. Disposal of Recapitalized Test Equipment. Disposal of test equipment must be coordinated with the TMDE Program via e-mail at mcms_help@us.navy.mil. Instructions should then be provided by the TMDE Program to return the test equipment to the NAVSEA test equipment loan pool or to dispose of it per regulations and policy via the Defense Logistics Agency's Disposition Services, GSAXcess, or other appropriate means.

Appendix A. GLOSSARY

PART I – ACRONYMS

ACRONYM	WORDS SPELLED OUT
2M/MTR	Miniature/Microminiature Module Test and Repair
ACR	Allowance Change Request
AED	Automated External Defibrillator
ALD	Asset Logistics Division
ANSI	American National Standards Institute
ASB	Architecture and Standards Branch
ASTM	American Society for Testing and Materials
BCD	Base C5I Department
BOD	Business Operations Division
C4IT	Command, Control, Communications, Computers and Information Technology
C5I	Command, Control, Communications, Computers, Cyber and Intelligence
C5ISC	Command, Control, Communications, Computers, Cyber, and Intelligence Service Center
CEU	Civil Engineering Unit
CG	Coast Guard
CGCYBER	Coast Guard Cyber Command
CGETEP	Coast Guard Electronic Test Equipment Program
CG-LIMS	Coast Guard Logistics Information System
CIO	Chief Information Officer
CO	Commanding Officer
CONOPS	Concept of Operations
CPR	Cardiopulmonary Resuscitation
CRT	Cathode Ray Tube
D-level	Depot Level
DCMS	Deputy Commandant for Mission Support
DHS	Department of Homeland Security
DoD	Department of Defense
EAL	Electronic Asset Logbook
EC	Engineering Change
EMI	Electromagnetic Interference
EMO	Electronic Material Officer
ESD	Engineering Services Division
ET	Electronics Technician
ETE	Electronics Test Equipment

ACRONYM	WORDS SPELLED OUT
FCC	Federal Communications Commission
FLS	Fleet Logistics System
FMC	Fully Mission Capable
FSTER	Fleet Supplemental Test Equipment Requirement
GFE	Government Furnished Equipment
GPETE	General Purpose Electronic Test Equipment
HERF	Hazards of Electromagnetic Radiation to Fuel
HERO	Hazards of Electromagnetic Radiation to Ordnance
HERP	Hazards of Electromagnetic Radiation to Personnel
IAW	In Accordance With
IEEE	Institute of Electrical and Electronics Engineers
ISD	Infrastructure Services Division
IT	Information Technology
MPC	Maintenance Procedure Card
MPE	Maximum Permissible Exposure
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply
NiCad	Nickel Cadmium
NMCD	Not Mission Capable Depot
NMCL	Not Mission Capable Lay-up
NMCM	Not Mission Capable Maintenance
NMCS	Not Mission Capable Supply
NSN	National Stock Number
NT/CGO	Navy Type/Coast Guard Owned
OET	Office of Engineering and Technology
OIC	Officer-In-Charge
O-Level	Organizational Level
OOD	Officer of the Deck/Day
O&M	Operation and Maintenance
ORD	Operations Requirements Document
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PJWG	Permanent Joint Working Group
PL	Product Line
PM	Preventive Maintenance

ACRONYM	WORDS SPELLED OUT
PMC	Partially Mission Capable
PMS	Planned Maintenance System
PPE	Personal Protective Equipment
RADHAZ	Radiation Hazard
RCM	Reliability Centered Maintenance
RF	Radio Frequency
SCAT	Sub-category
SELC	System Engineering Life Cycle
SFLC	Surface Forces Logistics Center
SILC	Shore Infrastructure Logistics Center
SL	Service Line
SOH	Safety and Occupational Health
SPETE	Special Purpose Electronic Test Equipment
SPETERL	Ship/Shore Portable Electrical/Electronic Test Equipment Requirements List
STIP	Surface Technical Information Portal
TCMA	Time Critical Maintenance Action
TCTO	Time Compliance Technical Orders
TEPO	Test Equipment Petty Officer
TMDE	Test, Measurement and Diagnostic Equipment
USN	U.S. Navy
VAC	Volts Alternating Current
WFD	Work Force and Facilities Division

PART II – DEFINITIONS

1. Concept of Operations (CONOPS) – A verbal or graphic statement that clearly and concisely expresses what the commander intends to accomplish and how it will be done using available resources.

2. Electromagnetic Interference (EMI) – Any electromagnetic disturbance, induced intentionally or unintentionally, that interrupts, obstructs, or otherwise degrades or limits the effective performance of electromagnetic spectrum-dependent systems and electrical equipment.

3. Hazards of Electromagnetic Radiation to Fuels (HERF) – The potential hazard that is created when volatile combustibles, such as fuel, are exposed to electromagnetic fields of sufficient energy to cause ignition.

4. Hazards of Electromagnetic Radiation to Ordnance (HERO) – The danger of accidental actuation of electro-explosive devices or otherwise electrically activating ordnance because of radio frequency electromagnetic fields

5. Hazards of Electromagnetic Radiation to Personnel (HERP) – The danger to personnel from the absorption of electromagnetic energy by the human body. Personnel hazards are associated with the absorption of radio frequency energy above certain power levels in certain frequency bands for certain lengths of time.

6. Preventive Maintenance (PM) – Care and service of equipment and facilities in satisfactory operating condition by systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.