UNITED STATES MARINE CORPS
Logistics Operations School
Marine Corps Combat Service Support Schools
Training Command
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F209

STUDENT OUTLINE

CORROSION PREVENTION AND CONTROL PROGRAM (CPAC)

LEARNING OBJECTIVES

1. Terminal Learning Objective: Given the billet of maintenance management chief, a requirement to monitor maintenance management programs, and the references, identify the procedures for processing equipment through the various maintenance related programs, to ensure required programs are utilized in accordance with the references.

2. Enabling Learning Objectives: Given the billet of maintenance management chief, a requirement to monitor maintenance management programs, and the references, identify:

    a. The purpose of CPAC
    b. The objectives of CPAC
    c. The responsibilities associated with CPAC

OUTLINE

1. BACKGROUND. Marine Corps tactical ground and ground support equipment are particularly susceptible to corrosion and other moisture intrusion damage due to their assigned missions and geographic locations in moisture-laden environments. Compounding the problem is the fact that a significant portion of Marine Corps ground equipment is stored outdoors without shelter and subject to the direct effects of this corrosive environment. Corrosion is defined as a gradual process of wearing away or dissolving (especially of metals) by chemical action. The world itself is a highly corrosive environment in which the dissolution and wearing away of metals and other materials is a constant process.

    a. To maximize our readiness and combat capability, we must preserve our equipment through prudent management of these

scarce and expensive resources with programs such as mileage reduction, administrative deadline, administrative storage and professional quality maintenance. The essential ingredient to the proper preservation of our assets is a solid and proactive program of preventive and corrective maintenance. The establishment of the CPAC program is an effort to improve readiness and combat capability, to extend the service life of both current and future vehicle and equipment inventories, and to reduce maintenance requirements and associated costs.

b. The overall program includes two primary elements, each with associated supporting initiatives. The two primary CPAC initiatives focus on the following areas:

(1) Preventive Corrosion Control. Preventing corrosion starts at acquisition. This most critical element will focus on identifying, developing, and implementation of state of the art technologies and processes that directly prevent the corrosion problem, not just the symptoms of the problem. While it is critical to address and improve corrective corrosion control initiatives, a fundamental long-term reorientation and redistribution of effort from corrective to preventive corrosion control programs is required.

(2) Corrective Corrosion Control. This element will focus on identifying, developing, and implementing technologies and processes that will correct current equipment deficiencies resulting from corrosion and moisture intrusion damage. The Marine Corps is currently experiencing severe corrosion problems resulting from the environmental impact of sea borne-transit of equipment and indoor/outdoor storage of equipment in moisture-laden environments, as well as equipment design and manufacturing deficiencies.

c. Supporting initiatives for the primary CPAC elements focus on the following three areas:

(1) Design. This initiative will focus on early involvement of the Marine Corps maintenance community to incorporate experience with corrosion related problems and ensure corrective action is incorporated in the design process. The goal of such an initiative will be to eliminate use of corrosion-prone material, inferior hardware, dissimilar metals, and other design problem areas such as pockets and sills. Other design characteristics such as equipment’s manufacturing processes and the stowage requirements will also be addressed.

(2) Training. This initiative will focus on the development of a formalized CPAC training program. Inclusion of standardized CPAC procedures in formal schools and operating forces training programs will be the focus of this initiative.

(3) Policy and Management. This initiative will establish centralized management of all CPAC-related programs at Marine Corps Systems Command (MARCORSYSCOM). A focal point for CPAC will be established within MARCORSYSCOM. MARCORSYSCOM will fund research and technical support, ensure CPAC is included in all phases of the acquisition cycle, and ensure that all procurement documents contain CPAC requirements. Furthermore, MARCORSYSCOM will be responsible for formalizing CPAC standards on all future equipment contracts, including corrosion resistant standards and the use of protective coatings to ensure that CPAC is emphasized during the development and hardware and the purchase of non-developmental items (NDI). The commandant of the Marine Corps (CMC) (LPP-3) will provide CPAC program direction, guidance and coordination.

2. PROGRAM DESCRIPTION

a. Mission. The CPAC program is established to extend the useful life of Marine Corps tactical ground and ground support equipment, and to reduce maintenance requirements and associated cost through the identification, implementation, and if necessary, development of corrosion prevention and control technologies and processes. The use of these technologies and processes will repair existing corrosion damage and prevent, or at least significantly retard future corrosion damage on Marine Corps tactical ground and ground support equipment.

b. Objectives. The CPAC program is designed to accomplish the following objectives:

(1) Establish a comprehensive CPAC program with the focal point at MARCORSYSCOM.

(2) Identify and assess current and projected CPAC problems within the Marine Forces through regular communication with Marine Forces accomplished via CPAC working group and the CPAC electronic mailbox.

(3) Assist the Marine Forces in addressing and solving current and future CPAC problems by establishing formalized procedures to enable a flow of information between MARCORSYSCOM,

program managers, and the operational forces regarding CPAC technologies and processes.

(4) Establish CPAC program requirements and formalized CPAC standards for all future equipment acquisitions.

(5) Leverage efforts currently underway in government and industry (both domestic and foreign) to identify available and developing CPAC technologies and processes which will improve our ability to prevent and control corrosion of our systems and equipment and will avoid duplication of effort.

(6) Incorporate CPAC training in all operator and maintainer courses, to include sustainment training.

(7) Establish formalized procedures for the conduct of self-initiated, informal test of new CPAC technologies and processes in the operating forces.

(8) Compliance with and consideration of environmental regulations in the CPAC process.

