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Coast Guard



U.S. Coast Guard Configuration Management Manual



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Subj: COAST GUARD CONFIGURATION MANAGEMENT MANUAL

- Ref:
- (a) Configuration Management Guidance, MIL-HDBK-61
 - (b) National Consensus Standard for Configuration Management, ANSI/EIA-649
 - (c) Management of Scientific and Technical Information (STINFO), COMDTINST M5260.6 (series)
 - (d) Classified Information Management, COMDTINST 5510.22 (series)

1. PURPOSE.

- a. This Manual provides Coast Guard (CG) policy on Configuration Management (CM) and its implementation guidelines and procedures within the CG. CM is applicable to any entity adding value to the organization's overall capability. This value is the abstract result of goal setting, planning, and the application of resources in response to a need. This Manual identifies the principles for documenting and managing the products, services, assets, activities, facilities, systems, data, people, and the interoperability thereof (the who, what, when, where, why, and how) necessary to perform as the CG.
- b. The CG is comprised of many entities that form an institutional level capability. A solution referred to as a Configuration Item (CI) could be hardware (HW) or software (SW) product, operating information document, facility, person, line of business, or an institution itself. The specific arrangement of a solution is referred to as its configuration, represented in a hierarchical manner. The level of independent CI management within the hierarchy can range from the top level itself, to a subsystem level, to a component level (cutter to an engine to an o-ring, computer to a software program to a line of code, standard/specification to a page to a paragraph, financial management line of business to strategic plan to a specific procedure, an individual rate to a qualification) or anywhere in between. A decision tree for use in determining CI level of management can be found in Chapter 3 of this Manual.

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NON-STANDARD DISTRIBUTION:

- c. Each CI is supported by a set of configuration artifacts specifying need, required and demonstrated performance, and detailed design. The initiatives and systems that sustain and support the storage, dissemination, assessment, application, refinement, and creation of our organization's knowledge base are embodied in these artifacts. Management and control of these artifacts are essential for ensuring information accuracy of the knowledge base used for decisions, investments, and resource allocation. Simply stated CM applies to all CG investments and shall be implemented per this Manual.
 - d. Computer based CM training is available to employees through the Commandant (CG-444) Portal. Employees are encouraged to take the computer-based CM training and may request up to one hour duty time. Such duty time shall be requested and approved in advance by their respective supervisor.
2. ACTION. All CG unit commanders, commanding officers, officers-in-charge, deputy/assistant commandants, and chiefs of headquarters staff elements shall comply with the provisions of this CIM. Internet release is authorized.
3. DIRECTIVES AFFECTED. The following directive is hereby cancelled: Coast Guard Configuration Management Policy, COMDTINST 4130.6A.
4. REQUEST FOR CHANGES. Recommendations for changes and improvements to this Manual shall be submitted via the chain of command to the CM Division, Commandant (CG-444) using Aeronautical Publication Change Recommendation, Form CG-22.
5. DISCUSSION. This Manual assures procedural consistency for the development and execution of CM by establishing specific guidelines and procedures that shall be followed. The degree of CM applied shall be tailored as appropriate for consistency with the safety, complexity and criticality of the CI involved. Specific CM requirements are stated as policy in the beginning of each chapter and in Paragraph 1.C.2., Responsibilities.
6. DISCLAIMER. This Manual is intended to provide operational requirements for CG personnel and is not intended to, nor does it, impose legally-binding requirements on any party outside the CG.
7. DISTRIBUTION. No Paper Distribution will be made of this Manual. To view this Manual or other unclassified directives visit the Coast Guard Directives System Intranet site at: <http://cgweb.comdt.uscg.mil/CGDirectives/Welcome.htm> and CG Portal: <https://cgportal2.uscg.mil/library/directives/SitePages/Home.aspx> or the Internet site: <http://www.uscg.mil/directives>.
8. RECORDS MANAGEMENT CONSIDERATIONS. This Manual has been thoroughly reviewed during the directives clearance process, and it has been determined there are further records scheduling requirements, in accordance with Federal Records Act, 44 U.S.C. 3101 et seq., National Archives & Records Administration requirements, and Information and Life Cycle Management Manual, COMDTINST M5212.12 (series). This policy does create significant or substantial change to existing records management requirements.

9. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS.

- a. The development of this Manual and the general policies contained within it have been thoroughly reviewed by the originating office in conjunction with the Office of Environmental Management, and are categorically excluded (CE) under current USCG CE #33 from further environmental analysis, in accordance with Section 2.B.2 and Figure 2-1 of the National Environmental Policy Act (NEPA) Implementing Procedures and Policy for Considering Environmental Impacts, COMDTINST M16475.1 (series). Because this Manual implements, without substantive change, the applicable Commandant Instruction or other federal agency regulations, procedures, manuals, and other guidance documents, Coast Guard categorical exclusion #33 is appropriate.
- b. This directive will not have any of the following: significant cumulative impacts on the human environment; substantial controversy or substantial change to existing environmental conditions; or inconsistencies with any federal, state, or local laws or administrative determinations relating to the environment. All future specific actions resulting from the general policies in this Manual must be individually evaluated for compliance with the NEPA, Council on Environmental Policy NEPA regulations at 40 CFR Parts 1500-1508, Department of Homeland Security (DHS) and Coast Guard NEPA policy, and compliance with all other environmental mandates.

10. FORMS/REPORTS. The forms Referenced in this Manual are available in USCG Electronic Forms on the Standard Workstation or on the Internet: <http://www.uscg.mil/forms/>; CGPortal at <https://cgportal2.uscg.mil/Pages/main.aspx>; and Intranet at <http://cgweb.comdt.uscg.mil/CGForms>.

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Assistant Commandant for Engineering and
Logistics

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CHAPTER 1. INTRODUCTION TO CONFIGURATION MANAGEMENT

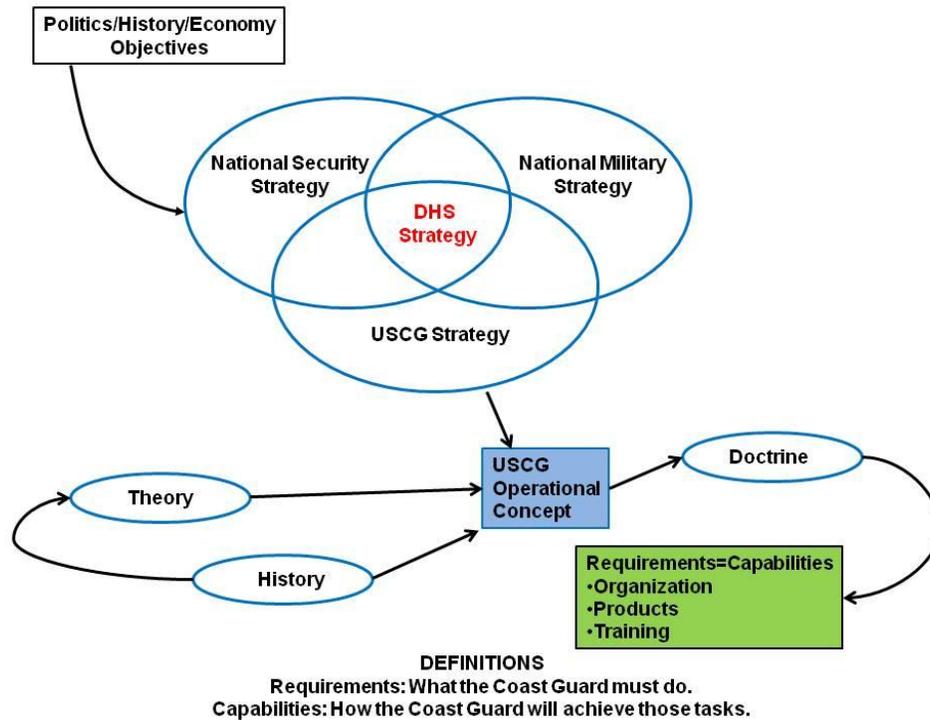
A. Policy.

1. A Configuration Management (CM) program and associated CM data shall be developed and maintained per the guidance contained in this Coast Guard (CG) CM Commandant Instruction Manual.
2. CM shall be applied by line of business, program, product line, platform, systems, and equipment managers, and other supporting managers from the initial identification of a need until the CG is no longer required to deliver that capability (i.e., product, service, personnel, data, asset, system, process, and equipment, including computer software and firmware) per this Manual.
3. This Manual provides a framework for CM. It is long recognized one standard does not meet the needs of all technical disciplines. Organizations within the CG may find industry or other government standards more directly applicable to their particular domain. Implementation of those standards is authorized as long as they adhere to the principals articulated in this Manual and such use is documented in the appropriate CM plan. Examples of industry standard frameworks are the Information Technology Infrastructure Library (ITIL) for the management of IT services, the National Consensus Standard for Configuration Management ANSI-EIA STD 649, etc.

B. Configuration Management.

1. There are as many different descriptions of CM as there are disciplines whose execution relies on the management process itself. The basic principle of CM is to capture and communicate the elements and relationships of a problem/need and its solution/product accurately and at all times. Let's consider the application of these principles to the following examples:
 - a. When applied to any item mass produced (appliance, food, vehicles, etc.) it is the discipline of CM that ensures the materials, quantities, skilled labor, processes and tools utilized are precisely managed to consistently re-produce the exact performance and characteristics. This ensures every product functions and looks exactly the same.
 - b. Some credit formalization of CM to Henry Ford when he sponsored the development of the assembly line technique of mass production. The principles of CM certainly contributed to the Model T's mass production, but an even earlier critical manufacturing change that marked the Industrial Revolution was the production of interchangeable parts. The ability to produce interchangeable parts heavily relied on detailed designs and processes to reproduce exact replicas, both in design and performance.
2. The first military standard to address CM was promulgated in 1940, at which time design/technical reviews and the management of requirements, as we know them today, were integral parts of the CM process. CM is the idiom of interoperability, recording thereby communicating. The traceability between needs, investments and capabilities produced by the CM process are foundational to readiness and risk assessment. CM

begins with the identification of a need (**Figure 1-1**) and ends when the need no longer exists. The ability to trace back to the roots of a need is not only useful but is necessary in defining the operational boundaries of the capability. The discipline describes what is supposed to be produced/accomplished and why, what is being produced/accomplished, what was produced/accomplished, and what modifications were made. CM ensures the pedigree of the capability solution is traceable to a need, required performance is demonstrated, design is documented (required for sustainment of demonstrated performance), risk is managed and interfaces are defined (**Figure 1-2**).

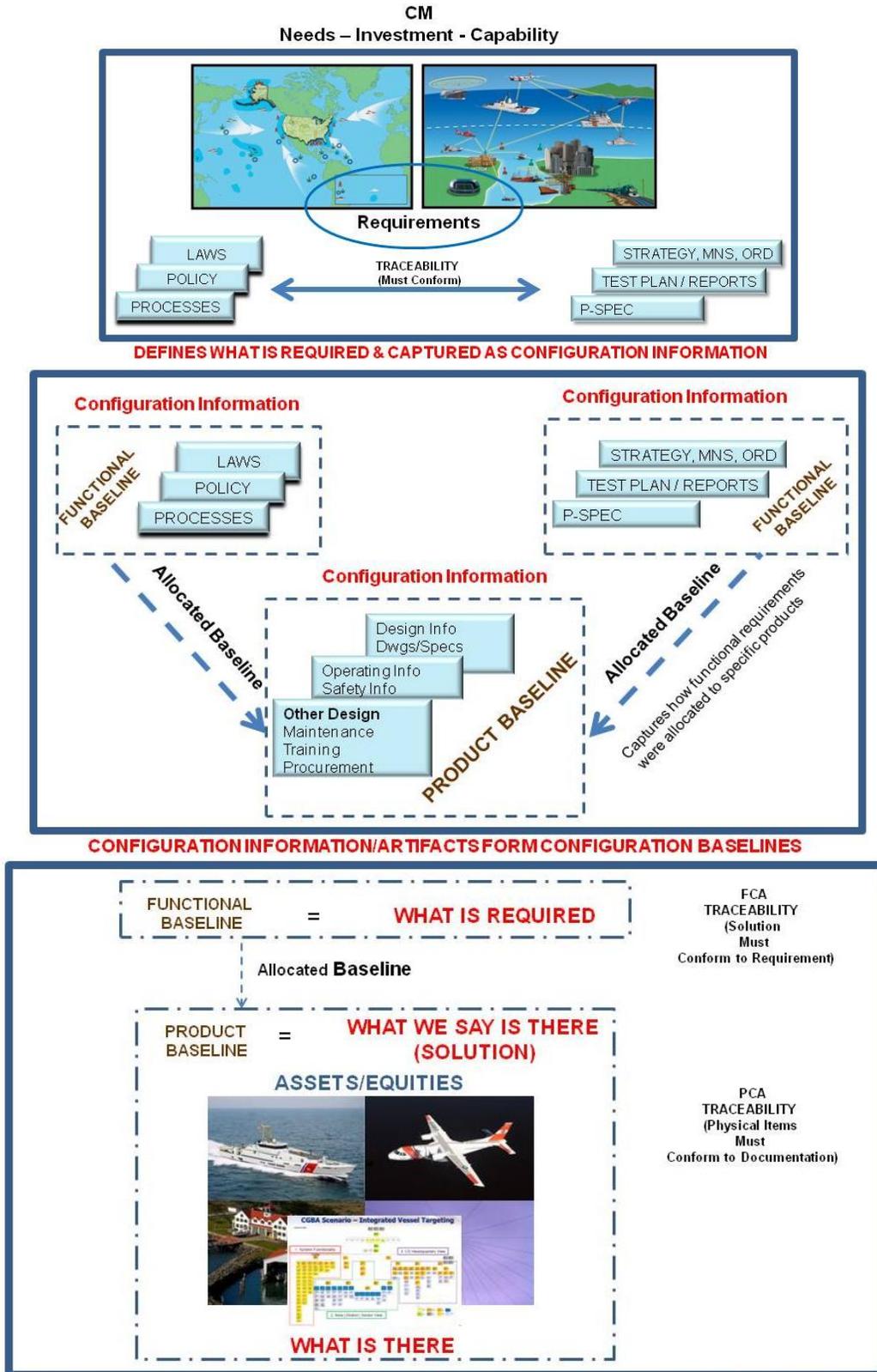


DEFINITIONS
 Requirements: What the Coast Guard must do.
 Capabilities: How the Coast Guard will achieve those tasks.

Need Decomposition

Figure 1-1

- For the CG’s purposes, CM is a technical discipline used to manage organizational capability, specifically, the “who, what, when, where, why, and how.” CM will be used to define and maintain an alliance between performance; functional and physical attributes; supporting information (requirements, design and operational); and their conformance, with traceability between the identified need, investments made, and outcomes produced (**Figure 1-2**). Capability, as used herein, represents the integration of products and services to operate and support those operations. These elements when fully integrated represent how the CG conducts the business of being the CG (**Figure 1-3**). When a need has been identified the CG utilizes its resources to produce a capability. Historically, CG CM has been applied, at best, to assets, primarily only after the asset had been produced, solely as a means for managing spare and repair parts. Although, this level of management is necessary, it doesn’t serve to aid in focusing scarce investments on activities that best meet stated objectives/needs: No more than necessary – No less than required.



CONFIGURATION BASELINES GOVERN WHAT IS REQUIRED AND THE SOLUTION PROVIDED

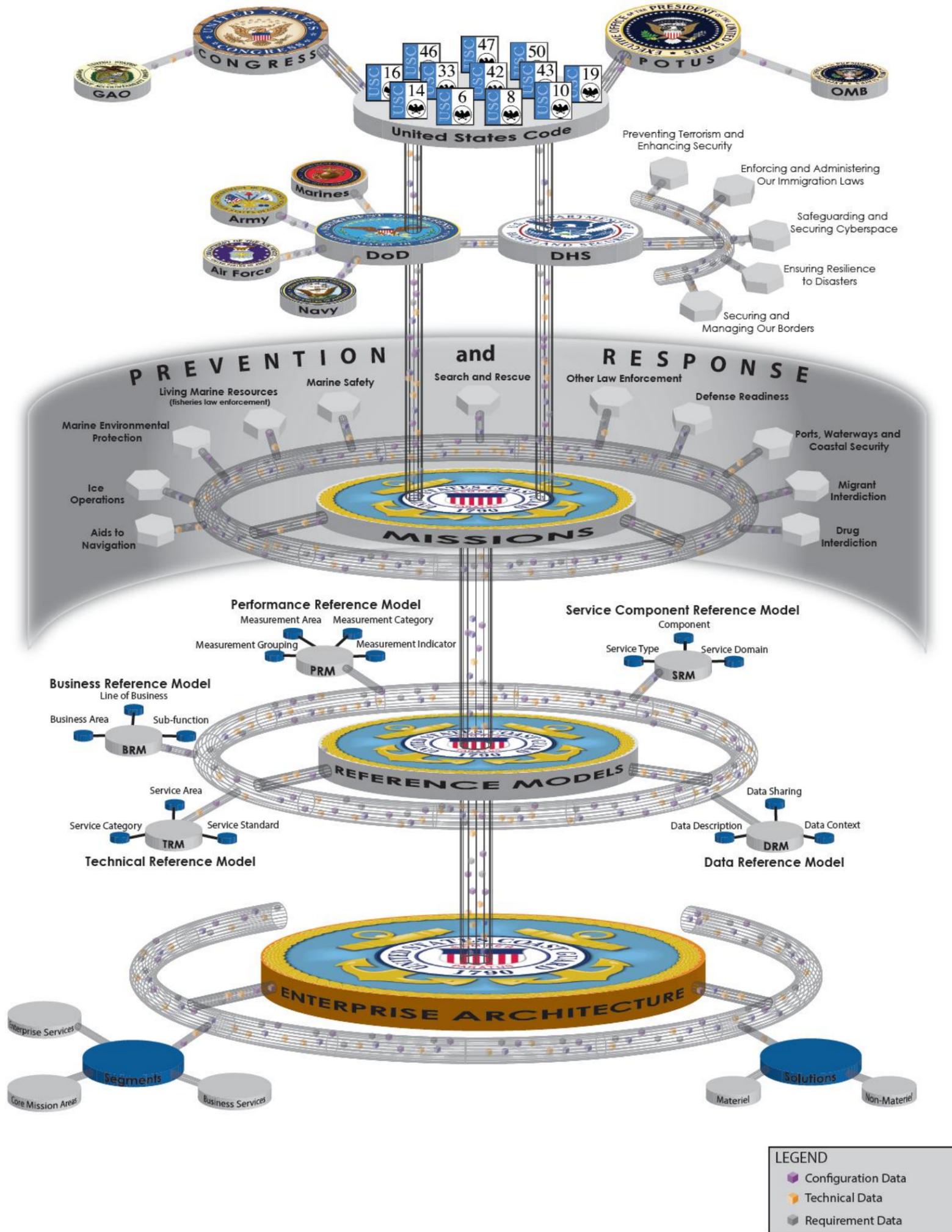
Capability Baseline Traceability

Figure 1-2



COAST GUARD'S INFORMATION ARCHITECTURE FRAMEWORK (CGIAF)

Developed by: CG-444 Office of Configuration & Technical Data



TRACEABILITY

Requirements
Missions
Capabilities

REPORTABILITY

GAO
OMB
DHS/DOD
Coast Guard

ASSESSABILITY

Performance
Mission
Capability
Risk

SUPPORTABILITY

DHS Missions
DoD Missions
Coast Guard Missions

Configuration Management Concept of Operations (CONOPS), OV-1
Figure 1-3

4. Every one of us applies CM every day, when you stop to think of it every time we feel the need to write something down we are in fact capturing an organizational artifact. Typically an organization records information for documenting or recreating an outcome. The CG itself is made up of configuration artifacts to support repeatable performance. The organizational chart, functional statements, doctrine, tactics, line of business process models, and even position descriptions are among some of the many artifacts used to manage the configuration of the CG Enterprise. One tends to think of assets when we think of CM and even then we have a hard time stepping outside of the traditional design evolution window when we do so.
5. During the “Need” phase of the Acquisition Review Process of the Acquisition Lifecycle Framework (ARP/ALF) stage, deciding what function we need to perform has been particularly difficult. This is the stage of defining the conformance and performance characteristics; the foundation of a Functional Configuration Baseline (FCB). A FCB is required regardless of solution and will always remain under the Government’s control, often serving as the basis of contracts for detail design.
6. Why is it important to maintain configuration control throughout the life of a capability (solution)? In addition to the need for consistent, or at least predictable, performance at any given time we will be called upon to communicate readiness, interoperability, cost and impact of that capability. To assess readiness of a capability requires business, technical, functional, operating and design information. The breadth and depth of what needs to be managed and to who it needs to be communicated only increases throughout the life. Within each acquisition phase:
 - a. **Need Phase:** As illustrated in **Figure 1-1** a need can be identified from numerous sources; for this example we will use Strategic Plans. During this phase a threat is identified and a subsequent “need” to counter the threat is defined. When defining the need, relationships to other constraints must be captured, communicated, allocated and recorded to establish solution boundaries. Numerous teams both internal and external to the CG will be working elements of the problem simultaneously. The inability to communicate, capture and guide team activities will result in insufficient and contradictory requirements. Insufficient and contradictory requirements not only drive up cost but increase the risk of not producing the desired outcome. CM during the Need Phase is critical: it is these requirements the solution will be tested against and which will become the basis of cost, schedule and performance scoping.
 - b. **Analyze/Select Phase:** During this phase, the systems engineering process called “Solution Engineering” is applied: Objectively identify, analyze, and select the preferred solution alternatives via an Alternatives Analysis (AA) to meet the approved mission needs. Create key acquisition documents that demonstrate readiness to enter the Obtain Phase. ADE-2 authorizes entry into the Obtain phase.
 - c. **Preliminary Phase:** During this phase the initial requirements produced during the need phase are further decomposed and additional constraints (normally from the functional area leads) are defined. The impact and interoperability of these constraints must be captured, communicated and controlled so each team member can assess alternatives. Teams of various specialties are each analyzing their particular elements (engineering, operations, functional/program, etc.) working concurrently to

come up with viable alternatives to the problem. Tradeoffs are constantly being considered. The probability that the output of each contributor aligns to produce an acceptable solution without CM is highly risky.

- d. **Detail Phase:** During this phase the comprehensive team has grown even larger: reviewers and vendors have been added to the mix. Test plans and performance data must be captured, traced to requirements and communicated as they influence solution detailed design. Inability to manage decisions and impact will not only drive costs and schedule increases but may even risk safety and performance.
- e. **Construction Phase:** During this phase in addition to managing the requirements, proposed design and test plans the manufacturing, test, and quality assurance processes are being introduced. Without adequate control production workers, who perhaps use their own personal processes for aligning fittings, may introduce processes that result in degraded or failed performance. Operations and Maintenance Manuals are under production utilizing detailed design data from this and previous phases. An unreported product line change could quite possibly affect maintenance philosophy, maintenance procedures, sparring and/or Tactics, Techniques, and Procedures (TT&P). Similarly when applied to a re-engineered business process short cuts will create the same results for example: a process may not produce the financial traceability necessary to comply with Chief Financial Officer (CFO) reporting requirements identified in the need and detail phases. Perhaps a decision to utilize supply specialists to design logistics requirements was made; if unrecorded, the potential impact/risk to operational availability will be unknown. Through CM the “who, what, when, where, why and how” artifacts are recorded and available. CM does not design or produce these artifacts but records, verifies, and communicates the elements and their interfaces.
- f. **In-Service Phase:** It is this phase where the effect of insufficient CM programs will be felt the most. Without governing the “who, what, when, where, why and how” the ability to assess performance and/or support trends cannot be accomplished. Without this capability changes could be unknowingly incorporated that affect safety or performance, the details, boundaries and interfaces would not be known. How would we qualify a replacement system? How could we be certain we weren't on the brink of a tolerance staking threshold? How would we determine what personnel are needed where? When asset CM verification checks are conducted to capture what is physically present, how would we know if what is there should be there? Where and/or what would we look at to investigate a mishap? What would be the authoritative source?

C. Definitions and Responsibilities.

1. Definitions.

- a. **Artifact:** An artifact is one of many kinds of tangible by-products produced throughout the life of a CI.
- b. **Attribute:** Is a “property or characteristic of an entity that can be distinguished quantitatively or qualitatively by human or automated means.” Attributes are used to uniquely describe an entity CI.

- c. **Configuration:** A "configuration" is the specific arrangement and relationships of elements and/or parts. A configuration can be any type of entity. It can be a product, a facility, a person, or a business enterprise. The hierarchy of a configuration (often referred to as parent-child relationships) range from a: cutter to an engine to an o-ring; computer to a software program to a line of code; standard/specification to a page to a paragraph; strategic plan to spend plan to purchase request; or person to a rate to a qualification. Artifacts used to manage configurations represent the organization's knowledge. Configurations are formally expressed through baselines, snapshots in time established after an audit has been conducted to verify contents. Configuration baselines are traditionally known as Functional, Allocated, or Product. These descriptors often have modifiers added for contracting, delivery, and logistics purposes. Examples of such modifiers include "as contracted," "as designed," "as tested," "as delivered," and "as maintained." All of these are acceptable as long as they are established as a result of a formal configuration audit. Additional information regarding the traditional Functional, Allocated, or Product configuration baselines can be found at the Commandant (CG-444) portal site as well as a link to contact us for questions and or assistance.
 - d. **Configuration Item:** Any item or entity designated for independent management (CI or SCI for software configuration items).
 - e. For purposes of this Manual the definitions in Section 3 of Reference (a) shall apply.
2. Responsibilities.
- a. **Mission Support Directorates- Commandants (CG-1), (CG-4), (CG-6), (CG-9), (DCMS-34), (DCMS-5) and (DCMS-8) shall:**
 - (1) Direct and oversee the implementation of CM policy and amplifying guidance set forth in this Manual within their directorates and shore activities. Establish Configuration Control Boards (CCBs) per this Manual and Interface Control Boards (ICB) to manage interface boundaries and controls identified within the interface control specifications.
 - (2) Direct all CG Line of Business Managers to ensure CM traceability of their functional requirements, services, and investments utilizing the CG Enterprise Architecture (EA).
 - (3) Ensure alignment between Acquisition Strategy and Configuration Control Authority; clearly articulate it to all program staff. The government can approve changes only to the level for which they have authority over the design. For commercial items this would include changes to the Performance Specification only. Detailed design changes do not fall within this category.
 - (4) Resolve disagreements/reclamas on proposed changes between Sponsors, Program Managers (PMs) or system and equipment Product Line Managers (PLMs). This includes resolution of design issues between the PMs and Lead Design Engineer or Ship Design Manager. When a common technical agreement cannot be reached on a change impacting more than one Technical Authority, the proposed change will be referred to the next higher CCB authority as specified in Chapter 5 to achieve resolution of the issue.

- (5) Ensure that the following CM responsibilities and actions are properly assigned to personnel within their directorates. Respective PMs shall:
 - (a) Identify the CIs and associated baseline documentation under their direct management.
 - (b) Develop, implement, and maintain a CM Plan for each product, service and/or system under their authority using Appendix A as guidance. The CM Plan is to be updated at every major milestone, decision event or with each strategic plan (as appropriate).
 - (c) Develop and maintain documentation for all products, services, assets, and administrative information owned by the CG and deemed configuration worthy.
 - (d) Initial CM Plans shall be submitted and reviewed through the USCG concurrent clearance process for approval. Post CM Plan updates, with the exception of classified and business sensitive information, to the Commandant (CG-444) website, for review, comment(s) and approval. Commandant (CG-444) will check the site for newly posted CM plans twice a week.
 - (e) Establish a CCB and issue a CCB Charter for the item under their authority.
 - (f) Ensure that input for CCBs from Sponsors, PMs/PLMs is received and assessed by all parties affected to ensure interoperability.
 - (g) Provide representation on all alterations and other equipment CCBs, as required.
 - (h) Exercise configuration change control using documented and established configuration baselines as the point of departure for change control. Procedural guidance is provided in Chapter 3 of this Manual.
 - (i) Ensure all configuration change requests are properly processed, documented, and tracked through completion.
 - (j) Ensure all contracts and data requirements comply with this Manual.
 - (k) Establish internal CM audit and verification teams and define qualifications and training requirements for their members.
 - (l) Ensure that Functional Configuration Audits (FCAs) and Physical Configuration Audits (PCAs) are completed and that all audit issues are resolved prior to acceptance. Procedural guidance on preparing for, conducting, and documenting FCAs and PCAs is provided in Appendices C and D.
 - (m) Designate Configuration Managers and CCB chairs in writing and report the names to Commandant (CG-444).
 - (n) Audit CM data for accuracy and periodically verify that approved configuration baselines have not been modified without authority.

- (o) Ensure that Configuration Managers and CCB members are trained in standard CM processes.
 - (p) Submit requests for exceptions to the specified policy and defined responsibilities of this Manual through Commandant (CG-444).
 - (6) Solicit Task Commitment Memoranda assigning personnel from Technical Authorities to represent their functional area for all established CCBs.
- b. Commanders, Commanding Officers (COs), and Officers in Charge shall:**
- (1) Report product deficiencies and desired improvements to the line of business, acquisition, and sustainment agents per designated process guides.
 - (2) Submit requests for Deviations through the appropriate Product/Business Manager.
 - (3) Implement only those configuration change requests that are approved by a CCB and issued in writing through an approved order (CCB Directive, Time Compliant Technical Order (TCTO) or memo). Tailor as necessary, capture specific process in CM Plan.
 - (4) Make no unauthorized configuration changes to their assigned products.
 - (5) Notify appropriate Logistics and Service Centers and the unit's Administrative Control for action regarding any unauthorized configuration changes.
 - (6) Notify appropriate Logistics and Service Centers and the unit's Administrative Control of product and/or services safety concerns or failure to achieve performance requirements.
- c. Sponsors shall:**
- (1) Develop, manage, and communicate functional requirements. Communicate requirements changes to fellow sponsors, acquisition agents, sustainment agents, the operator representatives and user representatives.
 - (2) Ensure operational and support requirements are included in the preliminary FCB.
 - (3) Participate in Systems Engineering Life Cycle (SELC) reviews established by the acquisition project's SELC Tailoring Plan
 - (4) Ensure that all requirements are testable and quantifiable.
 - (5) Validate that specifications meet the sponsor's and user requirements.
 - (6) Participate, if not chair, the FCA to ensure test data demonstrates 1-3 above.
 - (7) Review and approve the FCA report.
- d. CCBs shall:**
- (1) Have authority over changes, variance requests, and problem report actions for items under their change control authority. Note that the CCB is not synonymous with the Current Document Change Authority.

- (2) Include as its stakeholders: safety, operator representatives, EA representative, Sponsor, test and evaluation, and Logistics Center/Service Center.
- (3) Achieve unanimous consent or document the non-concurrence (who did not concur, the reason for non-concurrence, the justification for overriding the unanimous consent requirement, and the actions taken to mitigate risk that may have been identified by the non-concurring party). If non-concurrence is Safety related, or if the change involves adding capabilities not consistent with the approved operational requirements, the change request must be forwarded to next higher CCB for review.
- (4) Assign a CCB Chair.
- (5) The authority and responsibilities of the CCB Chair shall include:
 - (a) Ensuring that the CCB operates per the CM Plan;
 - (b) Assigning a CCB Secretariat;
 - (c) Making final decisions on change request, variance request and problem reports, when unanimous consent is not achieved;
 - (d) Ensuring actions are committed as directed until completed; and
 - (e) Ensuring CCB actions are recorded in the Configuration Status Accounting (CSA).
- (6) Evaluate proposed configuration changes, variance requests, and problem reports, and make dispositions in a timely fashion.
- (7) Identify and resolve issues impacting multiple CCBs, including ICBs that cross directorates, platforms, systems and interfaces. Refer unresolved issues between CCBs to the next higher level CCB or common authority in the command structure.
- (8) Track the request and disposition of all change requests submitted to the CCB.
- (9) If authorized by their charter, charter subordinate or local CCBs as needed for specific products.
- (10) Identify whether funding is available and if not plan for resource(s). If resourcing cannot be obtained capture the approved change in CSA as a basis for a Resource Proposal (RP) or for use for new or modified future acquisition requirements.
- (11) Have limited authority to approve change s based on the following:
 - (a) Wherever there is a hierarchy of CCBs on a complex program, authority may be limited by a higher level CCB.
 - (b) Local CCBs shall not approve changes for documents and products for which they do not have controlling authority.
 - (c) The United States Navy/United States Coast Guard (USN/USCG) Permanent Joint Working Group (NAVGARD BOARD) must approve all changes to Navy Type Navy Owned (NTNO) assets.

- (d) The potential impact on other CCBs must be considered. In this case, the CCB that receives the change request shall either achieve unanimous consent among all affected CCBs or document the non-concurrence (who did not concur, the reason for non-concurrence, the justification for overriding the unanimous consent requirement, and the actions taken to mitigate risk that may have been identified by the non-concurring party).
 - (e) Interface Control Working Group involvement may need to be sought out.
- e. **Configuration Managers shall perform the following functions:**
- (1) **CM Planning and Management.** Support the business/program/product line in development of the CM Plan and CCB Charter.
 - (2) **Configuration Identification.** Ensure that CI is performed per the standard CM processes and the CM Plan.
 - (3) **Status Accounting.**
 - (a) Record approved, pending and disapproved status of configuration documentation and identifiers associated with assigned products.
 - (b) Record and report via chain of command the status of proposed changes from initiation to final disposition.
 - (c) Establish and manage configuration baselines.
 - (4) **Change Control.**
 - (a) Screen Engineering Change Proposal(s) (ECP) to ensure completeness and CCB readiness (including but not limited to technical merit, cost, and the impact on operations, schedule, and life cycle sustainment).
 - (b) Record and report the status of all change requests, variance requests and problem reports that affect configurations.
 - (c) Provide traceability of all changes from the originally released configuration documentation from the mission needs statement to the disposition.
 - (d) Record and report implementation status of approved change requests.
 - (e) Record and report the effective date and implementation status of configuration changes.
 - (f) Establish configuration audit teams.
 - (5) **Audit.**
 - (a) Plan for and ensure all configuration audit activities, including contract clauses for Contractor participation or support when required.
 - [1] Establish audit teams comprised of Technical experts.
 - [2] Gather data (test reports, drawings and specifications).
 - [3] Gather special tools for measuring.
 - [4] Perform audit and provide information for all reviews and audits of assigned products.

- (b) Track and report the results of configuration audits including the status, corrective action, expected completion date, final disposition of identified discrepancies, and root cause closed-loop corrective action items.
 - (c) Report summary results of configuration audits to Commandant (CG-444), including all unauthorized changes and the associated cost.
- f. **CM Audit Teams shall:**
 - (1) Conduct audit of processes and products.
 - (2) Ensure products conform to released documentation, requirements, and design specifications.
 - (3) Notify Program CM and PM of non-conformance.
 - (4) Oversee audits and verifications delegated to Original Equipment Manufacturers (OEM).
 - (5) Promulgate Audit Report.
 - (6) Record results in CSA system.
 - (7) Track findings until remediated.
- g. **CM Verification Teams shall:**
 - (1) Verify physical item nomenclature matches logistics system data.
 - (2) Notify appropriate Logistics and Service Centers for action regarding any non-conformances and whether the non-conformances were corrected during the audit.
 - (3) Update logistics system as required (Coast Guard Logistics Information Management System (CG-LIMS), Fleet Logistics System (FLS), Asset Logistics Management Information System (ALMIS), Configuration Data Manager Database-Open Architecture (CDMD-OA)).
- h. **Configuration Data Managers shall perform the following tasks:**
 - (1) Enter configuration data provided by Configuration and Product Line managers into the logistics information systems
 - (2) Maintain integrity of configuration data within information systems through periodic verifications
 - (a) Plan for and ensure all verification activities are completed.
 - [1] Establish verification teams.
 - [2] Pull validation aids (equipment configuration listings, parts lists) from the Logistics information system.
 - [3] Verify physical item nomenclature against logistics system record.
 - (b) Track and report the results of configuration verifications to the Configuration and/or PLM.
- i. **Commandant (CG-444) as CG CM Technical Authority representative shall:**

- (1) Develop and maintain CM policy.
- (2) Represent the CG on all external Committees for all matters pertaining to CM.
- (3) Provide guidance to Business Line Manager (BLM)/PM/PLM on changes to CM policy.
- (4) Monitor and conduct assessments of BLMs', PMs' and PLMs' CM program implementation processes to ensure that procedures and implementing actions comply with the policy of this CIM.
- (5) Monitor CG CSA capability and overall management of CSA data, and assist with CSA reporting responsibilities.
- (6) Direct and oversee CG implementation of CM policy set forth in this policy.
- (7) Provide operating and performance requirements for CM Information Technology (IT) systems.
- (8) Generate Configuration Manager personal development plans.
- (9) Develop CM Core Competencies.
- (10) Certify CM Managers, specialists, and technicians.
- (11) Manage CM program changes to the enterprise architecture.
- (12) Direct CM program execution and control.
- (13) Facilitate CM interoperability with the Product Data Program.
- (14) Serve as CCB Secretariat to executive level CCBs.
- (15) Champion a SELC Program.
- (16) Establish a concurrent engineering environment (concurrent engineering is a work methodology based on the parallelization of tasks (i.e., performing tasks concurrently). It refers to an approach used in which multiple functions are integrated to reduce the elapsed time required to develop a new capability).

D. Relationship of CM to other Technical Tasks.

1. **CM Execution and Interoperability.** A complex collection of disciplines, technical and operational, concurrent and sequentially executed are employed every day to meet the needs of our country. Many rely on the CM discipline to identify, allocate, capture, and/or communicate details. A few of these specific relationships are discussed below.
2. **CM and Knowledge Management (KM).** KM involves the understanding of where and in what forms knowledge exists; how to make the right knowledge available to the right people; what the organization needs to know; how to best generate or acquire new relevant knowledge; how to promote a culture conducive to learning, sharing, and knowledge creation; how to manage all of these factors so as to enhance performance in light of the organization's strategic goals and short term opportunities and threats. The artifacts representing the CG's knowledge are also referred to as configuration artifacts. Each element of knowledge should be uniquely identified, validated/verified/date stamped as to authenticity, interfaces managed, base lined, and changes controlled.

These activities are essential to ensure confidence in the knowledge used to make decisions.

3. CM and Product Data Management (PDM).

- a. The Defense Federal Acquisition Regulation (DFAR)/Federal Acquisition Regulation (FAR) define “Technical data” as data of a scientific or technical nature. Data means recorded information, regardless of form or the media on which it may be recorded. PDM is the act of managing data produced as a result of the activities executed during need definition, design/engineering, material management, planning, construction, test, integrated logistics support, requirements management, collaboration, reporting, and publishing is configuration data. The configuration data as a whole represents the product and becomes the product data. It is through the management of individual configuration data artifacts that management of the product data can be achieved.
- b. These artifacts represent the “authoritative source” of the product or the CIs’ approved design. Not only is CM applied to each data artifact but it is the discipline used to manage the integration of the data. The automated environment used to create, manage, and disclose product information is referred to as Integrated Product Data Environment (IPDE). IPDEs are different from Integrated Data Environments (IDEs) in that the Product Data element includes drawings and/or 3D Models and represents an integration of the data more so than a document storage and management capability. The IPDE is intended to enhance traditional product configuration management capabilities. The IPDE is a configuration item itself and is therefore brought under CM. The [National Shipbuilding Research Program Integrated Product Data Environment \(IPDE\) Specification \(V1.0\)](#) is not only an excellent Reference but provides, from an Engineers perspective, an excellent overview of CM activities throughout a ship’s lifecycle.

4. Standardization and CM.

- a. Standardization as used in the CG is the process of developing, implementing, and maintaining consistency in the design of platforms and in the selection and arrangement of their installed equipment and systems. Standardization may also be applied to procedures for operation, maintenance, and training; choice of consumables and outfitting; and requirements for certification, readiness, and operational limits for systems and personnel. The goals of standardization can be to help with the independence of single suppliers, compatibility, interoperability, safety, repeatability, or quality. CM is sometimes thought to be synonymous with standardization; although this is not so, one can certainly understand why standardization is impossible without effective CM. Federal Management Regulation (FMR), 41 Code of Federal Regulation (CFR) and Federal Acquisition Regulation (FAR) state:

8.002 Priorities for use of Government supply sources.

(a) Except as required by 8.003, or as otherwise provided by law, agencies shall satisfy requirements for supplies and services from or through the sources and publications listed below in descending order of priority—

(1) Supplies.

- (i) *Agency inventories;*
- (ii) *Excess from other agencies (see Subpart 8.1);*
- (iii) *Federal Prison Industries, Inc. (see Subpart 8.6);*
- (iv) *Supplies which are on the Procurement List maintained by the Committee for Purchase From People Who Are Blind or Severely Disabled (see Subpart 8.7);*
- (v) *Wholesale supply sources, such as stock programs of the General Services Administration (GSA) (see 41 CFR 101-26.3), the Defense Logistics Agency (see 41 CFR 101-26.6), the Department of Veterans Affairs (see 41 CFR 101-26.704), and military inventory control points;*
- (vi) *Mandatory Federal Supply Schedules (see Subpart 8.4);*
- (vii) *Optional use Federal Supply Schedules (see Subpart 8.4); and*
- (viii) *Commercial sources (including educational and nonprofit institutions).*

(2) *Services.*

- (i) *Services which are on the Procurement List maintained by the Committee for Purchase From People Who Are Blind or Severely Disabled (see Subpart 8.7);*
- (ii) *Mandatory Federal Supply Schedules (see Subpart 8.4);*
- (iii) *Optional use Federal Supply Schedules (see Subpart 8.4); and*
- (iv) *Federal Prison Industries, Inc. (see Subpart 8.6), or commercial sources (including educational and nonprofit institutions).*

(b) *Sources other than those listed in paragraph (a) of this section may be used as prescribed in 41 CFR 101-26.301 and in an unusual and compelling urgency as prescribed in 6.302-2 and in 41 CFR 101-25.101-5.*

- b. Congress enacted Public Law 82-436 in 1952 to provide an economical, efficient, and effective supply management organization within the Department of Defense (DoD) through the establishment of a single cataloging system. The law further designated single item identification to be utilized for each item repetitively used, purchased, stocked or distributed, for all functions of supply from original purchase to final disposal. Implementation of this portion of the statutory requirement within the DoD provided the foundation of the Federal Catalog Program to provide a uniform system of item identification; preclude/eliminate different identifications of like items; reveal interchangeability among items; aid in standardization; facilitate intra- and inter-departmental logistics support; and improve materiel management and military effectiveness to promote efficiency and economy in logistics operations.
- c. DoD standardization operations are conducted primarily within the framework of the Defense Standardization Program (DSP) and per DoD Defense Standardization Program Policies and Procedures Manual, DoD 4120.24-M. The main objectives are to achieve and maintain the highest practical degree of standardization for items, materiel, practices, procedures and terminology by preparing standardization documents. In addition to participating in the DSP, the CG standardization mission entails the conduct of, and participation in various other related programs and projects, including International Standardization Programs, Non-Government Standards (NGS) Bodies, Parts Control Programs, and Overpricing Programs.

Product standardization is an efficient method to reduce costs and increase quality. By minimizing the differences in your products, you are able to respond rapidly to failures and parts shortages, to streamline distribution and to shorten the support chain. The best product standardization strategies allow you to balance the need for targeted adaptation with cost savings.