3. ACTION. The following responsibilities are assigned to accomplish the objectives of this program. Matters involving policy or issues that arise from these instructions should be referred through established command channels.

a. DC/S, I&L (LPP). Provide policy on all aspects of CPAC.

b. COMMARCORSYSCOM

(1) Assume responsibility for management of CPAC program. Verify that CPAC is adequately incorporated in all acquisitions, both new development and NDI. Provide overall CPAC program leadership, guidance, direction, and coordination.

(2) Serve as Marine Corps point of contact when interfacing with other DOD and industry agencies on CPAC matters.

(3) Serve as principal Marine Corps point of contact on CPAC matters. Identify the office and individual assigned this responsibility within 30 days of the date MCO 4790.18.

(4) Identify funding requirements for research and technical support of the CPAC program.

(5) Provide for inclusion of CPAC in all acquisition documentation.

(6) Establish quality assurance and testing procedures to ensure compliance with these instructions. Throughout equipment life cycle, provide CPAC preventive and corrective control action as needed.

(7) Establish procedures for the Field Evaluation and Analysis Program.

(8) Manage CPAC electronic mailbox.

(9) Establish and chair the CPAC working group.

(10) Prepare, publish, and update CPAC TM's. Coordinate TM changes with CPAC working group.

c. Commanding General (CG), MCCDC

(1) Provide representative to CPAC working group, who will also serve as MCCDC CPAC point of contact. Identify this billet to COMMARCORSYSCOM within 60 days of the date of MCO 4790.18.

(2) Include CPAC considerations in all requirement documentation.

(3) Provide CPAC instructions in MCCDC publications.

(4) Establish and promulgate training standards as the basis for CPAC training of all users/operators, maintenance personnel, and managers of Marine Corps systems.

d. Commanders, Marine Forces, Marine Corps Bases, Posts, Stations, and Reserve Forces.

(1) Establish CPAC as a maintenance related program under the staff cognizance of the Assistant Chief of Staff (G-4) down to the major subordinate command level. Responsibilities should include the following:

(a) Establish procedures for CPAC in all equipment inspections.

(b) Provide assistance to units encountering CPAC problems.

(c) Conduct training and CPAC awareness programs.

(d) Execute other CPAC responsibilities as deemed appropriate.

(2) MARFORLANT, MARFORPAC, MARFORRES, and each MEF shall provide a representative to the CPAC working group.

e. COMMARCORLOGBASES

(1) Identify a CPAC point of contact to COMMARCORSYSCOM (PSE) within 60 days of the date of MCO 4790.18.

(2) Recommend changes or additions to Marine Corps directives/instructions, as necessary, to accomplish program objectives.

(3) Provide technical assistance to HQMC/MARCORSYSCOM to ensure CPAC initiatives are considered.

(4) Ensure proper CPAC procedures are used in all depot level IROAN, repair and/or rebuild activities.

(5) Ensure that CPAC instructions are provided in all applicable publications under COMMARCORLOGBASES, Albany cognizance.

(6) Provide technical assistance in CPAC matters relating to the Marine Corps Reserve.

(7) Provide representative to CPAC working group.

NOTE: The remainder of this period of instruction is provided as general information ONLY.

4. TYPES OF CORROSION

a. General. Marine Corps equipment contains steel, aluminum, composites, and other materials, which will corrode. Corrosion occurs quickly if the materials are not corrosion resistant or covered by protective coatings maintained by the following CPAC procedures:

(1) Inspection ------I
(2) Cleaning -----------C
(3) Preservation ----------P

These CPAC procedures must be included in your unit's preventive maintenance (PM) and corrective maintenance (CM) programs. If not, equipment and components will degrade resulting in loss of combat capability and high replacement cost.

b. Metals Affected By Corrosion. A common form of corrosion is rusting of iron and steel. The table below lists the corrosion products of metals commonly used on Marine Corps equipment:

ALLOY	APPEARANCE OF CORROSION
Mild Steel	Red-brown oxide (rust)
Stainless steel	Corrosion evidenced by rough surface; sometimes by red, brown or black stain
Galvanized steel	White or gray powder
Aluminum	White or gray powder
Copper-based alloy, brass, and bronze	Blue or blue-green powder deposit
Magnesium	White powdery snow-like mounds and white spots on surface
Nickel-based alloy	Green powdery deposit
Cadmium, used as protective plating for steel	White powdery corrosion products
Chromium used as a wear-resistant plating for steels	Chromium, being cathodic to steel, does not corrode itself, but promotes rusting of steel where pits occur in the coating

c. Corrosive Environments. Marine Corps equipment is operated in a number of environments, which can accelerate metal corrosion. Environments, which have a high degree of moisture, are the greatest contributors to deterioration of metals. Other factors of the environment such as temperature, salt, sand,

coral, mud and sunlight also contribute to corrosion. By applying protective coatings such as paint and preservatives to equipment slows down the corrosion process of metals. If the protective coatings are not maintained, loss of equipment and high replacement rates occur. This can be avoided if first and second echelon personnel institute CPAC procedures along with required PM/CM on the equipment.

d. Specific Types of Corrosion

(1) Direct surface attack

(2) Galvanic or dissimilar metal corrosion

(3) Intergranular corrosion

(4) Pitting

(5) Exfoliation

(6) Crevice attack or concentration cell corrosion

(7) Fretting corrosion

(8) Stress corrosion cracking

(9) Corrosion fatigue

(10) Filiform corrosion

(11) Microbiological induced corrosion

REFERENCES:

1. MCO 4790.18