5. **Systems Engineering (SE) and CM.** The definition of SE presented below was written in the 1960's yet still holds true today. SE is a method that recognizes each system design as an integrated whole even though composed of diverse, specialized structures and sub-functions. It further recognizes that any system has a number of objectives and that the balance between them may differ widely from system to system. SE methods seek to optimize the overall system functions according to the weighted objectives and to achieve maximum compatibility of its parts. CM provides visibility that the allocation of requirements has been adequately decomposed; control has been established on the requirements and design; components have been uniquely identified; product and documentation structures have been defined; and recorded; performance, interface, and other attributes have been defined; release control has been implemented; relationships have been captured; and end product performance has been demonstrated. SE depends on the CM discipline to provide:
 - a. the structure (audits);
 - b. definition (documentation); and
 - c. visibility (status accounting) of a systems objectives (performance), specialized structure and sub-functions (functional), integrated whole (performance) and the management of functional and physical attributes and their interfaces (internal and external).
6. **Design to Cost/Life Cycle Cost and CM.** Designing to cost and/or life cycle cost provides a threshold and objective cost which a solution must be designed to meet. SE, enabled by CM, provides the ability to align design to system-level requirements and to demonstrate that the design meets the required performance. Cost becomes a requirement that must be managed; CM allocates the "Cost" requirement throughout the design, then captures actual costs and controls changes so that the initial constraint is not overridden. The detailed management and traceability provided by the SE and CM disciplines enable life cycle costs and performance to be predicted and managed. The governance afforded through CM over the evolution of a product and/or services' design facilitates establishment and confirmation of cost thresholds. This threshold shall be confirmed during the FCA and sustained through its supporting data. Cost is a major element of the change control process and although cost may be affected, cost changes can be predicted and planned. Maintenance and supply activities are aligned to the demonstrated design cost. Poorly documented requirements (FCB) will introduce excessive capability and changes (both major and minor) into a solutions design, causing substantial increases in both design and sustainment costs. Through proper CM, cost and performance surprises/delays are minimized, allowing a level of performance for level of cost prediction.

7. Safety and CM.

- a. CM is a vital part of the safety of any CG activity, and a staple to those in the safety business by simply providing governance over the solution design. How a design works, the relationship between the components/elements of the design and its performance relay safety implications. The Office of Security and Safety Performance Assurance states that adequate CM of vital safety systems is fundamental to supporting the long-term health of the vital safety systems of our nation. Hazard, fault-tree, and root-cause analyses reports are a few of the configuration artifacts that support the safety program.

Remember the scene in the movie Apollo 13 in which the space craft experiences an O₂ tank explosion leaving the crew with insufficient breathable air?

The National Aeronautics and Space Administration (NASA) engineers gathered the drawings and technical specifications, identified what was on-board, what was available to the crew (whose skill sets they knew) and proceeded to develop a repair procedure from the configuration data. That's CM at the capability level! In fact the O₂ tank explosion failure mode, effect, and criticality analysis would have been a CM artifact and available to describe the explosion's impact on all other systems. The artifacts within the configuration baseline of the CI uniquely identified as "Apollo 13" contained sufficient detail to describe the full design evolution of the space craft.

- b. CM efforts supporting safety are not limited to the system design but also incorporate training, operations, and maintenance enhanced through accurate and concise documentation. Safety (similar to other performance parameters) identification, allocation, and management are monitored through your CM effort. Safety requirements and their allocation within the design (to include operations and maintenance procedures) are known therefore assessments of safety impacts due to failures or proposed changes can be assessed. Without CM, risk to personnel and readiness is substantially increased.

8. Acquisition Logistics and CM.

- a. The logistics support analyses conducted during the acquisition relies on accurate and current configuration data. CM provides the product and documentation structure; defines the performance, interface and other attributes; provides for the unique identification of the product, components and documentation; prescribes identification marking protocols; maintains release control and baseline definition; provides Reference for changes and corrective actions; organizes engineering data for provisioning; and supports provisioning parts lists. CM is the discipline used to identify and track achievement of Integrated Logistics Support (ILS) and Supportability requirements within the design. Understanding these requirements and their relationship to the detailed design will result in delivery of a logistics support program that will sustain the delivered performance of the system at an affordable cost; while also providing the knowledge necessary for continuous improvement.

- b. When individual solution support requirements are aggregated, the entire organizational mission support footprint can be baselined. Once the mission support capability has been baselined, formal change control can be applied to optimize resources and response time. This is achieved through managing the configuration of your enterprise (operational and support infrastructure design).
9. **Maintainability and CM.** Maintainability is an inherent design characteristic dealing with the ease, accuracy, safety, and economy in the performance of maintenance functions. Maintainability is a characteristic of the design that must be demonstrated during the FCA. Maintainability of a product in the field is determined by the completeness and accuracy of a product's configuration documentation. CM artifacts (drawings, parts lists, Operations and Maintenance (O&M) guides, test plans/reports, etc.) are critical for support personnel to maintain the product's required performance. These artifacts are used to determine training, skills, maintenance tasks, quality assurance (QA) and replacements parts necessary for sustained performance.
10. **Risk Management and CM.** Risk Management is the identification, assessment, and prioritization of risk followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities. Initial threats are characterized as functional requirements and captured in your functional baseline. Design characteristics are allocated to accommodate functional requirements which are captured in detailed configuration documentation such as drawings, specifications, and failure modes, effects, and criticality analyses. These configuration artifacts represent the end state performance that was verified during Operational Test and Evaluation (OT&E) and baselined with all changes managed through formal change control. These activities are a fundamental component of managing risk and reporting readiness status. For the most part, it consists of the following elements, performed, more or less, in the following order.
 - a. Identify, characterize, and assess threats, assess the vulnerability of critical assets to specific threats;
 - b. Determine the risk (i.e., the expected likelihood and consequences of specific types of attacks on specific assets);
 - c. Identify ways to reduce those risks; and
 - d. Prioritize risk reduction measures based on a strategy.
11. **Test Management and CM.** Test results are not conclusive unless the configuration of the Unit Under Test (UUT) is identified, usually by a CSA Report pulled on demand for the specific UUT. For example, a hardware or software UUT presented for testing that does not match its approved configuration may do poorly on affected portions of the testing particularly considering test protocols were calculated to align to the detailed design of the "system". If it is known that the UUT has uninstalled changes, the test program can be adapted or canceled. A UUT may test successfully, but the test results lose credibility without configuration identification for the tested unit specifically. The test was successful, but what exactly was tested? Maintaining strict configuration control during the design process and subsequent testing program not only reduces probability of cost and schedule slippage but also supports combined developmental and operational test opportunities.

E. CM Execution.

1. CM execution requires a balanced and consistent implementation. The practical application of CM is more science than art and is therefore typically employed by a Configuration Manager (CM Mgr). A CM Mgr is an individual who is a recognized expert in many of the fields discussed above as well as: CM; Program Execution and Control; Acquisition Policy, Processes, and Reporting; Quality Management; Test and Evaluation (T&E); Contracting; Data Management; Verification and Audits; Requirements Management & Control; Systems Engineering; and ILS. The CM Mgr is the technical communication hub. (See Commandant (CG-444) Website for an overview of competency requirements.)
2. Execution of CM requires the ability to tailor your CM program to meet the needs of the CI being managed. What items/artifacts must be managed to ensure, mission execution and supportability to the level necessary to deliver expected performance without incurring excess cost - affordable readiness - yet still insure traceability between needs, investments and outcomes. CM tasks must be planned for and executed to align with other functional area activities supporting critical impact assessments of funding, deferred maintenance, reduced training and/or failures on readiness. The resources necessary for CM have demonstrated a tenfold return in readiness, safety, supply chain and risk - the liabilities immeasurable. Let's not forget that CM is essential for warranty administration, liability determination, maintenance need and cost assessments, as well as to provide the ability to identify and resolve safety and environmental issues. CM at the enterprise level is invaluable for addressing questions such as:
 - a. What systems make up XXX Capability (ex. Long Range Search & Rescue)? Configuration baselines define functional performance required, physical components, and the relationship between the two.
 - b. Are there plans to include additional systems in the capability? Pre-Planned Product Improvements are used to show a structured increase in capability not readily available either due to funding or technology defined through management of requirements (Need) and current capability gaps.
 - c. Where are the systems in terms of development for this capability? Top level CI is the capability, each system is a CI. CIs and their interfaces are evaluated at scheduled technical/design reviews (Preliminary, Critical, Test Readiness, etc.) capturing the current status of design evolution enabling the CG to assess the system's status.
 - d. How are systems integrated with capabilities? Interface Specifications (configuration artifact) managed by ICBs would be used to describe interface boundaries/relationships. The EA provides a means for recording and illustrating these interfaces.
 - e. What office has the primary responsibility for identifying and prioritizing modifications and enhancements of CG capabilities? The executive level CG CCB has primary responsibility for managing change to the CG's capability. Individual product/process CCBs (lower level) manage changes to the performance envelop of the elements under their cognizance and ensure the end state capability integrates into the overall capability. This would also include mission critical failure information that would inform readiness reporting.

- f. How does that office ensure the capability is meeting its goals? First opportunity is the FCA and then through effective change control of baselines.
- g. Do you have a mechanism for feedback or comment from operators executing missions? The MAR, Maintenance/Publication Feedback and Deficiency Reports (Form CG-22) process, Electronic Asset Logbook (EAL), etc., readiness reporting which describes status of maintenance completed, spares availability, training and failure reporting.
- h. Do you provide any training and development opportunities on how to use products / processes? If formalized training, even on-the-job training (OJT), was developed in support of the product/capability it should be included in the baseline as a configuration artifact and part of the configurations data set.
- i. What challenges do you face in implementing a capability? CI identification / decomposition, management of technical data and CCB hierarchies.
- j. How are the capabilities/requirements developed? Gap analysis between current capability baselines and threat/need analysis.
- k. Once the CONOPS is signed how do you manage modifications or elimination of requirements/capabilities for affordability, risk reduction, or other reasons? FCBs and their formal change control provide the ability to show exactly what modifications/changes have occurred.
- l. Does the development of a capability follow any specific industry standards? The FCB which includes required specifications and the Product Configuration Baseline (PCB) which identifies specifications/standards imposed as part of the design process would reflect application of industry standards.
- m. Of the CG's assets (i.e., cutters, aircraft, etc), which currently have what capability? Functional, allocated and product configuration baselines are the source of this type of information. Baselines describe exactly and to what degree each asset possesses a capability, to include required interfaces.

CHAPTER 2. CONFIGURATION PLANNING/MANAGEMENT

A. Policy.

1. The degree of CM applied shall be tailored for consistency with the quantity, size, complexity, intended use, life cycle phase (as appropriate) and mission criticality of the CI involved. CM shall be exercised throughout a CI's existence as discussed and outlined in Chapters One through Eight of this Manual.
2. CM shall permit the maximum latitude during initial definition of need as the functional requirements are being identified.
3. Provisions shall be made in the early CM planning and execution stages to ensure that the current configuration identification is always known for each item under configuration control and that configuration changes are properly assessed to support areas such as detailed design, safety, quality, system engineering, Lines of Business, EA and ILS.
4. A CM plan shall be developed and implemented for all critical assets, products or services including but not limited to boats, aircraft, cutters, Command, Control, Communications, Computers and Information (C4IT) systems, people (billet structures, certification requirements and documentation), lines of business, hardware, software, data, platforms, facilities, equipment, NTNO products, logistics and service centers. CM provisions for contractor furnished systems and equipment will ordinarily be covered in the product's CM plan. Appendix A of this Manual provides guidance on the contents for and practical application of the CM plan. A single CM plan may suffice for similar type products or for groupings of family related systems or equipment if sufficient specific CM program information is provided for each CI being managed and controlled by the same program and/or product line as long as each top level CI has an appendix identifying its specific configuration hierarchy and top level functional requirements.
5. The CM Plan shall be reviewed and updated, at a minimum, prior to entering each program life cycle phase or concurrent with strategic plans as appropriate. It shall also be updated as significant changes occur, particularly in the acquisition and/or logistic support strategy, and utilized as a working and living document. Due to the continuous need to revise, update and implement the CM Plan the concurrent clearance authority shall be comprised of the Sponsor, Line of Business Manager, Program/Project Manager, the Product Manager, the CM Mgr, and the Contracting Officer/Funding Manager, with Commandant (CG-444) technical authority and oversight.

B. Introduction. A basic principle of management is that responsibility, unlike authority, cannot be delegated. The CG, including CM Managers have the responsibility to ensure operating forces are provided with correctly "configured" products and services and the information necessary to operate and maintain those products and services effectively. Regardless of the acquisition concept (major, non-major, material or non-material) employed, this responsibility cannot be delegated, nor can it be taken lightly.

C. Scope.

1. The documentation acquired by the CG and the degree of Government detailed involvement in configuration change decisions varies with the acquisition approach being utilized. In the past, contractual imposition of a CM military standard assured contractors employed CM practices, and could be held accountable through audit, oversight and other surveillance methods. The Government typically assumed control of configuration documentation in three progressive stages (Functional, Allocated, and Product configuration baselines). The control consisted of Government CCB approval of Class I changes and Government concurrence on Class II changes (Figure 5-2). By assuming direct control of the configuration baselines the Government could prevent changes that were not beneficial, could not be supported, or were too costly. The Government CM Mgr fulfilled his responsibility through a hands-on management and detailed decision making. To reduce the cost of acquisition, relieve the cost premium on Contractors for doing Government business, facilitate a common commercial/Government industrial base, and solve the problems relating to equipment obsolescence, Government acquisition practices were revised to adopt industry practices and to promote performance based acquisitions.
2. In a performance-based acquisition, the CG controls only the specified performance and the critical interfaces of the item, leaving the detailed design and its management to the Contractor. Understanding the Contractor's CM proficiency certainly reduces the government's risk in such circumstances. Where necessary the CG assumes configuration control of the PCB (the detailed design solution) after successful functional and physical configuration audits. FCA and PCA shall be performed before OT&E.
3. This new approach relieves the Government CM Mgr of much of the hands-on processing of change proposals at the detailed design level, described above, but it does not relieve his / her responsibility to the operating forces of ensuring the required performance is delivered. The changes in acquisition methods and strategies have not changed the activities to be accomplished as part of the CM process. Military CM standards are currently being reinstated and should be available soon; until such time MIL-STD-973 forms can be used as templates. This will be particularly helpful when the government is executing a build to print type acquisition in which we will be responsible for all design decisions. A design change is authorized only through an ECP approved by the CCB. The authority to modify either the requirements or design of a CG capability rests solely on the CCB Chair. A capability and a contract are not one and the same. The Contracting Officer is in fact the only person who can modify a contract (via a contract mod) but this authority shall not be confused with the authority vested in the CCB Chair to approve the change (requirements or design).
4. Given the differences in acquisition concept and the variations which will occur from program to program, the CM responsibility must be fulfilled using flexible, adaptive, and mature management methods. Planning and management techniques are the key to effective implementation of CM. Acquisition methods and strategies often drive the determination of the degree and level to which Government and Contractor CM is applied. There are a few of the many options which must be determined during the acquisition phase planning and preparation, and defined in the contract language. This

chapter provides rationale, based on benefit to risk considerations, to help in making appropriate choices.

D. Management and Planning Activities.

1. The CG's management and planning activities are common to all phases, although the details imposed vary from phase to phase and are dependent on the capability being managed e.g., asset, IT, business process, part, system and/or an individual required skill set. These are the same management and planning activities that we should be applying to everything we do, if you don't plan for it - it isn't going to happen, therefore the following questions apply: (1) What needs to be done (task)?; (2) Who is going to do it (resource)?; (3) When does it need to be done (time)?; and (4) Is tasking related to another task (relationship)?
 - a. **Management and Planning Top Level Activity Breakdown.** The following represents the core CG CM activity and its relationships to the other stake-holding activities.
 - (1) Inputs
 - (a) Authorization to initiate the Program.
 - (b) Communications with all of the other stakeholders.
 - (c) Elected information and performance measurements received from the CSA activity.
 - (2) Mechanisms
 - (a) The degree of management support provided.
 - (b) The working relationships established with such other interfacing activities as Program Management, Engineering and Logistics, and Contractor CM.
 - (c) The resources and facilities assigned to the function including such resources as automated tools, connectivity to a shared data environment, and other infrastructure elements.
 - (d) The training and experience of the personnel and the guidance and resources they have at their disposal are also facilitators.
 - (3) Constraints
 - (a) A compressed time schedule for program execution.
 - (b) A lack of needed people and tools, or by a lack of effective planning.
 - (c) Contractual provisions which limit the Government CM manager's sphere of control.
 - (4) Outputs
 - (a) CM planning information and the resulting documented CM process that determines the extent of allocation of the CM change authority to the Contractor and the Government.

- (b) Statement of work language and other information to be inserted in Requests for Proposals and Contracts.

Note:

The CM interactive website contains many CM products produced by other Government Agencies and/or industry. These products are provided to optimize interoperability and resources. Please contact Commandant (CG-444) if you have any questions regarding CG application of information supplied.

Note:

Government Product CM Management Activities span all phases of the Program Life Cycle. The specific actions and criteria within these activities vary from phase to phase. More information is depicted within the interactive CM Product Life Cycle webpage, which is hyperlinked through [Figure 2-1](#).

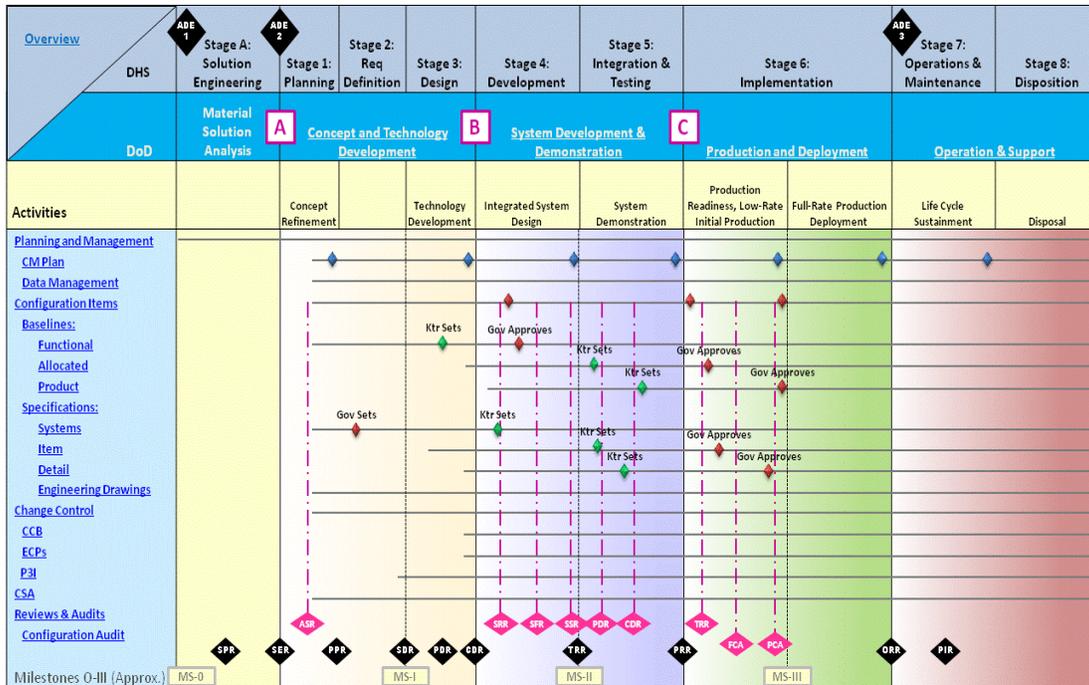
b. Implementation of Government CM Management Activities.

- (1) Prepare for Next Phase (see more detailed information in Para. E). Perform CM Planning/Develop CM Plan (see Appendix A)
 - (a) Develop/Revise CONOPS;
 - (b) Determine/Update CM Acquisition Strategy;
 - (c) Develop Request for Proposal (RFP) CM Requirements and Goals;
 - (d) Prepare CM Proposal Evaluation Criteria; and
 - (e) Establish CM Infrastructure Needs/Changes, Resources and Facilities.
- (2) Implement Government CM Process (see more detailed information in Para. F)
 - (a) Assign Roles and Responsibilities;
 - (b) Select/Acquire/Customize Automated CM Tools;
 - (c) Prepare, Gain Acceptance of, and Implement Procedures;
 - (d) Conduct Training; and
 - (e) Manage process.
- (3) Measure/Evaluate Government/Contractor CM Process and Performance (see more detailed information in Para. G)
 - (a) Implement Appropriate Corrective Action.
 - (b) Develop/Select Metrics.
 - (c) Coordinate and Communicate metrics.
 - (d) Obtain Measurement Data.
 - (e) Assess Trends.
 - (f) Establish Level of Confidence.
 - (g) Provide Feedback.
 - (h) Establish Data Collection Process.

- (4) Effect Process Improvements/Document Lessons Learned (see more detailed information in Para. H)
 - (a) Revise process, Procedures, Training.
 - (b) Implement and continue Measurement/Improvement Cycle.
 - (c) Document changes, reasons and results.
2. Planning the CM effort should begin the moment a need has been identified. The capability known as the “CG” is documented in the CG Enterprise Architecture (CGEA). CGEA, in and of itself, is comprised of many “configuration items” requiring management. Each element of the organization has a requirement to document their configuration item artifacts (processes, data, and tools) in the CGEA; therefore, the identification and management of each configuration artifact should be addressed within the directorate’s CM plan. When determined by the CG executive level CCB that an identified need will require the acquisition of a new asset a CM Mgr shall be appointed to oversee the CM effort. The CM Mgr will work closely with other project technical discipline (systems engineering, acquisition planning, test and evaluation, and logistics) representatives to ensure the CM plan is reflective/supportive of program efforts. The CM plan should identify the CM tasks to be performed throughout the life of the required capability, the organizations involved in the CM effort their roles and responsibilities, inputs and outputs from these tasks and the interrelationships and/or interfaces. The plan should include a high level schedule of major CM events, with completion times tied to project milestones rather than dates to reduce the frequency of update needed to keep the CM plan current. If the program under question is in the pre-Milestone Decision Event A phase (or if otherwise desired), a CM Approach specifying the CM guidelines to be followed and the strategy for executing the CM effort shall be included in acquisition documentation developed to initiate the program. A CM plan should be written as a follow-up document to the CM Approach.

Note:

System Spec and Functional Baseline as depicted below are basically one in the same and apply only to contracts. The System Spec as set by the Government is the basis of the Contractor Functional Baseline this should not be confused with the Program Functional Baseline which may include requirements broader than those contained within the contracted effort. This is an important difference to understand for all industry standards recognize the functional baseline as the performance or system specification placed on contract. In a governmental application the functional baseline would not be set until after the FCA was completed until that time it would only be an initial functional baseline. For further information or clarification please contact Commandant (CG-444).



Product Configuration Management Life Cycle
Figure 2-1

E. Preparing for the Next Phase.

1. The enterprise architecture will align itself with the phases of the CG Strategic Plan. During each life cycle phase, preparation for the following phase takes place. For concept exploration phases, this work takes place prior to the initiation of the conception phase, when the requirements for funded study efforts are being formulated.
2. CM planning describes how we are going to ensure that we can communicate “why” the CG needs the capability; “who” is going to do “what”, “when”, “where”, and “how” to ensure the required capability is delivered and maintained. For acquisitions it is a vital part of the preparation for each phase. CM Planning consists of developing a concept for how the CM effort is intended to be executed. Specifically citing what activities are required for the forthcoming phase and preparing or revising the plan as necessary. Configuration Managers must envision and determine what information is required now and in the future to ensure required capability is delivered, verified and sustained.

Note:

Obviously configuration questions cannot and should not be answered in isolation. They require close coordination, preferably in a team atmosphere involving Program, Engineering, and Logistics personnel. Where feasible, it is desirable to work out planning for future phases within a team arrangement with the Contractor(s) participating in the current phase. This provides an opportunity to examine all perspectives on the critical issues and

goals in an open atmosphere, and to arrive at the best approach forward

- a. The CM CONOPS answers questions such as:
 - (1) What are the CM objectives for each phase? For instance a commercial off-the-shelf acquisition strategy is being sought therefore, what configuration data should be available at contract award? The CM Mgr needs to influence what rights in data are sought.
 - (2) What is the rationale for these CM objectives? Rationale for requesting full data rights might be based on Project CONOPs stating system shall be organically maintained.
 - (3) How is each CM objective related to project objectives and risks? The objective of a physical configuration audit would be to ensure the item scheduled for OT&E is that which is unambiguously described in the manufacturer's technical data. Why? Because the decision for full rate production will follow successful OT&E therefore insurance that what is documented is what was tested and what was tested is what will be reproduced.
 - (4) What is the risk associated with not meeting the objectives? Example - if the FCA and PCA are not conducted prior to OT&E there is substantial risk that the demonstrated performance cannot be replicated.
 - (5) How can achievement of the objectives be measured?
 - (6) What information is required to support the CM goals for the next phase? Future phases?
 - (7) How can that information best be obtained?
- b. The acquisition strategy shall include CM roles and responsibilities for government and contractor. It should address whether or not CM will be part of the source selection criteria and if so to what degree. It should address specific questions such as:
 - (1) What are the deliverables from the next project phase?
 - (2) Which deliverables are configuration items (CI)?
 - (3) Who will propose candidate CIs (Government or Contractor)?
 - (4) How will the final listing of CIs be officially designated?
 - (5) What is the end use of each CI?
 - (6) How are they to be supported?
 - (7) To what extent will the CG and/or manufacturer support the CIs?
 - (8) To what level are specifications required? CIs? Repairable components? Replaceable components?
 - (9) Will the CG prepare performance specification, or will Contractors?

- (10) Who in the Contractor organization will be responsible for approving the specifications? In the Government organization?
- (11) What level of configuration documentation (e.g., performance specifications, detail specifications, complete technical data package) will the Government and/or the Contractor require by the end of the next phase?
- (12) What kinds of configuration identifiers (e.g., part numbers, serial numbers, nomenclature, National Stock Numbers) will the CG and/or the Contractor require by the end of the next phase?
- (13) Which baselines (and documents) will already be subject to CG Configuration Control at the start of the next phase?
- (14) What baselines will be established by the Contractor during the next phase? As designed? As tested? As manufactured? Functional? Allocated? Product?
- (15) What documents shall be included in those baselines?
- (16) Will control of any of the baseline documents transfer from the Contractor to the CG during the next phase? When is the transfer planned to occur?
- (17) What status accounting will be needed in the next phase?
- (18) Which specific information should the CG provide? Which specific information should the Contractor provide?
- (19) Does the project have approval to obtain the information in other than electronic format? Will the CG need to have on-line access?

F. Implementing the CM Process.

1. Managing the CM process in the environment of performance-based acquisition, IPTs, and allocated configuration control authority is a challenging enterprise. The individual IPTs, Contractors and other CG activities that are the authority for configuration control of segments of a solution design must apply consistent logic to their decision making. They must provide information that can be shared. Once a well thought out plan and a documented and agreed-to process are in place, the CM Manager must employ modern management techniques to assess process effectiveness, assure anticipated results and fine tune the process as necessary.
2. It is also necessary to maintain the CM process documentation by updating plans, procedures and training as required. It all starts and ends with communication:
 - a. Articulating clear goals and objectives;
 - b. Making sure that the various players understand and cooperate;
 - c. Providing frequent feedback;
 - d. Assuring that current status information is accessible; and
 - e. Paying attention to the inevitable minor problems which surface.

Note:

Select your metrics after you have defined your goals and related performance questions. Wait until after you have determined what you are set to accomplish (improve stakeholder satisfaction? Elevate the quality of requirements artifacts? Reduce rework? improve predictability of project schedules?) to start thinking about what to measure.

G. Measuring/Evaluating Government/Contractor CM Process and Performance.

1. Both the Government and the Contractor CM process are measured and evaluated using metrics, project reviews, and other means such as Contractor Performance Assessment Reviews (CPARS). Project specific metrics collected throughout the process may be utilized to determine the degree to which objectives (CM goals) are being met. Focusing the measurement on the most meaningful and important parameters the metrics can provide a level of confidence in the process.
2. Since the CM Process is a shared enterprise, the Government CM objectives and Contractor CM objectives should be in agreement. The best way to do that is to communicate. During the CM planning for each phase, the Government must articulate the vision and the Contractor must realize the seriousness of the intent. The CG CM objectives should be made available to the Contractor(s) for comment before being finalized. The Contractor's CM objectives should be provided to the Government for review as part of the Contractor's proposal.
3. Ideally, all should agree upon a common set of objectives. Metrics constitute the data for improvement, the facts of the process. They enable problems that need attention to be quantified, stratified and prioritized and also provide a basis for assessing trends and improvements. Only a few critical items should be used at one time. They should be designed to positively motivate, rather than keep score, and should be forward focused, (where are we going) not merely a compilation of past history.
4. No important CM function is performed without interaction with other functional or team members. Therefore, CM objectives and measurements cannot and should not be divorced from interacting with systems engineering, design engineering, logistics, contracting and other project objectives and processes. **Most importantly, it is not the efficiency of CM activities that add value, but their result in contributing to overall project objectives.**
5. Metrics.
 - a. Improving the CM process is a venture that typically requires interaction across a broad spectrum of project activities including technical, financial and contractual (**Figure 2-2**). The CM process has its own CIs that must be documented to a level of detail that is:
 - (1) Easily understood by all participants in the process;
 - (2) Focused on the key process interfaces; and

- (3) Less detailed than the procedures used to perform the process but sufficient to determine what must be measured to obtain factual information on the process.
- b. A metric involves more than a measurement; it consists of:
 - (1) An operational definition of the metric which defines what is to be measured, why the metric is employed, when, where and how it is used. It can also help to determine when a metric has outlived its usefulness and should be discontinued.
 - (2) The collection and recording of actual measurement data. In the case of the CM process, this step can often be accomplished by query to the status accounting data base, which normally can provide a great deal of process flow information.
 - (3) The reduction of the measurement data into a presentation format (e.g., run chart, control chart, cause and effect diagram, Pareto charts, histogram) to best illuminate problems or bottlenecks and lead to the determination of root cause or largest constraint.
- c. An effective metric has the following attributes:
 - (1) It is meaningful in terms of customer relationships (where the “customer” can be any user of information that is provided.).
 - (2) It relates to an organization’s goals and objective, and tells how well they are being met by the process, or part of the process, being measured.
 - (3) It is timely, simple, logical and repeatable, unambiguously defined, economical to collect.
 - (4) It shows a trend over time which will drive the appropriate forward focused action which will benefit the entire organization.

| Measure | Formula |
|---------------------------------|-------------------------------------------------------------------------------------------------------|
| Schedule Variance | Actual duration/Planned duration |
| Effort Variance | Actual effort/Planned effort |
| Requirement stability | Number of requirements /Number of requirements traceable to verification data (test results/analysis) |
| Requirement definition process | Total number of ECPs processed during design evolution. |
| Defect density | Total number of defects found before testing Total no. of defects found after testing |
| Audit variance | No. of discrepancies found during audit No. of discrepancies found after baseline |
| ECP stability | ECs executed per plan/actual execution of ECs (cost, schedule, performance, spares, etc.) |
| Technical Data Package Accuracy | TDP configuration/pre-depot physical configuration |

Sample CM Metrics
Figure 2-2

H. Effecting Process Improvements/Documenting Lessons Learned.

1. We learn from effective measurements and metrics if the process is or is not meeting objectives. Therefore not only is the CM process itself a CI but the metrics become CIs as well. This level of management is necessary within a project because we learn which part of the process is currently not working through the measurement. By focusing on that weakest link, we can isolate the problem and trace it to its root cause effecting a Process Change. Often the cause can be corrected by streamlining the process (eliminating redundancy or non-value adding steps, modifying sequence and performing tasks in parallel rather than in series) or improving communications. Measurements should continue as is or be altered (through formal change control process) to fit for a period of time needed to assess if the altered process is resulting in improved performance.
2. This measurement/improvement cycle is a repetitive process. Once a weak link is improved, the process metrics are again reviewed to determine and improve other parts of the process that stand out as contributors to deficiencies or lengthy cycle time. These “total quality management aspects” of the job are best performed as a necessary part of the process of management, rather than as isolated exercises. To obtain best value of changes made in the process each element of the process shall be placed on configuration control e.g., metrics should be recorded along with the reasons the changes were made and the measured results to clearly document the lessons learned to maximize the effectiveness of future applications.
3. Record process changes in the CM Plan as they occur. Initially your CM plan is only a projection of the expected CM implementation over the project life cycle. At a minimum, it is updated during each phase to address the next phase’s application and to capture actual accomplishment of the previous phase. Including process change and lessons learned information makes the plan a working document reflecting the transition from planning to reality. It then serves as a better Reference for use in planning for the next project phase and in the initial planning for future projects.

CHAPTER 3. CONFIGURATION IDENTIFICATION

A. Policy.

1. The selection of an item as a CI shall be determined by the need to control the item's inherent design characteristics, attributes, and performance or the need to control the item's interface with other related items that are managed independently.
2. Applicable CI documentation shall be developed and maintained throughout the life cycle of all CIs. Each project level CI will have a designated CM Mgr who is responsible for maintenance and control of configuration baselines and the supporting artifacts. Examples of configuration artifacts are presented in this chapter.
3. Configuration baselines shall be established for items deemed necessary for CM as identified in this chapter.
4. Specifications and drawings shall be considered as the primary baseline artifacts for products.
5. The Enterprise Architecture (EA) shall be considered as a primary baseline artifact for functional lines of business.

B. Configuration Item (CI).

1. The CM process begins with the selection and unique identification of items and/or artifacts required to produce a capability. As described in chapter one a configuration is the arrangement and relationship of parts or elements which are considered CIs. A CI can be any type of entity and is simply something whose design and / or interface must be managed. The platform itself would be a CI as may be the engine, pump, hardware, software, or firmware. CIs are the basic units of CM. This includes the interfacing of logistics support products between the support system and the CIs they are developed to support. CIs may differ widely in complexity, size, and kind (e.g., propulsion system, navigation system, embedded computer, computer program, electronic system, feed pump, test equipment, or a round of ammunition are all considered possible CIs).
2. New CIs may also be generated as a result of modernization efforts for a project. Although this will occur during the operational life of the system, the same process as described above is followed as the modernized CI is developed and fielded.

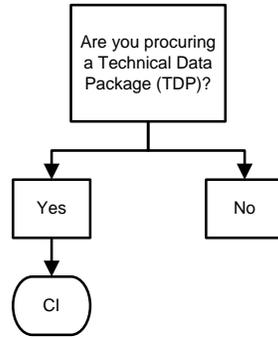
Note:

Failure to identify CIs and their associated configuration artifacts/documentation properly will result in an inability to control changes to the item's configuration, establish accurate records and reports, or validate the configuration through audit. Inaccurate or incomplete configuration documentation may result in defective products, schedule delays, and higher maintenance costs after delivery.

3. A CI satisfies an end-use function or combination of functions. Thus a top-level CI or "parent" item, such as a project, major system, business process, or equipment, is composed of a number of lower level CIs to which various functions have been allocated by the designer. Similarly, functions of these lower level CIs are further sub-allocated

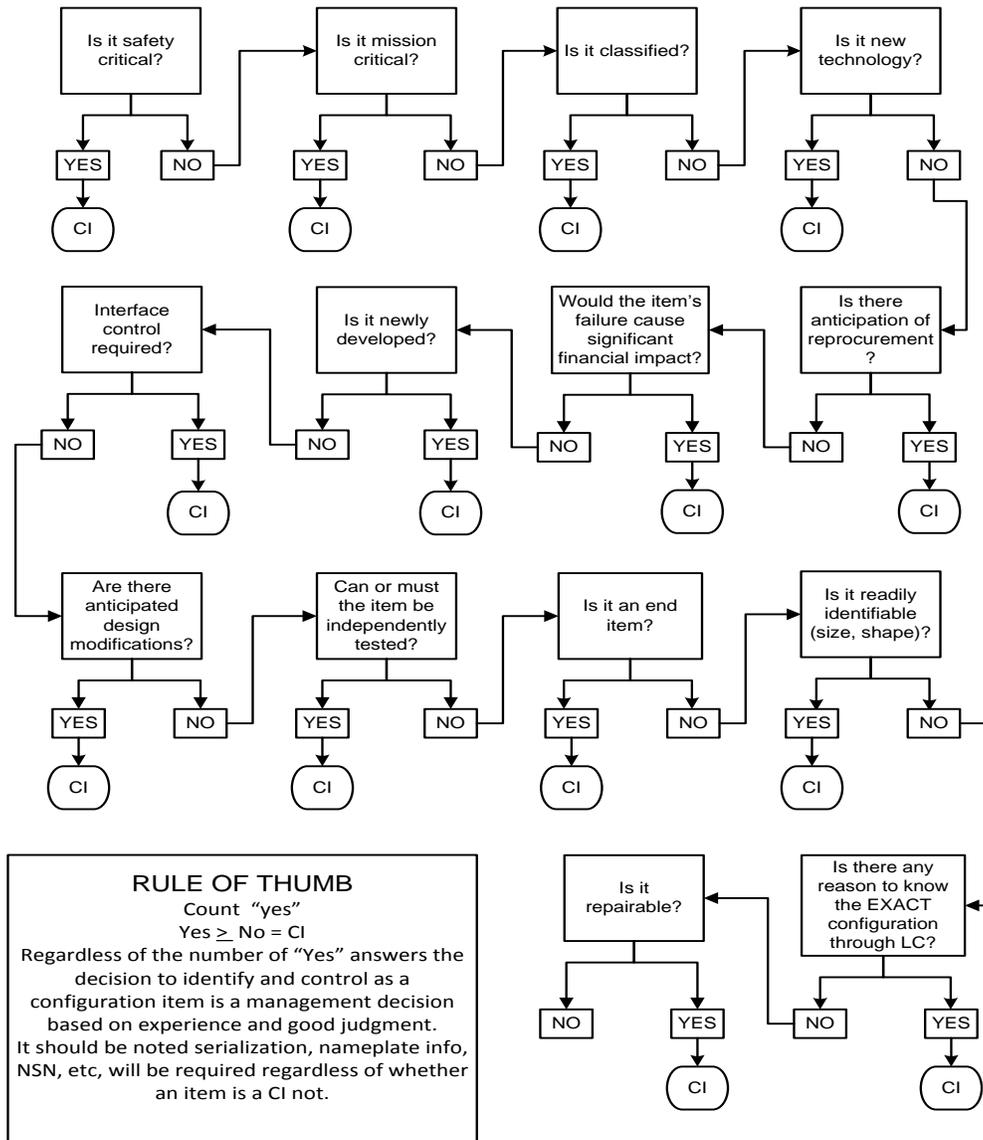
downward resulting in the formation of a hierarchically structured family of CIs. By use of this hierarchical structuring concept, top level CIs can be broken down into sufficient detail such that lower level CIs can be uniquely identified and interfaced at some level of agreement. Depicted **Figure 3-1** is a CI Decision Tree to assist in the selection of CIs.

- a. For each CI:
 - (1) There will be associated configuration documentation (which may range from a performance specification to a detailed drawing to a commercial item description);
 - (2) Configuration changes to include changes to documentation will be controlled;
 - (3) CSA records will be maintained; and
 - (4) Configuration audits will be conducted to verify performance and product configuration (unless the CI has an already established PCB).
- b. Some of the primary reasons for designating separate CIs are:
 - (1) Critical, new or modified design;
 - (2) Independent end use functions;
 - (3) Sub-assembly factors such as the need for separate configuration control or for the affectivity of changes;
 - (4) Components common to several systems;
 - (5) Interface with other systems, equipment or software;
 - (6) Level at which interchangeability must be maintained;
 - (7) Separate delivery or installation requirement;
 - (8) Separate definition of performance and test requirements;
 - (9) High risk and critical component; and
 - (10) GFE, hardware and software.
4. Once the criteria have been defined, the system engineer should lead a group consisting of representatives from the project areas of design and development, logistics, acquisition, cost management, test and evaluation and CM to determine the initial set of CIs for the system. In general, only one or perhaps several CIs may be determined at project initiation – this number will greatly expand as the project progresses through its development cycle.



UNIQUE ID = SPECIFICATION = TDP=(DWG, IPB) = CM PLAN = CCB = SPEC TREE = INTERFACE CONTROL DOC = PDR/CDR/TRR = QUAL TESTING = QA RECORDS = FCA/PCA = OPERATIONS & MAINTENANCE MANUALS = DETAILED DESIGN INFOR PER HULL (AS MAINTAINED)

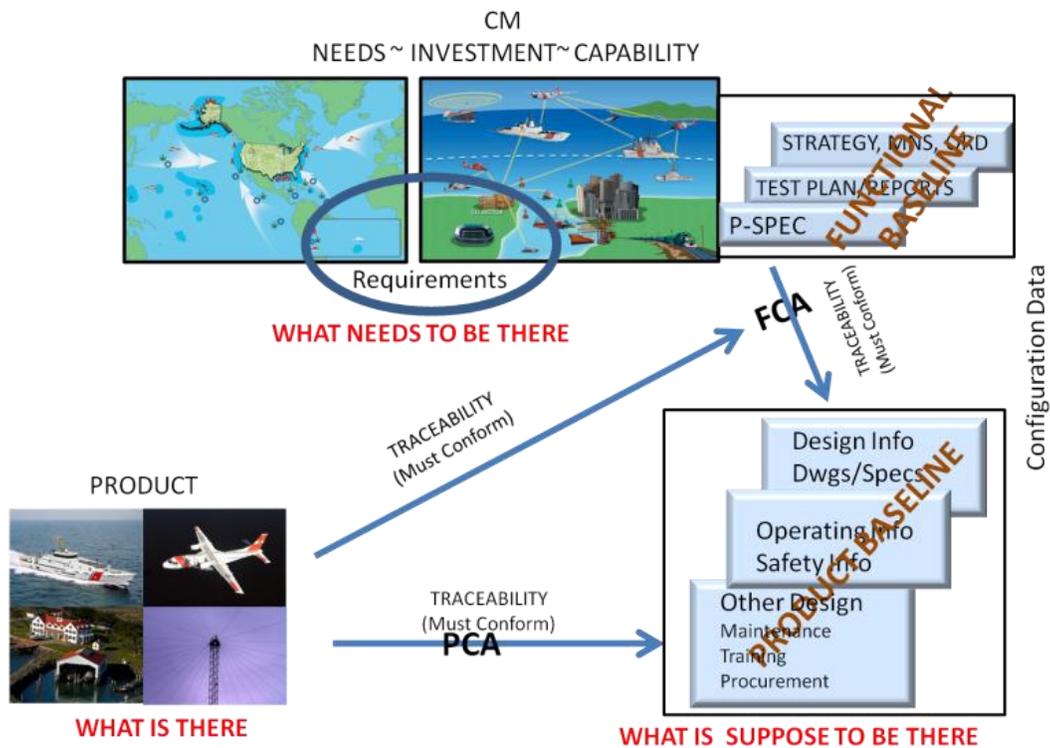
AT A MINIMUM



Configuration Item Decision Tree
Figure 3-1

C. Configuration Documentation and Baselines.

1. A CI can be described in either functional (what it does) or physical (what it is) terms. Initially a CI is identified in a functional context that is uniquely related to technical specifications and performance requirements defined by the item's FCB documentation. During the design phase the designers will specify lower level CIs e.g., a sub-system or equipment CI to be procured or fabricated in the form of a technical specification. This initial CI may be identified by a specific manufacturer's part number, and it may also be identified by a standard nomenclature such as a type designation (specific "AN/") or "MARK/MOD" designator for electronics or ordnance hardware items, respectively. In either case the CI is still considered a component of the FCB or ACB and is in itself functionally defined. Transition to a physically defined item takes place when the CI's documentation is such that it represents the product itself. This is referred to as the PCB. Each CI represents a component of the asset's PCB when installed into a completed system. See **Figure 3-2** for illustrated description of CM baselines. The unique CI may or may not be controlled by a serial number assignment, depending on the nature of the item or as explained earlier the degree to which the items shall be managed. Each established baseline of a CI and that of its associated artifacts (logistics support products included) is managed and controlled using a well-defined family of baseline and other related configuration identification documentation (e.g., engineering drawings, technical manuals, and Provisioning Parts Lists (PPLs)) applicable to the whole population of the top level CI. Also, any specific changes to or variance from the baseline will have an impact on a particular application of the CI.



Configuration Management Baseline Illustration
Figure 3-2

2. CIs are normally managed in a hierarchical manner; that is, the initial CI of a system will lead to the identification of sub-system/sub-element CIs, which will then lead to the components of the subsystems being designated as CIs. For capability managed projects, a functional breakdown of CIs may occur, as the capability itself is broken down into sub-elements which will be satisfied by various systems (having a hierarchical CI structure). Regardless, as configuration baselines are established, new CIs will be identified and managed. The classic configuration baselines and the level of CIs being tracked are summarized in **Table 3-1**.

| Baseline | Establishment Time | General levels of CIs | *Consists of: (*In general, not specific to every acquisition) |
|--------------------|--------------------------------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Functional | System Definition Review (SDR) | System | Contractor= System Requirements Spec, GFE/GFI lists USCG= Operational Requirements Document (ORD), CONOPS, System Performance Spec, Detail Design Spec, Interface Spec |
| Allocated | Preliminary Design Review or Contract Design Review | Subsystems | CIs and other Specs |
| Software Allocated | Software Specification Review | Subsystems | SW Requirements and Interface Requirements Spec |
| Product | Critical Design Review or Physical Configuration Audit | Components | SW= Code, Version Description Document and Software Product Spec HW= Technical Data Package |

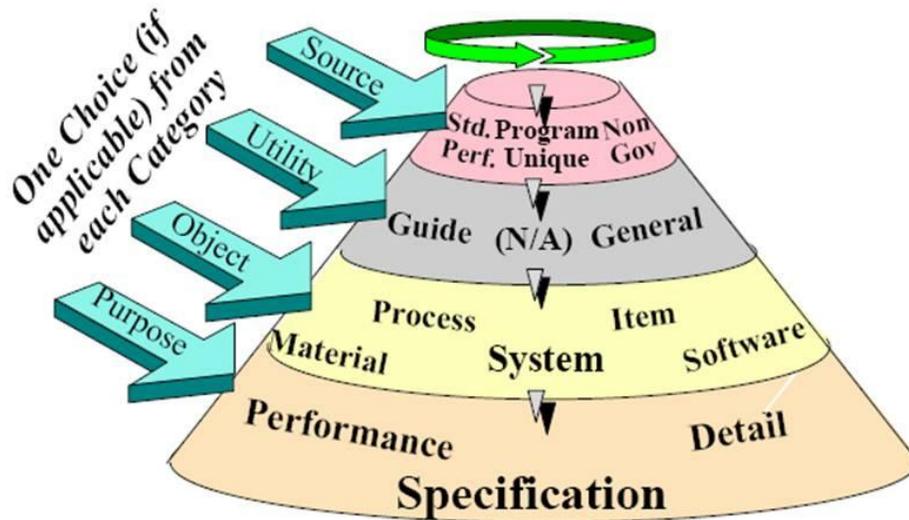
Level of CI Tracking by Baseline
Table 3-1

D. Specification Concepts.

1. Specifications by their nature and purpose are Requirements Documents (documents that specify requirements that are intended to be met when cited in a contract or agreement), and are treated as such in Electronics and Information Technology Association (EIA)-836, the industry standard for configuration data exchange and interoperability. The selection of the appropriate specification types is dependent upon a number of factors such as the maturity of the item's design, contracting strategy, and the context and environment in which it must operate. The new order of precedence defined by policy strongly indicates preference for the use of existing commercial products, wherever

possible, and the choice of products meeting performance rather than detail specifications, see **Table 3-2**.

2. Project Unique Specifications, of both a performance and detailed nature, are at the bottom of the preference hierarchy and are used when the other choices are not available or applicable. Nonetheless, acquisition projects dealing with the development of new systems will continue to see the use of project-unique specifications where the specifications are being prepared for a single system or item and have little potential for further use except for repetitive fiscal year production and spares purchases. Both the Government and contractors should seize opportunities at lower levels of the specification tree (where developed items, referred to as non-developmental items (NDI) may be used) to select higher preference specification types, and to specify only performance and interface requirements rather than design solutions in those specifications, whenever possible.
3. To aide in understanding the array of various designations used to identify specifications, **Figure 3-3**, categorizes the specification document types, as follows:
 - a. Source (Non-Government, Commercial, Federal, Military, Project Unique) – category indicates the standardization/specification domain of the document (**Table 3-3**).
 - b. Utility (General, Generic, or Guide) if applicable- relates to the characteristics of the documents that facilitates standardization by providing “boilerplate” or templates for classes of items with largely common requirements. This category applies only to those documents where these characteristics are applicable (**Table 3-4**).
 - c. Object (System, Item, Software, Material, and Process) – represents the type of CI object in MIL-STD-961, Appendix A that a specification is intended to define. The objects are not restricted to use with project unique specifications; they are applicable for use with the other source categories as well. They replace the MIL-STD-490 categories, e.g., prime item, critical item, inventory item, etc. (**Table 3-5**).
 - d. Purpose (Performance or Detail) – distinguished between performance and detail specifications. Their content and format are delineated in MIL-STD-961. Performance specifications define requirements and constraints for a product and/or service entering the engineering and/or manufacturing development phase or being acquired at a performance level. Detail specifications define requirements and a specific design for a CI being acquired during a production, deployment and operational support phase (**Table 3-6**).



Selection of Specification Types
Figure 3-3

4. The requirements of the FCBs and ACBs are basically design constraints. As the design solution evolves the performance requirements evolve into a specific product and/or service definition. The product and/or service definition is based on an aggregate of the configuration documentation. For products and services this documentation will include models (for legacy products this documentation includes drawings), associated lists and the material and process documents that are referenced in the drawings/model.

Table 3-2 Order of Preference for Specifications

| ORDER | TYPE OF DOCUMENT | DEFINED BY | USE |
|--------------|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I | Specific Defined Documents | | |
| | Various | Law, or regulation pursuant to law | When mandated |
| II | Performance Documents (Not Project Unique) | | |
| | Non-Government Standards | Industry Associations and Societies (e.g., American Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM), Society of Automobile Engineers (SAE), EIA) | When they contain only performance-based requirements sufficient for the intended acquisition |
| | Commercial Item Descriptions | | Commercially available item, performance description of which has been standardized |
| | Federal Specifications | | When an applicable Federal specification (applicable for use by all agencies and departments) is available |
| | Standard (General) Performance Specification (MIL-PRF-XXXXX) | MIL-STD-961 | (See Note 1) |
| III | Detail Documents | | |
| | Non-Government Standard | Industry Association | (See Notes 2 and 5) |
| | Federal Specifications | | (See Notes 2 and 5) |
| | Standard (General) Performance Specification (MIL-DTL-XXXXX) | MIL-STD-961 | (See Notes 1, 2 and 5) |
| IV | Government Non-MIL, Non-Fed Standard/specification | | |
| | Purchase Description Product Description Specification | Multiple sources, various Government agencies | When a suitable, existing, document can be found |
| V | Project Unique Specifications: Performance (PRF)/Detail (DTL) | | (Notes 2, 4, 5 apply to all items below.) |
| | System Specification (PRF only) | MIL-STD-961, Appendix A | When performance of system is specified |
| | Item Specifications | MIL-STD-961, Appendix A | To document the performance or detail requirements of a CI, when an item is being acquired by the Government or by a contractor (See Note 6) |
| | Software Specifications | MIL-STD-961, Appendix A and International Organization for Standardization (ISO)/International Electro Technical Commission (IEC) | <u>Performance</u> : When requirements are specified for development or delivery of software. <u>Detail</u> : When software design, interface and data base descriptions are specified either in appendices, or by Reference, as the basis for delivery of software. (See Note 6) |

Table 3-2 Order of Preference for Specifications

| ORDER | TYPE OF DOCUMENT | DEFINED BY | USE |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Material Specifications | MIL-STD-961, Appendix A | When a specific material, for which there is no existing standard, must be specified as part of the design solution by a contractor. (See Note 7) |
| | Process Specifications | MIL-STD-961, Appendix A | When a unique manufacturing, test method, or inspection process must be specified as part of the contractor's design solution. (See Note 7) |
| IV | (Legacy) MIL, Federal (FED) or Project Unique Specifications | | |
| | Various types | MIL-STD-490, etc | Only for re-procurement of items not requiring major modification or upgrade or when a non-DoD customer or lead agency from another country requires it. |
| <p>Notes:</p> <ol style="list-style-type: none"> When the requirements can be cited using a General specification, specification sheet, or military specification sheet. A Detail Specification is used when requirements for interface definition, safety, adequacy or interchangeability make specification of materials, design or construction requirements, or "how-to" information necessary. Use of a Federal or Military Detail Specification by the Government requires a waiver granted by the applicable authority for the project's acquisition category (See DoD 5000.2-R and DoD Policy Memo 95-1) unless one or more of the following applies: <ol style="list-style-type: none"> It is for re-procurement of an item not requiring major modification or upgrade; The contractor proposes its use in response to a solicitation; The acquisition is for Federal supply Group 11 (Nuclear Ordnance) or Federal supply Class 4470 (Nuclear Reactors); It is required by a non-DoD customer or lead agency from another country in a joint acquisition; and It is cited for guidance only A Performance Specification is changed into a Detail Specification by addition of design requirements (design constraints, design solution) beyond the minimum required for interface and interchangeability. A project unique Specification is used: <ol style="list-style-type: none"> When there are no alternative higher precedence documents available; For a specific project or part of a single system (including repetitive fiscal year production and spares purchases), and If there is little potential for future use by subsequently developed systems. MIL-STD-961 recommends that Project Unique Item and Software Specifications be prepared as unified specifications containing all applicable performance and design requirements in a single document as opposed to separate development (or requirements) and product specifications. DoD discourages use of military unique material and process; commercial materials and methods shall be used wherever possible. | | | |

This table describes various standardization and specification domains in which a specification may originate. This category is part of a string comprising the specification type.

Table 3-3 Specification Types Categorized by Source

| Source | Description |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Non-Government | Standards or specifications published by industry associations or societies recognized as standards making bodies by the American National Standards Institute (ANSI), which define minimum acceptable performance and quality or precise interface requirements for a category of product. Examples of non-Government associations are ASME, SAE, EIA; example of performance/quality standard is SAE 50 Motor Oil; examples of standard interfaces are electronic connectors, screw thread sizes. |
| Commercial | Commercial Item Descriptions (CID) are standard purchase descriptions that by definition, are performance-based because they facilitate competitive bid for products meeting a stated functional requirement. Also commercial product descriptions (such as a manufacturer's catalog or specification sheet) and commercial purchase descriptions (item descriptions to be spelled out directly in a purchase order) qualify under this category. |
| Federal | Standards or specifications applicable to all agencies of the federal Government for items widely used. (They may be either performance or detail based) |
| Military | Specifications prepared for standard items with use in many different applications in weapons systems and their support equipment. These specifications are intended mainly for the competitive procurements of identical items for use as spares and for use in new weapons systems. Military Specifications are prepared per MIL-STD-961 and are listed in the DoD Index of Specifications and Standards (DoDISS). They are subject to the requirements of the Defense Standardization Program. |
| Standard Performance | Standard Performance Specifications (MIL-PRF) are performance specifications for items common to a number of different systems and subsystems. They follow the same guidelines as other performance specifications. They differ from Military specifications in those different, perhaps competing products that are not identical but meet the same form, fit and function requirements may satisfy them. |
| Project Unique | Specifications for a system, item, software, process or material, unique to a specific acquisition project, prepared by either Government or Contractor to define and baseline requirements for development, production (including repetitive fiscal year production and spares purchases), support and re-procurement. Project unique specification format and content are defined in MIL-STD-961. |

This table describes a category of specifications that facilitate standardization by providing templates for classes of items with largely common requirements. This category applies only to those documents where these characteristics are applicable. This category is part of a set of categories, which comprise the specification type.

Table 3-4 Specification Types Categorized by Utility

| Utility | Description |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| General, Associated, and Specification Sheets | <p>A general specification is one which facilitates the preparation of specifications for a number of items that are common except for specific variables such as size, power, range, etc. The General Specification defines the common requirements; the specific variables of each item are defined in either associated specifications or specification sheets.</p> <p>Associated specifications are used when the variables require a number of pages of specification language to define. Specification sheets are used when the variables can be numerically tabulated. Both are linked by specification number to the related general specification. Typically the general specification number followed by a slash and a serially assigned identifier identifies the associated specification, or specification sheet. (Example: MIL-PRF-18/25).</p> <p>Where there is ambiguity (conflict) between the General Specification and the Associated Specifications or Specification Sheets, the latter governs because it describes the specifics of a product while the general specification encompasses a family of products.</p> |
| Generic or Guide | <p>A Generic or Guide Specification is a tool for preparing a number of similar specifications for a class of like end items to be developed. The guide specification is a “template,” which identifies all of the essential performance parameters normally associated with the class of item, but does not provide the specific performance capabilities. The specification is then tailored to fill in the blanks to create a specific system or item specification.</p> <p>Some specific, but design-independent, performance capabilities may be provided by the Government, prior to an RFP. Each offerer would then provide the remaining performance capabilities. Typically inputs to the system and item specification are generated from the activities of prior project phases.</p> <p>Contractors also create generic specifications to use as “boilerplate” for preparation of a number of different item specifications with common requirements deriving from a common operating environment.</p> |

This table describes the type of CI “objects” that a specification is intended to define. This category is part of a string of categories which comprise the specification type.

Table 3-5 Specifications Types Categorized by Object

| Object | Description |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System | <p>A system specification defines the overall performance and mission requirements for a system, allocates requirements to lower level components of the system, and identifies system interface and inter-operability constraints. It is the top-level functional requirements specification for the system. A system specification is used to establish a functional baseline for the system.</p> <p>Large systems are usually decomposed; level two system components are often complex enough to be called "systems" themselves (although, for configuration management purposes, they are designated as Subsystems or CIs).</p> |
| Item | <p>The Item specification for a CI defines the performance and interface requirements and design and inter-operability constraints that have been allocated to the CI from a system or higher level CI.</p> <p>Item specifications provide the contractual basis for the development and verification of CI performance. The item performance (development) specification(s) will normally be used to establish the allocated baseline for the CI.</p> <p>An item performance (product) specification (essentially the same document) or an item detailed specification (containing specific design requirements) is used to provide the contractual basis for acquisition of production quantities of the CI.</p> |
| Software | <p>Computer Software Configuration Items (SCIs) are documented with software specifications prepared per MIL-STD-961D.</p> <p>A Software Performance Specification is similar to the Software Requirements Specification (formerly required by MIL-STD-2167A, and MIL-STD-498). A Software Detailed Specification is similar to the Software Requirements Specification plus the set of design documents describing the software, interface and database design.</p> |
| Material | <p>Material specifications are used where a raw material, mixture or semi-fabricated material has been developed specifically for use with a particular item or system and are critical to the performance or design of the item. (Example a missile rocket motor solid propellant chemical mixture.) The material specification is called out in the CI(s) design documentation. It therefore becomes part of the PCB of the CI(s).</p> |
| Process | <p>A process specification is used where a process (or service) has been developed specifically for use with a particular system/item and is critical to its performance or design. (A common Example – the curing process for the missile rocket motor solid propellant.) The process specification forms a part of the PCB of the CI(s).</p> |

This table describes the categories that indicate the intent of the specification, i.e., distinguish between performance and detail specifications. This category is part of a set of categories that comprise the specification type.

Table 3-6 Specification Types Categorized by Purpose

| Purpose Category | Description |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Performance | <p>A performance specification provides requirements for a system, item, software, process or material in terms of the required results and the criteria for verifying compliance. It defines the functional requirements, the operational environment, and interface and interchangeability requirements but does not state how the requirements are to be achieved; require the use of specific materials or parts; or give design or construction requirements beyond those design constraints necessary to unambiguously define interface and interchangeability requirements.</p> <p>The intent of a performance specification is to allow more than one design solution for the requirements specified so that interchangeable competitive products may be evaluated, and new technology may be inserted.</p> |
| Detail | <p>A detail specification may consist of all detail requirements or a blend of performance and detail requirements (MIL-STD-961). However, the DoD preference is for one specification to convey all the performance and detail requirements for an item so that, for repetitive re-procurement, the function and performance attributes of the product are included. In fact, in appendix A of MIL-STD-961 (which addresses project unique specifications), clearly states that unified, rather than separate development/requirements and product specifications are to be prepared.</p> <p>One intent of the detailed specification, as a revision of the performance specification, is to provide sufficient detail to distinguish the features of one design solution for an item from other competing design solutions. Another intent is to specify details of the design solution, such as the use of specific parts and materials, that are essential for critical, safety or economic reasons, but to state as many requirements in performance terms as possible. When the Government baselines a detail specification, it limits its re-procurement choice to a particular design solution, and when a contractor agrees to that baseline, some design change flexibility is surrendered. What makes a stated requirement a design requirement and not a performance requirement is that it prescribes design, construction, material or quality control solutions, rather than allow contractor development flexibility.</p> |

Table 3-7 Engineering Drawings and Associated Lists

| Subject | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sub-Topic/Reference | Description |
| Definition | |
| <ul style="list-style-type: none"> • ASME Y14.100 and Appendices B, C, D, and E • ASME Y14.1 • ASME Y14.24 • MIL-STD-31000 | <p>A drawing is an engineering document or digital data file that discloses the physical and functional requirements of an item (directly by means of graphic and textual presentations, or by Reference). Drawings communicate a variety of information, both textual and graphic. All drawings have certain common elements. Normally several types of engineering drawings combined into sets with associated lists are required to completely define the end-product requirements of an item. Drawings may be categorized into the following MIL-STD-31000 Technical Data Package (TDP) elements:</p> <ul style="list-style-type: none"> - Conceptual design drawings - Developmental design drawings - Product drawings - Commercial drawings - Special inspection equipment drawings - Special tooling drawings |
| Drawing Types and Applications | |
| <ul style="list-style-type: none"> • ASME Y14.24 | <ul style="list-style-type: none"> • Detail, assembly, control, installation and diagrammatic drawings - as necessary, provide engineering description and control of product attributes. • Ancillary drawings (drawings supplementing end-product drawings) and special application drawing types aid logistics, configuration management, manufacturing, or other functions. • Additional DoD-unique types: procurement control, design control, vendor item control, microcircuit drawing set, paint scheme, software, transportability, camouflage basis and pattern, combination of adopted items, kits, package content Common Drawing Sheet Sizes and Format |
| Common Drawing Sheet Sizes and Format | |
| <ul style="list-style-type: none"> • ASME Y14.1 • ASME Y14.1M <p>Note: In this instance there are separate documents for English and metric units respectively</p> | <ul style="list-style-type: none"> • Drawing sheet sizes - Standard sizes for engineering drawing sheets, e.g., A, B, C, etc. • Title block - Design activity name and address, drawing title, drawing number, drawing size, Commercial and Government Entity (CAGE) Code, drawing scale, drawing sheet size, number of sheets (for a multi-sheet drawing). Most formats include drawing approval authority and angle of projection symbols. • Revisions block - Usually in the upper right hand corner. See Revisions to drawings, below. • Optional blocks - Additional blocks may be included on a drawing format adjacent to the Title Block. Examples: Application Block and Mechanical Properties Block |
| Drawing Variables | |
| <ul style="list-style-type: none"> • ASME Y14.1, 14.1M • MIL-STD-1840 (Gen) • MIL-PRF-28000 Initial Graphics Exchange Specification (IGES) • MIL-PRF-28001 Standard Generalized Markup Language (SGML) • MIL-PRF-28002 (Raster) • ASME Y14.100 | <ul style="list-style-type: none"> • Media <ul style="list-style-type: none"> – Hard copy - Single sheet, multi-sheet, tabulation, book-form, drawings for microcircuits – Digital - Magnetic tape, Raster Image, IGES, Product Data Exchange Using STEP (PDDES)/ Standard for the Exchange of Product Model Data (STEP) representations • Format <ul style="list-style-type: none"> – Contractor - Contractor title block, CAGE code and process – Government - For repetitive re-procurement of identical items, Government title block, CAGE code and release control • Detail options <ul style="list-style-type: none"> – Mono-detail - Each drawing covers a single part or assembly – Multi-detail - A drawing may cover an assembly and detail parts • Dimensioning and tolerancing - Several conventions may be chosen • Drawing notes - Short, concise statements providing clarification. They may apply to the entire drawing or any portion of the drawing. Notes do not include contractual requirements or requirements for data submission, approval or distribution. Preferably Notes are located on sheet 1 of the drawing, or direction is included on sheet 1 indicating location of notes, i.e., on parts list or separate associated list. |

Table 3-7 Engineering Drawings and Associated Lists

| Subject | |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Associated Lists | |
| <ul style="list-style-type: none"> • ASME Y14.54M | <ul style="list-style-type: none"> • Parts list - a tabulation of all parts and bulk materials (except those materials which support a process) used in the item to which the list applies. Parts Lists may be Integral Parts Lists, prepared and maintained as part of the actual engineering drawing, or Separate Parts Lists, prepared as a document separate from the drawing with which it is associated and maintained independently from that drawing. • Data list - a tabulation of all engineering drawings, associated lists, specifications, standards, and subordinate data lists pertaining to the item to which the data list applies • Indented data list - that is structured by successive assembly level • Index list - a tabulation of data lists and subordinate index lists pertaining to the item to which the list applies • Wire list - a tabulation of all the wires in an assembly which indicates their identification and terminations • Application list - a tabulation of parts and the next higher assemblies into which they install. (Commonly referred to as a where used list.) |
| Revisions to Drawings | |
| <ul style="list-style-type: none"> • ASME Y14.55M | <ul style="list-style-type: none"> • Drawing revision identification • Any change to a drawing, including a change to Rights-in-Data, must be recorded in the revisions block of the affected drawing. • Record revision status, identification of change authorization documents, or description of changes, and change approvals, and if multi-sheet, revision status of sheets <p>Note: If revision history is maintained in a data base, common practice is to provide it as part of an associated list (e.g., parts list) or via data base access rather than on the field of the drawing</p> |
| Numbering Coding and Identification | |
| <ul style="list-style-type: none"> • ASME Y14.100 • ASME Y14.100 Appendix D | <ul style="list-style-type: none"> • Drawing and part identification rules liberal enough to accommodate a wide variety of industry practices. Any keyboard characters allowed. • Limited to precise drawing and part identification discipline necessary to provide unique identification for military equipment (e.g., use of CAGE codes, part identity keyed to drawing identity) • Original and current design activity; design disclosure, delivery of drawing originals • Drawing title conventions • Special markings, symbols and part/item replacement notations • Marking for shipment and storage • Special items and processes (e.g., system safety, electrostatic discharge) • Type designators |
| Drawing Requirements Manual (DRM); Tailoring and Application Guides | |
| <ul style="list-style-type: none"> • ASME Y14.100 | <ul style="list-style-type: none"> • Drawing or Drafting Manuals are a Reference defining in-house practices and extent of applicability of Standards. Government activities use tailoring or application guides. • The DRM guides and standardizes drawing form and presentation, facilitate communication (of intent and technical detail), assure consistent quality, simplify training, and provide a basis for improving practices. |

Table 3-8 Software Documentation

| SW Life Cycle Process (Engineering View/Development Process) Purpose | | | |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Acronym | Document Description (keywords) | MIL-STD-961 Equivalent | Config Doc? Baseline? |
| Process Implementation – Planning | | | |
| OCD SDP STP SIP STrP | <i>Operational Concept Document</i> - proposed system; user needs <i>Software Development Plan</i> - development effort; process, methods, schedules, organization, resources. (Includes or refers to Software Configuration Management (SCM) & Software Quality Assurance (SQA) plans) <i>Software Test Plan</i> - Qualification testing; SW item; SW system; environment, tests, schedules <i>Software Installation Plan</i> - installing SW; user sites; preparations; training; conversion <i>Software Transition Plan</i> - transitioning to maintenance organization; HW; SW; resources; life cycle support | <ul style="list-style-type: none"> • No MIL-STD-961 equivalent: These documents are not specifications | <ul style="list-style-type: none"> • Not configuration Documentation • Data Control Only (i.e., Baseline internal to developer for document, document representation and file management purposes only). |
| System Requirements Analysis and Architectural Design | | | |
| SSS SSDD | <i>System/Subsystem Specification</i> - Specifies system or subsystem requirements; requirement verification methods. (May be supplemented with system level IRS) <i>System/Subsystem Design Description</i> - system/subsystem-wide design; architectural design; basis for system development. (May be supplemented with IDD, DBDD) | <ul style="list-style-type: none"> • Project Unique System Performance specification • Part of Project Unique System Detail specification | <ul style="list-style-type: none"> • Functional or Allocated Baseline • Design Release |
| Software Requirements Analysis and Design | | | |
| SRS IRS | <i>Software Requirements Specification</i> - specifies SW requirements; verification methods. May be supplemented with IRS) <i>Interface Requirements Specification</i> - specifies interface requirements for one or more systems, subsystems, HW items, SW items, operations or other system components; any number of interfaces (Can supplement SSS, SSDD, SRS) | <ul style="list-style-type: none"> • Both part of Project Unique Performance or Detail specification | <ul style="list-style-type: none"> • (Government or Contractor) Allocated Baseline for SCI |
| Software Architectural and Detailed Design | | | |
| SDD IDD DBDD | <i>Software Design Description</i> - SW item-wide design decisions; SW item architectural design; detailed design, basis for implementing; information for maintenance (May be supplemented by IDD, DBDD) <i>Interface Design Description</i> - interface characteristics; one or more systems, subsystems, HW items, SW items, operations or other system components; any number of interfaces; detail companion to IRS; communicate and control interface design decisions (Can supplement SDD) <i>Data Base Design Description</i> - data base design; related data, files, SW/data base management system for access, basis for implementation and maintenance | <ul style="list-style-type: none"> • All are part of Project Unique Software Detail Specification | <ul style="list-style-type: none"> • All are Config Doc • Design release |

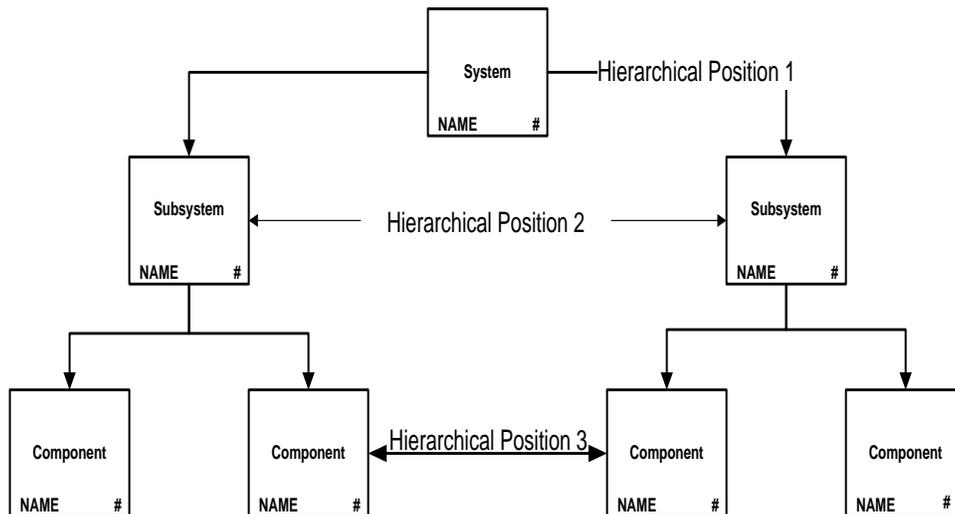
| Software Integration and Qualification Testing | | | |
|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| STD | <i>Software Test Description</i> - test preparations; test cases; test procedures; qualification testing SW item, SW system or subsystem <i>Software Test Report</i> - record of test performed; assess results. | • No MIL-STD-961 equivalent. These documents are not specifications | • Not configuration documentation. • Data Control • Evaluate change to config docs for impact on these test docs |
| STR | | | |
| As-Built Software Product Definition | | | |
| SPS | <i>Software Product Specification</i> - Contains or References executable SW, source files; SW maintenance information; “as-built” design information,7 compilation, build, modification procedures; primary SW maintenance document <i>Software Version Description</i> - identifies and describes a SW version; used to release, track and control each version | • Part of complete Project Unique Product Detail specification | • Product baseline; either Government or Contractor |
| SVD | | • No MIL-STD-961 equivalent: This document is not a spec | • Not baselined. Status Accounting record for released SW Version |
| System Operation | | | |
| SUM | <i>Software User Manual</i> - hands-on software user; how to install and use SW, SW item group, SW system or subsystem <i>Software Input/Output Manual</i> - computer center; centralized or networked installation; how to access, input and interpret output; batch or interactive. (With SCOM is alternative to SUM) <i>Software Center Operator Manual</i> - computer center; centralized or networked installation; how to install and operate a SW system (With SIOM is alternative to SUM) <i>Computer Operator Manual</i> - information needed to operate a given computer and its peripherals | • No MIL-STD-961 equivalent: These documents are not specifications | • Not configuration documentation. • Data Control • Evaluate change to configuration documents for impact on these manuals |
| SIOM | | | |
| SCOM | | | |
| COM | | | |
| System/Software Maintenance | | | |
| CPM | <i>Computer Programming Manual</i> - Information needed by programmer to program for a given computer; newly developed; special purpose; focus on computer not on specific SW. <i>Firmware Support Manual</i> - information to program and re-program firmware devices in a system; Read Only Memory (ROMs); Programmable Read Only Memory (PROMs); Erasable Programmable Read Only Memory (EPROM)s, etc. | • No MIL-STD-961 equivalent: These documents are not specifications | • Not configuration documentation. • Data Control • Evaluate change to configuration documents for impact on these test docs |
| FSM | | | |

E. Work Breakdown Structure.

1. All CIs identified for separate management require identification and structuring so that they can be uniquely interfaced and integrated with items having various applications. The Work Breakdown Structure (WBS) is a functionally oriented, drawing based, hierarchical structured code system, which provides the basis for developing a top-down, breakdown arrangement of a total system. The WBS system allows any part of the process, system, assembly, or subassembly to be uniquely identified relative to its next higher assembly. WBS was developed to standardize the integration of CIs between systems. For the integration process to be effective, a functionally defined CI index, consistent with the design, must be established as early in a project as possible; another activity to planned for when developing your CM CONOPs. A unique functional description and WBS based number should be assigned to each CI identified. The functional description should be similar to the item's service description, which may be

found on the applicable engineering drawing or process model notation. The unique WBS based number will provide a Reference to the unique application of each CI, independent of its specific, physical characteristics. Specific technical and logistics support products and information, including baseline documentation, can then be linked to each CI. The CI index will evolve in increasing detail as the design matures and transitions to its ultimate physical configuration. Once established, each unique CI WBS based number and functional description, as contained in the index, should not be changed unless the primary function, as it relates to its next higher assembly, is changed. If this change applies to only one application of the CI then a new CI designator will be established.

2. A similar hierarchical structuring system needs to be applied to CIs at and below the major system and equipment level; down to the level that individual management has been designated.
3. When developing performance or system specifications, determine at least the first 3 levels of hierarchical structure as depicted in **Figure 3-4**.



Example Configuration Identification Hierarchical Structure

Figure 3-4

- F. **Unique Identification (UID) of Tangible Items.** Unique Identification (UID) or a USCG-recognized unique identification equivalent for all property items delivered is required. Implementation guidance may be obtained at: <http://www.acq.osd.mil/dpap/pdi/uid/index.html> or [MIL-STD-130](#), Identification Marking of U.S. Military Property.

CHAPTER 4. CONFIGURATION STATUS ACCOUNTING (CSA)

A. Policy.

1. The Asset Project Office (APO), Project Resident Office (PRO), Facility Design Construction Center (FDCC) or Civil Engineering Unit (CEU) (as applicable) shall be tasked for each new system delivered under contract to ensure the accuracy of configuration artifacts and design documentation via design review participation and Technical Authority coordination or Contractor oversight. APO/PRO involvement should start as early as possible/practical, prior to issuance of the solicitation.
2. Information described in this chapter shall direct the development and operation of the applicable status accounting system for products, programs, processes, related systems and equipment, including computer software and firmware.

B. Introduction.

1. This paragraph is provided to describe the methods for reporting, recording, storing, verifying, and maintaining CSA information that enable proper life cycle support for sustaining performance via operations and maintenance manuals, training, spare and repair parts, etc., to be established. CSA data records CI information to support the development, testing, evaluation, delivery, operation, and maintenance of a CI to a particular baseline. The CSA function provides a means of traceability for baselines and of changes; it is also a basic tool required for acquisition, management, testing, and life cycle support of the CI, an essential activity for successful project execution. Accurate configuration information is essential not only at the project level but also at the command level to ensure interoperability and life cycle support. Also, an accurate CSA is essential to produce a common operating picture. In many cases, these systems are integrated with other capabilities/systems at the process, data, inter-platform level and platform-to-platform level, further adding to the complexity of maintaining complete and accurate information. The CSA function provides a method for identifying and tracking proposed and approved baselines and changes down to the CI. The objective is to achieve a set of data that represents the need, capability and performance output linked and tracked throughout the CI's existence. For it to be useful, ACCURATE INFORMATION MUST BE PROMPTLY REPORTED EVERY TIME AN AUTHORIZED CHANGE IS MADE. This information needs to be maintained down to the CI level throughout its operational life for use by all levels of management.

Note:

The term "effectivity" is used frequently in MIL-HDBK-61A (and not defined) and other CM references. Effectivity is a designation defining the product range (e.g., serial, lot numbers, model, dates) or event at which a change to a specific product is to be (or has been) effected or to which a variance applies.

2. CSA data is collected while a new system, project, or equipment is being constructed. New records are initialized regularly. Sources of CSA data include the IPDE and those

information systems used to manage life cycle support e.g., Configuration Data Managers Database – Open Architecture (CDMD-OA). CDMD-OA provides a limited CSA capability by managing the physical construct of the configuration item e.g., the Bill of Materials. Contractors can be given access to our IPDE and life cycle support information systems to populate and initialize an end item’s configuration. After the information is populated, the PM’s or APO’s designated agent validates the information prior to the signing of the Material Inspection and Receiving Report Form, DD250 for acceptance. After new construction is completed, the system or program will experience configuration changes as a result of the installation of new systems and the removal, replacement or changes to existing systems.

3. CDMD-OA is one tool used by the CG as the government OEM interface until final acceptance. It provides limited CSA database capability for documenting and controlling the “as defined” and “as maintained” product structure during new construction. The CG currently does not have an all inclusive CSA capability. AutoCAD, PRO Engineer, used in conjunction with Aviation Technical Information Management System (ATIMS), Technical Manual Identification Numbering System (TMINS), Technical Manual Application System (TMAPS), ALMIS, Vessel Logistics System (VLS), Shore Asset Management (SAM), CDMD-OA and Naval and Electronics Supply Support System (NESSS) provide CSA capability for the CG.
 - a. Commandant (CG-444) is responsible for the management and reporting of policy and processes for the CG’s CSA capability and overall management of CSA data to include an IPDE and its associated requirements to support CSA reporting responsibilities. Commandant (CG-444), through Logistics Compliance Inspections (LCIs) will monitor the system to ensure that guidelines are being adhered to and that data contained in the system is complete and accurate.
 - b. PMs are responsible for collecting and recording the CSA data necessary to manage configuration identification effectively throughout all phases of the acquisition life-cycle. The CSA method used by the project will be such that information will be easily integrated into the appropriate CSA systems as the project progresses. The PM will coordinate with Commandant (CG-444) in determining specific data requirements and input procedures for integrating project information. Because new software is frequently “mailed out” or “downloaded” and installed in a different manner than hardware or equipment, PMs of software are responsible for ensuring that all installations of their computer projects are coordinated with the PLMs, Configuration Managers (CM Mgrs), Configuration Data Managers (CDMs), and the Software Configuration Managers for the timely and accurate reporting to the CSA systems.
 - (1) It is recommended that PMs consult ANSI/EIA- 649, Institute of Electrical and Electronics Engineers (IEEE)/EIA 12207, ISO/IEC 15939:2002, EIA/IEEE J-STD-016 and Reference [National Shipbuilding Research Program Integrated Product Data Environment \(IPDE\) Specification \(V1.0\)](#) when planning and implementing CSA activities.
 - (2) PLMs are responsible for overseeing modernization efforts for systems under their cognizance, which includes the reporting and recording of all installations

into the appropriate CSA systems for each CI. The PLM monitors and tasks both the CM Mgr and the CDM to perform CSA functions enabled through the life cycle support tools and ensure that records are created and updated in a timely manner consistent with the data required.

- (3) CDMs are responsible for ensuring the information in the logistics support system reflects the physical item. The CDM's role shall not be confused with that of the CM Mgr, and is limited to the data fields within the logistics system particularly CDMD-OA. All baselines and proposed changes will be vetted via the CM Mgr before entered into the CSA. CDMs will initiate action to verify suspect data and provide missing data to CDMD-OA as approved by the CM Mgr.
 - (a) The CDM is responsible for assigning X-Repairable Identification Codes (XRIC) and entering configuration data into CDMD-OA.
 - (b) The CDM is also responsible for reviewing and processing all emergent changes, and reporting any unauthorized changes with recommendations and supporting rationale to the CM Mgr.
- (4) The Logistics and Service Centers are responsible for assigning an Allowance Parts List (APL) for provisioned systems using data from the Interactive Computer Aided Provisioning System (ICAPS), logistics information systems and CDMD-OA. APL changes shall be included as part of an Engineering Request and when approved notifications will be issued to the CDM to update CDMD-OA or the appropriate information system. The CDM shall report completion of the task to the CM Mgr. Additionally, the PLM is responsible for ensuring that existing APLs are accurate by verifying XRICS in the CSA system and notifying the CDM when a discrepancy is identified and corrected.

C. Configuration Identification Documentation (EXAMPLES).

Examples of configuration identification (baseline) documentation developed and maintained for products/services including computer software and firmware, are as follows:

1. Functional
 - a. System Specification.
 - b. Operational Requirement(s) Document.
 - c. Top Level Requirement (TLR) Document.
 - d. Interface Specification(s).
 - e. Performance Specification(s).
 - f. Conceptual Drawings.
 - g. Tactical Operational Specification(s).
 - h. Test Specification(s).
 - i. Test Result(s).
 - j. Data Link Operational Specification(s).

- k. System Operational Specification(s).
 - l. System Integration Test Plan.
 - m. See also CIs at FCB on the Commandant (CG-444) website.
2. Allocated
- a. Development Specification.
 - b. Developmental Drawings.
 - c. Interface Control Drawings.
 - d. Project Design Specifications.
 - e. Project Performance Specification(s).
 - f. Interface Design Specification(s).
 - g. Functional Operational Specification(s).
 - h. Subsystem Specification(s).
 - i. See also CIs at Allocated Baseline on the Commandant (CG-444) website.
3. Design/Product
- a. Product, Material and Process.
 - b. Specifications.
 - c. Product Drawings and models.
 - d. Configuration Identification Manual.
 - e. Project Description Documents.
 - f. Acceptance Test Specifications and Procedures.
 - g. Data Base Design Document.
 - h. See also CIs at PCB on the Commandant (CG-444) website.

CHAPTER 5. CONFIGURATION CHANGE CONTROL PROCESS

A. Policy.

1. No changes are to be made to the configuration of assets, products, services, or administrative information that is owned by the CG or owned by another agency, unless the change has been approved by the governing CCB and documented in association with its configuration baseline to maintain the accuracy of the as is configuration. **The prohibition on changing the configuration of assets, products, services, or administrative information owned by the CG or other agencies without the approval of the governing CCB constitutes a general order, which is punitive in nature. Failure of military personnel to observe the prohibitions contained herein is punishable under Article 92 of the Uniform Code of Military Justice for military members.** Failure to comply with this order by civilian employees may result in adverse administrative or disciplinary action per Civilian Personnel Actions: Discipline, Performance, Adverse Actions, Appeals, and Grievances, COMDTINST M12750.4 (series).
2. PMs and GFE PLMs shall establish CCBs to review and approve or disapprove, as appropriate, all proposed configuration changes. CCBs shall be established for business processes, enterprise architecture, platforms and systems, or equipment-level acquisition projects prior to establishing the Functional requirements. Guidance for developing and establishing a configuration change control process and a CCB Charter are provided in this chapter.

B. Introduction and Overview.

1. A configuration change control process must ensure efficient and effective change proposal processing without impeding design development, production, or operational readiness.
2. Accurate and current configuration identification is essential throughout the life cycle of a CI. CM and more specifically changes to the configuration must be developed, approved, and managed within the bounds of the operational requirements of the configuration including the required operating capability and planned operating environment.
3. CCBs play a vital role in the configuration change control process. CCB hierarchies shall be created and managed to align with that of the product or service configuration hierarchy. Sometimes referred to as lower level CCBs the boundaries of change authority at each level within the CCB hierarchy must be defined and documented. Proposed changes crossing into a higher authority boundary must be presented to the higher level CCB for disposition. For example the change control authority for the CG Enterprise Architecture functional baseline would rest with the Executive Level (COMDT and three stars) CCB. CG Modernization represents an example of a change affecting the CG Enterprise that would require Executive Level CCB approval. Specific lines of business (LoB) change authority would rest with Assistant Commandant Level CCBs; except when a proposed LoB crosses into another LoB. For products the lowest level CCB

might reside with the Vendor who provides water pumps. As long as the proposed change does not affect output, interfaces or life cycle support the vendor's internal CCB would be the approval authority, but if output, interfaces or life cycle support is affected then the PM/PLM CCB would be the approval authority. The CCB membership, as described in paragraph 5.3 of this chapter, evaluates change proposals and makes recommendations to the deciding CCB Chair. Before convening the CCB and voting on a proposed change, the CCB membership shall ensure that their reporting SMEs have thoroughly evaluated the technical validity of the proposed change; interface effect on other CIs; impact on engineering areas and logistics support; effect on established delivery schedules during production; life cycle cost effectiveness; and the availability of funds.

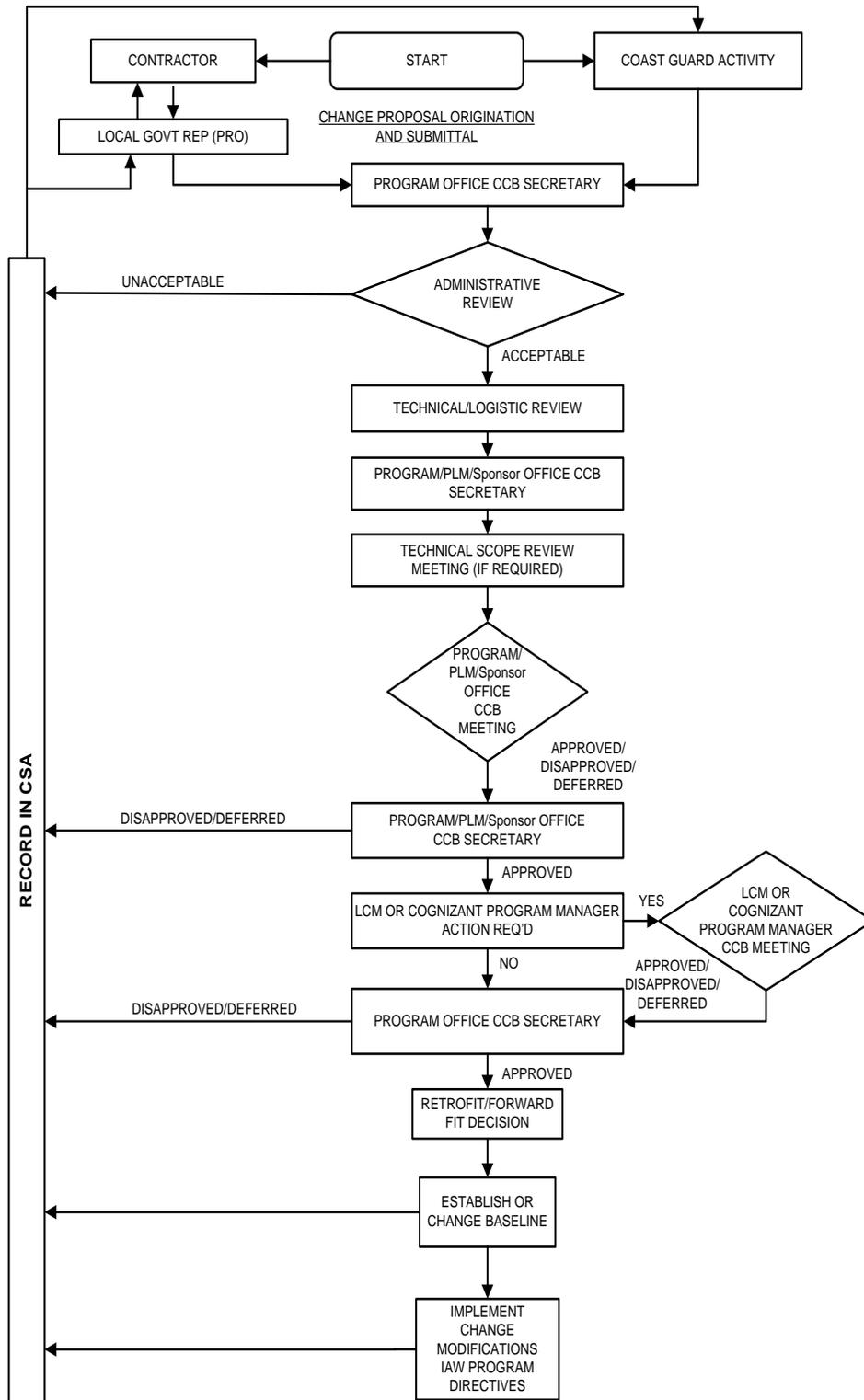
4. CCB authority applies to the CI's functional and physical characteristics but may not apply to a specific configuration document. Configuration documents are controlled by the Current Document Control Authority (CDCA). For example test specifications, drawing or operations manual CDCA is the authority governing that function. The specification would require the CDCA's approval prior to being included in the Change Package for the end item. Another example would be during Acquisition when the Project Manager is the CCB Chair for the project but the Sponsor is the CDCA for the Performance Specification and Functional and Operational Requirements.
5. The following discussion describes a typical configuration change control process (depicted in **Figure 5-1**) and provides procedural guidance to be applied and tailored to meet the specific CM requirements for products, services and documents.

C. Process Description.

1. **Change Proposal Preparation.** The configuration change control process begins with the preparation of a configuration change proposal. Guidelines for change proposal preparation are provided in References (a), (b) and Appendix B. The project office may choose to direct change proposal originators to document and submit the need for a change as a Preliminary Engineering Change Proposal (PECP) first. This early assessment of the problem and proposed corrective action allows the project office to make a decision on whether or not to commit resources for full change proposal development and ensure the change proposed can be traced back to a valid requirement.
2. **Change Proposal Submission.**
 - a. Change proposals are submitted to the project office CCB Secretariat per contractual requirements or as otherwise specified (such as in the Project's CM Plan).
 - b. For Contractor-originated Class I ECPs and critical or major Requests for Deviations (RFDs), the PRO will normally receive the ECP, conduct an initial evaluation, and forward it to the project office CCB Secretariat with comments and recommendations. Paragraph 5-6.b of this chapter discusses ECP approval authority. Concurrence in the classification of the change proposal (Class I or II for ECPs and critical, major or minor for RFDs, see **Figure 5-2** for Change Classification Criteria) is an important function of the PRO. If the PRO does not find the ECP acceptable, it will be returned to the Contractor with comments for rework. The PRO's actions must be clearly documented.

Note:

The use of ECP, DD Form 1692 is highly recommended to ensure contractor compliance, a comprehensive change package and data and information system standardization. ECP, DD Form 1692 Engineering Change Proposals with its associated Contract Data Requirements List (CDRL) and Data Item Description (DID) promote both compliance and standardization. The Multi-User ECP Automated Review System ([MEARS](#)) is designed to support these forms, CDRLs and DIDs.



CHANGE CONTROL PROCESSING

Figure 5-1

Class I (MAJOR) Criteria

An ECP proposing a change to an approved configuration baseline or a specific configuration artifact for which the Government is the CDCA or that has been included in the contract or statement of work by the tasking activity, and;

1. Affects any physical or functional attribute in approved functional or allocated configuration documentation, or
2. Affects any approved functional, allocated or product configuration baseline, cost, warranties or contract milestones, or
3. Affects approved product configuration documentation by one or more of the following:
 - a. Government furnished equipment,
 - b. Safety,
 - c. Compatibility, interoperability, or logistics support,
 - d. Technical data,
 - e. Will require retrofit of delivered units,
 - f. Preset adjustments or schedules affecting operating limits or performance to the extent that a new identification number is required,
 - g. Interchangeability, substitutability, or replace-ability of any item down to non-repairable subassemblies,
 - h. Sources on a source control drawing,
 - i. Skills, manning, training, biomedical factors or human engineering design, and
 - j. Ownership costs

Class II (MINOR) Criteria

NOTE: Change Proposal classification should not be assigned based on approval level. Class 1 ECPs can be approved by lower level CCBs based, as discussed earlier, on the boundary of authority and impact.

An ECP proposing a change which does not affect any of the items discussed above for Class I. Primarily Class II is used for the correction of typographical errors.

ECP Guidance:

1. The first criterion for ECP (both class I and II) is that it is an engineering change; it must affect approved configuration baselines or specific artifacts within the baseline.
2. Furthermore an ECP is limited to a change to approved configuration documentation under Government configuration control. Configuration documents must be supported by a CDCA. Section a, b, and c below amplify the criteria by providing specific evaluation factors to use in judging whether a proposed change shall be processed as a Class I or Class II.
 - a. Since there are both Contractor-approved and Government approved configuration items, any change to Contractor approved CIs must be reported to the Government for impact/interface evaluation.
 - b. This item concerns a change to Government controlled CI, which if the change did not impact cost, warranties, or milestones would not otherwise be Class I. It is treated like a commercial item, i.e., Contractor is obligated to the provisions but can change the design of the product so long as it meets the specified performance requirements and does not affect life cycle cost, acquisition cost, or delivery schedule. The Contractor must initiate contractual change actions, outside the scope of the configuration control, to change the contract cost, warranties or milestones.
 - c. Provides some factors to evaluate when examining a proposed change to Government-controlled product CIs. Many of these factors are specified by requirements in functional and allocated configuration documentation, covered by 2.a. All proposed changes must be examined to capture functional or allocated requirements.

**Change Classification
Figure 5-2**

3. **Administrative Review and Distribution.** After recording receipt of the ECP (or critical or major RFD), the PMs/PLMs CM Mgr and/or CCB Secretariat will conduct an administrative review of the change proposal to determine if it is acceptable for processing. This review will be conducted to: verify need, package completeness (from – to drawings, marked-up manuals, test reports, etc.), contractual compliance (if appropriate) life cycle support, total ownership costs, accuracy and determine need for ICWG review. The PM/PLM/Sponsor will designate a Technical Manager (individual having technical cognizance over CI affected by the change proposal) to sponsor change. Based on the administrative review, if the ECP is insufficiently complete it will be returned to the originating activity (via the local government representative's office, as applicable) under formal letter from the CCB Chair stating the deficiencies and terms for re-submittal. If the proposed change is acceptable, the CCB Secretariat will forward, in parallel, copies of the complete change proposal package to CCB members and their supporting SMEs for evaluation. CCB members are responsible and accountable for comprehensive review of the functional area they represent and shall coordinate internal reviews. The ECP package should include: a copy of the original ECP, the Change Review sheet (Figure 5-3), Estimated Total Cost Impact (Figure 5-4), redlined is/was drawings, red-lined manuals, proposed TCTO, marked up or new Maintenance Procedure Cards (MPCs), maintenance package, parts lists, changes to scheduled services, test reports, and instructions for implementation as applicable. The due date for comments and recommendations for approval, disapproval, or deferral shall be indicated on the package. The CCB Secretariat shall be notified if a reviewing activity is unable to meet the assigned due date. The CCB Chair will determine if processing should continue without the activity's comments or if ECP processing should be delayed based on CM Mgr's recommendation.
4. **Change Review Comment Package.** The CCB Secretariat will receive all returned ECP packages and consolidate the comments and recommendations into a master change proposal package for CCB action. The master change proposal package shall contain:
 - a. The original ECP, submitted for approval, including all supporting data (e.g., Notice of Revision (NOR)) and all supplemental review and impact sheets;
 - b. The completed ECP Evaluation checklist(s); and
 - c. The completed ECP Review supporting documentation with CDCA approval if necessary.
5. **Comment Assessment.** Based on an assessment of the review comments, the CM Mgr will determine the need for a formal CCB or Technical Scope Review (TSR) meeting. The purpose of this meeting is to resolve sensitive technical issues among the reviewing activities as to the scope of the change.
6. **Review.**
 - a. If approval or disapproval recommendations are unanimous as indicated on change proposal packages, a formal CCB meeting may not be required. If a formal CCB meeting is not required, and the change proposal is approved or disapproved, a CCB Decision and Action form (**Figure 5-6**) or equivalent shall be prepared by the CCB Secretariat and signed by the CCB Chair. A letter notifying the change proposal

- originator of the status shall also be prepared by the CCB Secretariat for the CCB Chair's signature.
- b. If a formal CCB meeting is required, correspondence will be prepared and issued by the CCB Secretariat to CCB members and any additional activities, as required. The ECP originating activity may be requested to attend on behalf of the Technical Manager.
7. **CCB Meeting.**
- a. The formal CCB meeting will be convened by the CCB Chairperson, this can be accomplished electronically. The purpose of the CCB meeting is to assist the CCB Chairperson in making the decision for approval, disapproval, or deferral, not to re-engineer the change. If additional information is necessary to make the management decision, the change proposal may be deferred. This may require returning the change proposal to the originator for rework or clarification. Based upon the recommendations of the CCB Members, the CCB Chairperson will determine whether the proposed change should be:
- (1) Approved and CCB Decision and Action form prepared (see **Figure 5-5** for review and disposition actions), or
 - (2) Disapproved and returned to the originator with an explanatory letter, or
 - (3) Deferred to a later meeting to allow further evaluation or possible revision.
- b. If the Chairperson decides to direct the implementation of a change, which a member of the CCB has found not to be properly supported, the Chairperson must, in each case, document the reasons for so doing.
8. **Meeting Results.** Following the formal CCB meeting, the CCB Secretariat will prepare necessary CCB Decision and Action form(s) (as depicted in Figure 5-6), a change implementing letter, and meeting minutes for review and signature by the CCB Chair. If the ECP is disapproved, it will be returned to the originating activity (via the local government representative's office, as applicable) under formal letter from the CCB Chair. If the ECP is approved and authorized, to include funding, the Change Proposal, the Change Proposal Review sheets, and the ECP Evaluation checklists will be used as sources for identifying required change-implementation actions by the PM/PLM/Sponsor. The CCB Secretariat will consult with the CM Mgr., Technical Manager and ILS Manager during the review of the signed CCB Decision and Action form for the identification and assignment of implementing actions. Approved but unfunded changes shall be recorded in the CSA for new or replacement product and/or service requirements definition. The CCB Decision and Action form shall be completed and distributed with a copy of the approved change proposal to all activities having assigned implementing action(s) and recorded in the CSA.
9. **Change Proposal Tracking.** The PM/PLM/Sponsor or CCB Secretariat will assign a unique change proposal control number to each ECP and log the change proposal into a tracking system. Electronic CCBs, IPDEs and Life Cycle Support Information systems may auto assign an ECP number when initiated. The tracking system should include, as a minimum and as applicable, the following data elements: ECP control number, originator's ECP number, priority, class, originator, ECP title, affected configuration

item(s), date of receipt by the project office, CCB meeting date, ECP approval, disapproval, and deferral or referral status.

10. **Tasking.** The role and responsibility of the PM/PLM is implementing the ECP and assigning actions to responsible activities. As a minimum, implementing actions will include updating current baseline documentation to add the approved changes and affected logistics support products from marked-up items provided within the ECP. The appropriate logistics element manager or ILS manager is assigned the responsibility for ensuring all logistics products are properly reviewed and updated. As required a contract modification shall be prepared for processing by the Procuring Contracting Officer (PCO), to incorporate the change. For Government field activities supporting the project office, a TCTO also referred to as Ordnance Alterations (ORDALT), Electrical Alterations (ELEXALT), Ship Alterations (SHIPALT), etc. should be finalized to assign implementing actions. These documents represent the direction to conduct unscheduled maintenance tasks required to implement the change. The CCB Decision and Action form can be used for assignment of tasks to CG activities. The Contractor can only be directed to complete actions by contract authorization issued by the PCO.
11. **Follow-Up.** Implementing actions are required for each approved change. Implementing organizations are responsible for the completion of actions as assigned by a CCB Decision and Action (Figure 5-6) and/or as tasked by contract, and the reporting of completed actions to the PM/PLM/Sponsor. The CM Mgr. is responsible for tracking and verifying successful completion of all associated CCB approved implementing actions. Procedures should be established for tracking and reporting implementation of changes in the technical and logistics support documentation and recorded in your CM plan. CG support activities will report, in writing, the verification of change implementation directly to the PM/PLM/Sponsor or through the CDM. The Contractor shall be monitored by the local government representative's office, with that office officially notifying the CM Mgr of the accomplishment of Contractor assigned actions including verification of accurate production or construction cut-in of the approved and authorized change. It is imperative that after the successful completion of any change to a CI the information is incorporated in the CSA and effectivity of change managed, (please see Note in paragraph 4.2 for definition of effectivity).

Figure 5-3 ECP Content Review Sheet

| Element | Definition |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ECP Identification And Administrative Attributes | |
| Date* | Submittal date of the ECP or ECP Revision |
| Originator name and address* | Name and address of the activity submitting The ECP |
| CAGE code* | CAGE code for the activity originating the ECP |
| ECP designation | |
| Model/Type* | Model, type designation or identifier of the CI or SCI for which proposal is being submitted |
| System designation* | The system or top-level CI designation or nomenclature |
| Procuring Activity | Used by Procuring Activity |
| ECP Number* | ECP Identifier assigned by the originator. The ECP number is unique for any CAGE Code identified activity; once assigned, the ECP Number is retained for subsequent submissions. The same ECP number may be used for a related ECP by adding a dash number to the basic identifier. Number will be auto generated when MEARS is used. When a proposed change applies to two or more platforms or systems under the authority of different PMs and CCBs, the ECP must be given a number for each platform or system. Use of MEARS allows the cognizant CCBs to review the ECP and vote concurrently if desired. |
| Revision* | Identifier for an ECP Revision |
| Title of change* ECP Classification* | Brief descriptive title for the engineering change proposal If Class II, only the ECP elements indicated with a * symbol, and the following minimum information content, are applicable: <ul style="list-style-type: none"> • Name and part number of item affected • Name and part number of next higher assembly • Description of the change • Need (reason) for making the change |
| ECP Justification Code | See further information in Appendix B |
| ECP Type | See further information in Appendix B |
| ECP Priority | See further information in Appendix B |
| Contract Information | |
| Contract Number/ Contract Mod* | Number(s) of currently active contract(s) at the originator's activity that are affected by the engineering change |
| Contract Line Item | Contract line item number(s) to which the engineering change relates |
| Procuring contracting officer | Procuring Contracting Officer's name, code, and telephone number |
| Date Contractual Authority Needed for Production, Retrofit | Date contractual authority is required to maintain the established production schedule, and date contractual authority is needed to accomplish retrofit as proposed |
| Description of Proposed Change | |
| Configuration Item Nomenclature | Name and type designation, SCI name and number, or other authorized name and number of all CI(s) affected by the ECP |
| Is the CI in production? | If "yes", provide information as to whether deliveries have been completed on the contract(s). Regression testing applied? |
| Description Of Change* | Description of the proposed change phrased in definitive language such that, if it is repeated in the contractual document authorizing the change, it will provide the authorization desired. Including the purpose and sufficient detail to describe what is to be accomplished. If the proposed change is an interim solution it shall be so stated. |

Figure 5-3 ECP Content Review Sheet

| Element | Definition |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Need For Change * | <ul style="list-style-type: none"> • Explanation of the need (e.g., requirements for change), identifying the benefit of the change, and as applicable • Correspondence such as a request for ECP or Government direction • Quantitative improvements in performance characteristics (range, speed, performance, endurance, striking power, and defensive or offensive capabilities) • Nature of a defect, failure, incident, malfunction; available failure data • Maintenance/ logistics problems corrected • Identification and summary of testing accomplished • Supporting data as necessary • Consequences of disapproval |
| Baseline Affected | Indicate whether Functional, Allocated or Product baseline(s) is affected |
| Developmental requirements and status | If proposed engineering change requires a major revision of the development project, status of current project and details of the revision. When applicable, recommendations for additional tests, trials, installations, prototypes, fit checks, etc. Include the test objective and test vehicle(s) to be used. Indicate the development status of major items to be used and their availability in terms of the estimated production incorporation point. |
| Trade-Offs And Alternative Solutions. | Summary of the various solutions considered and reasons for adopting the solution proposed by the ECP. When analysis addresses new concepts or new technology, supporting data may be presented with the proposal to authenticate the trade-off analysis |
| Production Effectivity by Serial Number | Proposed end item CI production effectivity for the production items including serial numbers, or other item identification (e.g., block or lot numbers). For SCIs, the SCI version number into which the change will be incorporated, if known, and the proposed effectivity of the end item CI (vehicle, aircraft, ship, etc.) into which the capability represented by the new version of the software is proposed to be incorporated |
| Proposed Delivery Schedule | Estimated delivery schedule of items incorporating the change, either in terms of days after contractual approval, or by specific date contingent upon contractual approval by a specified date. (Indicate if there will be no effect on the delivery schedule.) |
| Recommendations for Retrofit | When applicable, description of recommendations for retrofit of the engineering change into accepted items (including applicable substantiating data or discussion of implications). If retrofit is not recommended, explanation/reason for the recommendation. |
| Recommended Retrofit Effectivity | Quantities and serial (or lot) numbers of accepted items in which the change is proposed for incorporated by retrofit with retrofit recommendations for items in production (at the time of the ECP) based on an estimated ECP approval date*. |
| Ship/Vehicle Class | When the delivered CI is installed in one or more ship/aircraft classes, enter the identification of such classes* |
| Locations or serial numbers affected | The location(s) where retrofit is proposed to be accomplished. The ship hull numbers or aircraft numbers, if retrofit is to be accomplished in ships or aircrafts*. |
| Estimated Retrofit Kit Delivery Schedule | Estimated kit delivery schedule by quantity and date. Dates of availability for any special tools, jigs, or test equipment required in conjunction with the kits*. |
| Order of Implementation | Identification of the ECPs and order of implementation, where this change must be accomplished before, with, or after other previously approved retrofit ECPs*. |

Figure 5-3 ECP Content Review Sheet

| Element | Definition |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Work Hours To Install And Test Retrofit Kits | <ul style="list-style-type: none"> • Work-hours per unit that must be programmed for to install the retrofit kit, test the system or the item following installation of the retrofit kit, and conduct system tests in all proposed installation environments, including where applicable, when weapon system is undergoing overhaul. • Are Contractor field service engineering or other supporting organizations required on site? If "yes" attach proposed requirements for participation. • Estimate the total time period from removal of the equipment from operational service until equipment will be returned to operational status after being retrofitted. • Estimate the out of service time from removal of the equipment from operational service until equipment will be returned to operational status after being retrofitted. |
| *Apply to SCI changes that are to be incorporated as part of a hardware or equipment change; and implemented per a hardware retrofit schedule, or where the fielded version of the software is to be replaced. | |
| Effects of the Proposed Change | |
| Specifications affected | Identity specifications cited in the baseline and/or contract that are affected by the ECP, by the CAGE code of the design activity, document number and revision letter, and if applicable, the number of the NOR being submitted with the ECP. |
| Effect On Performance Allocations and Interfaces | The changes in performance and in functional/physical interfaces. |
| Lower level items affected. | Identifier of lower level CI, SCI, processes or parts affected, and the quantity and National Stock Number (NSN) of each part, where applicable. |
| Other systems/ Configuration Items affected? | Identify other systems affected by the proposed change that are outside the purview of the originator. Indicate whether the effect on other systems or CIs requires the submittal of related Class I ECPs. |
| Other activities affected? | Identify other Contractors or Government offices that will be affected by this engineering change. |
| Effects on employment, logistics support, training, operational effectiveness, or software | <ul style="list-style-type: none"> • Effects of the proposed change on operational employment, deployment, logistics, and/or personnel and training requirements specified in the approved system and/or CI specifications, including any changes or effects on operability and survivability. Quantitative values shall be used whenever practicable and are required when reliability and service life are impacted. Effect on interoperability. Including LoBs within the EA. • Effect on operational software. For SCIs, as applicable: <ul style="list-style-type: none"> --- Required changes to database parameters, values, or management procedures; --- Anticipated effects on acceptable computer operating time and cycle-time utilization; --- Estimate of the net effect on computer software storage; and, --- Other relevant impact of the proposed change on utilization of the system. |

Figure 5-3 ECP Content Review Sheet

| Element | Definition |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Effect On Acquisition Logistics Support Elements | <p>The following shall be covered, as applicable:</p> <ul style="list-style-type: none"> • Effects on schedule and content of the Integrated Logistics Support Plan (ILSP). • Effect on maintenance concept and plans for the levels of maintenance and procedures. • System and/or CI logistics support analysis (LSA) tasks to be accomplished and LSA data requiring update (GEIA-STD-0007) • Extension/revision of the interim support plan. • Spares and repair parts that are changed, modified, obsolete, or added, including detailed supply data for interim support spares. • Revised or new technical manuals. • Revised or new facilities requirements and site activation plan. • New, revised, obsolete or additional support equipment (SE), test procedures and software. • Description of the proposed change(s) to SE and trainers and Reference to related ECPs. • Effect on maintenance or training software. • Qualitative and quantitative personnel requirements data identifying additions or deletions to operator or maintenance manpower requirements in terms of personnel skill levels, knowledge and numbers required to support the modified CI. • New operator and maintenance training requirements in terms of training equipment, trainers and training software for operator and maintenance courses. This information should include identification of specific courses, equipment, technical manuals, personnel, etc., required to set up the course at either the Contractor or Government facility. • Contract maintenance that increases the scope or dollar limitation established in the contract. • Effects on packaging, handling, storage, and transportability resulting from changes in materials, dimensions, fragility, inherent environmental or operating conditions. |
| Other considerations | <p>The effects of the ECP on the following shall be identified:</p> <ul style="list-style-type: none"> • Interfaces having an effect on adjacent or related items (output, input, size, mating connections, etc.) • Organizational Construct • GFE or Government Furnished Data (GFD) changed, modified or obsolete. • Physical constraints. Removal or repositioning of items, structural rework, increase or decrease in overall dimensions. • Software (other than operational, maintenance, and training software) requiring a change to existing code and/or, resources, or new software. • Rework required on other equipment not included previously which will affect the existing operational configuration. • Additional or modified system test procedures required. • Any new or additional changes having an effect on existing warranties or guarantees. • Changes or updates to the parts control program. • Effects on life cycle cost projections for the CI, including projections of operation and support costs/savings for the item(s) affected over the life and projections of the costs/savings to be realized in planned future production and spares buys of the item(s) affected. |

Figure 5-3 ECP Content Review Sheet

| Element | Definition |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Effect On Product Configuration Documentation. | If drawings or other product configuration artifacts/documents are affected by the ECP, their identity by the CAGE code of the design activity, document number, revision letter, and, if applicable, the NOR number being submitted with the ECP. |
| Estimated Net Total Cost Impact (See Figure 5-4 for Cost Spreadsheet Template) | |
| Production Costs/(Savings) | Estimated costs/savings applicable to production of the item resulting from the change. Includes the costs of redesign of the CIs or components thereof, of factory test equipment, of special factory tooling, of scrap, of engineering design, of engineering data revision, of revision of test procedures, and of testing and verification of performance of new items. |
| Retrofit Costs | Estimated costs applicable to retrofit of the item including installation and testing costs. Includes retrofit-specific engineering data revision, prototype testing, kit proof testing, purchase of retrofit kits for operational systems, preparation of modification instructions, design and manufacture of special tooling for retrofit, installation of kits by Contractor personnel, installation of kits by government personnel, testing after retrofit and modification, and testing and verification of performance of GFE/GFP. |
| Logistics Support Costs/(Savings) | Estimated costs/savings of the various elements of logistics support applicable to the item. Includes spares/repair parts rework, new spares and repair parts, supply/provisioning data, support equipment, retrofit kit for spares, operator training courses, maintenance training courses, revision of technical manuals, new technical manuals, training/trainers, interim support, maintenance manpower, and computer programs/documentation. |
| Other Costs/Savings | Includes estimated costs of interface changes accomplished by other activities. (Do not include costs if the changes are covered by related ECPs) Also includes estimated costs of interface changes accomplished by the Government for changes which must be accomplished in previously delivered items (aircraft, ships, facilities, etc.), other interfacing products, and/or retrofit of GFE/GFP, to the extent that such costs are not covered under production, retrofit, or logistics support. |
| Estimated Net Total Costs (Savings) | Total of all the costs (savings) under contract and from other costs. |
| Implementation Milestones | |
| Milestones | ECP implementation milestones that show the time phasing of the various deliveries of items, support equipment, training equipment and documentation incorporating the basic and related ECPs. Enter symbols and notations to show the initiation or termination of significant actions. Base all dates upon months after contractual approval of the basic ECPs. |

| ESTIMATED NET TOTAL COST IMPACT (Use parentheses for savings) | | | | | | |
|---------------------------------------------------------------|--------------------------------|---------------|---------------|--------------------|---------------|-----------------------------------------|
| FACTOR | COSTS/(SAVINGS) UNDER CONTRACT | | | | | Other Costs/ Savings to the Govt. |
| | Non-Recurring | Recurring | | Total Recurring | Total | |
| | | Unit | Quantity | | | |
| a. PRODUCTION COST (SAVINGS) | | | | | | |
| (1) Configuration Item/CSCI | | | | \$0.00 | \$0.00 | |
| (2) Factory Test Equipment | | | | \$0.00 | \$0.00 | |
| (3) Special Factory Tooling | | | | \$0.00 | \$0.00 | |
| (4) Scrap | | | | \$0.00 | \$0.00 | |
| (5) Engineering & Engineering Data Revision | | | | \$0.00 | \$0.00 | |
| (6) Revision of Test Procedures | | | | \$0.00 | \$0.00 | |
| (7) Qualification of New Items | | | | \$0.00 | \$0.00 | |
| (8) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (9) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (10) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (11) SUBTOTAL OF PRODUCTION COSTS/(SAVINGS) | \$0.00 | XXXXXX | XXXXXX | \$0.00 | \$0.00 | \$0.00 |
| b. RETROFIT COSTS | | | | | | |
| (1) Engineering Data Revision | | | | \$0.00 | \$0.00 | |
| (2) Prototype Testing | | | | \$0.00 | \$0.00 | |
| (3) Kit Proof Testing | | | | \$0.00 | \$0.00 | |
| (4) Retrofit Kits for Operational Systems | | | | \$0.00 | \$0.00 | |
| (5) Prep of MWO/TCTO/ALT/TD | | | | \$0.00 | \$0.00 | |
| (6) Special Tooling for Retrofit | | | | \$0.00 | \$0.00 | |
| (7) Installation -- Contractor Personnel | | | | \$0.00 | \$0.00 | |
| (8) Installation -- Government Personnel | | | | \$0.00 | \$0.00 | |
| (9) Testing after Retrofit | | | | \$0.00 | \$0.00 | |
| (10) Modification of GFE/GFP | | | | \$0.00 | \$0.00 | |
| (11) Qualification of GFE/GFP | | | | \$0.00 | \$0.00 | |
| (12) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (13) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (14) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (15) SUBTOTAL OF RETROFIT COSTS (SAVINGS) | \$0.00 | XXXXXX | XXXXXX | \$0.00 | \$0.00 | \$0.00 |
| c. INTEGRATED LOGISTICS SUPPORT COSTS/(SAVINGS) | | | | | | |
| (1) Retrofit of Spares/Repair Parts | | | | \$0.00 | \$0.00 | |
| (2) New Spares/Repair Parts | | | | \$0.00 | \$0.00 | |
| (3) Supply/Provisioning Data | | | | \$0.00 | \$0.00 | |
| (4) Support Equipment | | | | \$0.00 | \$0.00 | |
| (5) Retrofit Kits for Spares | | | | \$0.00 | \$0.00 | |
| (6) Operator Training Courses | | | | \$0.00 | \$0.00 | |
| (7) Maintenance Training Courses | | | | \$0.00 | \$0.00 | |
| (8) Revision of Technical Manuals | | | | \$0.00 | \$0.00 | |
| (9) New Technical Manuals | | | | \$0.00 | \$0.00 | |
| (10) Training/Trainers | | | | \$0.00 | \$0.00 | |
| (11) Interim Support | | | | \$0.00 | \$0.00 | |
| (12) Maintenance Manpower | | | | \$0.00 | \$0.00 | |
| (13) Computer Programs/Documentation | | | | \$0.00 | \$0.00 | |
| (14) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (15) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (16) Blank or user identified factor | | | | \$0.00 | \$0.00 | |
| (17) Operations and Support Cost Change | | | | \$0.00 | \$0.00 | |
| (18) SUBTOTAL OF LOGISTICS SUPPORT COSTS/(SAVINGS) | \$0.00 | XXXXXX | XXXXXX | \$0.00 | \$0.00 | \$0.00 |
| d. OTHER COSTS/(SAVINGS) | | | | \$0.00 | \$0.00 | |
| e. SUBTOTAL COSTS/(SAVINGS) | \$0.00 | XXXXXX | XXXXXX | \$0.00 | \$0.00 | \$0.00 |
| f. ESTIMATED NET TOTAL COSTS/(SAVINGS) | | | | | | \$0.00 |

Net Total Cost Estimate
Figure 5-4

| ECP Type & Action | Disposition By | Governing Criteria |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLASS I ECP Approval /Disapproval /Deferred | Government CCB | <ol style="list-style-type: none"> 1. CCB decision does not mean that the Contractor is authorized to proceed with the performance of the change activity. A Contract Modification (MOD) must be issued by the PCO. 2. Additional government actions, e.g., preparation of required funding documents and authorizations are usually necessary before the Contractor or Government can be told to officially proceed with the change. <ul style="list-style-type: none"> • A formal contract modification is processed to affect a Contractor ECP. • An approval letter from the PM/PLM/Sponsor (or other representative) is required to affect a performing Government activity ECP. |
| CLASS I ECP Disapproval/ Rejection | Government Project office or CCB | <ol style="list-style-type: none"> 1. When Class I ECPs are disapproved, other than recording in CSA the only government action normally required is preparation of a disapproval letter to be transmitted by the Contracting Officer (KO) or other representative identified in the contract. 2. As a courtesy, the ECP disapproval letters should provide the rationale for disapproval. 3. The notification of rejection may include direction to revise and resubmit the ECP. |
| Class II ECP Concurrence or Non-concurrence | Government Plant Representative Office (PRO) or other Designated Government Activity (On rare occasions, the issue of concurrence in classification is deferred to the Lowest Level CCB for disposition) | <ol style="list-style-type: none"> 1. Government concurrence in Class II ECP classification, when required by contract, signifies that the proposed change does not impact any of the Class I ECP criteria. 2. Government concurrence normally allows the Contractor to incorporate the change in the applicable CI and update its configuration documentation without any further Government CCB action, authorization, or contract modifications being required. 3. A non-concurrence in classification may result in the Class II ECP being: <ul style="list-style-type: none"> • Revised, reclassified and re-submitted as a Class I ECP for approval • Withdrawn if the proposed change is not desired. (Non-concurrence has the same effect as disapproval because it does not allow the Contractor to incorporate the change) |
| Class II ECP Approval or Disapproval | Designated Government Activity | <ol style="list-style-type: none"> 1. Required only when unique project requirements deem it necessary, e.g., Government approval of Class II ECPs may be required when approval/disapproval authority is assigned to a Government office different than the PRO or the procuring activity. 2. Government Plant Representative Office concurrence in classification may be required prior to submittal. |

**ECP Review and Disposition Actions
Figure 5-5**

D. CCB Composition and Responsibilities.

1. **CCB Charter.** CCB charters which depict CCB composition and specific responsibilities are established and issued by the PM/PLM/Sponsor and should be included in the CM Plan. An example of a CCB Charter promulgation letter is provided as Figure 5-7.
2. **Membership.** The CCB will normally consist of a Chair (and/or Alternate Chair), Secretariat, Sponsor, Safety, EA Representative, CM Mgr, Technical Manager, and ILS Manager. The following functional areas should also be represented on the CCB, as appropriate: legal, quality assurance, reliability, maintainability, engineering, finance, contracting, weight and moment control, installation and/or production or construction, test and evaluation, and interface control. This representation can be either standing or voting members of the CCB. On small projects, the functions and duties of the CM Mgr and Secretariat are sometimes combined for practical reasons. For the specific functional area or areas of responsibility, each member of the CCB shall provide comments and approval or disapproval recommendations on each change proposal. Technical advisors and cognizant representatives from the design activity, user organizations, implementing activities and those activities providing logistics support may attend CCB meetings on an as-required basis.
3. **Member Responsibilities.**
 - a. **CCB Chairperson.** The CCB Chairperson (or Alternate) has the authority to approve, disapprove, or defer a change proposal. The Chairperson is generally at the level appropriate to fully evaluate impact of change, Executive (EA/LoBs), PM, PLM, or Sponsor level. Should there be a disagreement among CCB members that is out of the scope of the Chairpersons authority, the Chairperson shall raise the approval to the next higher level CCB. The Chairperson is responsible for:
 - (1) Chairing all CCB meetings.
 - (2) Assuring CCB members have had an opportunity to review the proposed change in their respective areas of responsibility.
 - (3) Assuring adequate member representation for interface impacts.
 - (4) Approval, disapproval, or referral action on all change proposals per project policies.
 - (5) Documentation of the decision particularly if it's not a unanimous vote among CCB Members.
 - (6) Requesting higher level approval when a consensus is not met by voting members.
 - b. **Secretariat.** A CCB Secretariat shall be designated to provide for proper coordination, evaluation, processing, and implementation of change proposals. Each change proposal shall be provided to the CCB Secretariat for coordination and administrative action. These actions involve the recording, duplication, managing, and expediting the distribution of the change proposal to the CCB members for comment and return. The CCB Secretariat shall accumulate all comments, ensure that all applicable blocks of the standard forms are completed, provide sufficient

copies, and submit the forms, supplemental and attachments, and all comments to the CCB. The CCB Secretariat shall record all CCB meetings and shall be responsible for administering all CCB procedures and actions. The CCB Secretariat is responsible to the Chairperson for:

- (1) Administering CCB operations, scheduling CCB meetings, arranging for attendance by appropriate CCB members and other cognizant personnel, providing staff assistance to the Chairperson, and indoctrinating and assisting CCB members in the procedures of the CCB.
- (2) Maintaining the change proposal tracking system, ensuring that the change proposal approval and authorization status is recorded in the project office change proposal tracking system.
- (3) Preparing and distributing the CCB meeting agenda, CCB meeting minutes, and CCB Decision and Action forms.
- (4) Preparing letters to the change proposal originators to advise disposition.

c. Configuration Manager.

- (1) Performing a review of changes for completeness and inclusion of all applicable attachments.
- (2) Determining areas of engineering inter- or intra-system interfaces (i.e., equipment-to-ship, equipment-to equipment, equipment-to-computer program or computer program to computer program) for each change and providing for interface impact evaluation. Informing platform directorates and design offices of a proposed system or equipment change having a platform level impact and providing them copies of the change proposal prior to the CCB meeting.
- (3) Developing a schedule for accomplishing the actions directed on the CCB Decision and Action form.
- (4) Ensuring that contract modifications and/or funding actions are properly prepared and executed.
- (5) Coordinating determination of the priority of change implementation for production or construction cut-in.
- (6) Verifying the successful completion of assigned implementing actions.
- (7) Establishing and maintaining an implementing action item tracking system.
- (8) Preparing change proposal review packages and ensuring proper distribution for evaluation.

d. Technical Manager.

- (1) Sponsoring the change proposal.
- (2) Assuring accuracy and completeness of the technical information presented on the change proposal form.
- (3) Coordinating all change proposals having weight and moment impact through the weight control engineer for review and concurrence.

e. **Sponsors Rep.**

- (1) Reviewing change proposals for requirement's impact.
- (2) Identifying sponsor-related implementing actions associated with implementing the change.
- (3) Ensuring all requirements' documentation are properly reviewed and updated if affected by the approved change.

f. **EA Representative.**

- (1) Reviewing change proposals for EA impact.
- (2) Recording EA-related impacts associated with implementing the change.
- (3) Ensuring any EA related documentation is properly reviewed and updated if affected by the change.

g. **Safety.**

- (1) Reviewing change proposals for safety impact.
- (2) Identifying safety-related implementing actions associated with implementing the change.
- (3) Ensuring all safety associated products are properly reviewed and updated if affected by the approved change.

h. **ILS Manager.**

- (1) Reviewing change proposals for ILS impact.
- (2) Identifying logistics-related implementing actions associated with implementing the change.
- (3) Ensuring all logistics products are properly reviewed and updated if affected by the approved change.

i. **Other Standing or Voting Members.**

- (1) Representing and committing their organization with respect to the proposed change.
- (2) Providing approval or disapproval recommendations for changes within their areas of cognizance.
- (3) Functioning as the primary contact within their organization for the proposed change.
- (4) Ensuring that all change proposals which require inputs from their organization are reviewed within the specified time.

From: Commander, XX Logistics Command

Subj: ESTABLISHMENT OF (PLM NAME & COMMAND CODE) CONFIGURATION CONTROL BOARD (CCB)

Ref: (a) Configuration Management (CM) Manual, COMDTINST M4130.6 (series)

Encl: (1) (Project Name & Command Code) Configuration Control Board Charter

1. The purpose of this letter is to establish the (Project Name & Command Code) Configuration Control Board (CCB). Reference (a) prescribes uniform policies and guidance for implementation of configuration management within the Coast Guard.
2. Establishment of (Project Name & Command Code) CCB is effective (date). It will function per Reference (a) and the Charter is hereby established as enclosure (1). Enclosure (1) specifies CCB membership by Code and functional responsibilities.
3. The point of contact for additional information concerning the CCB Charter is (CM Mgrs Name, Code, and Telephone Number).

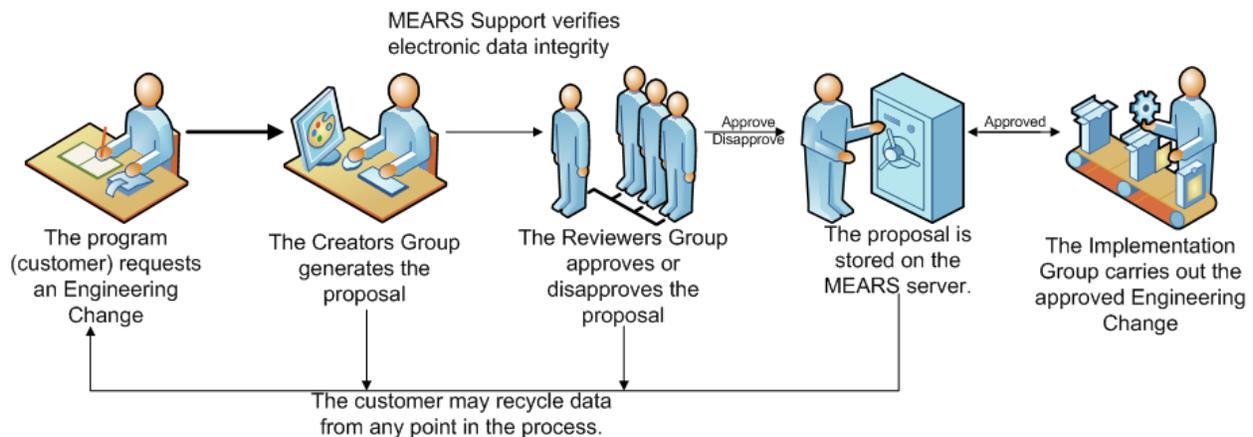
Project Name and Life Cycle (LC) Code Configuration Control Board Charter

(Enclosure (1) to Promulgation Letter)

1. Purpose
2. Applicability
3. Composition of CCB and Functional Responsibilities
4. a. Chairperson (Alternate Chairperson)
 - b. CM Mgr
 - c. Secretariat
 - d. Safety
 - e. Technical Manager
 - f. ILS Manager
 - g. Logistics Information System Configuration Data Manager (CDM)
 - h. Other Members, as appropriate:
 - (1) Reliability and Maintainability Manager
 - (2) Business and Financial Manager
 - (3) Test and Evaluation Manager
 - (4) Weight Control Engineer
 - (5) Interfacing Manager(s)
 - (6) Other Technical Advisors (Government Activities and Contractors as required by the CCB Chairperson)

**Configuration Control Board (CCB) Charter Promulgation Letter
Figure 5-7**

4. MEARS is a web-based software application that provides a virtual CCB for processing engineering change documents including: ECP, ECP Short Form, Request for Waiver (RFW), RFD, Specification Change Notice (SCN), and TCTO as depicted in **Figure 5-8**. MEARS has the ability to collect opinions, comments, red-lined drawings, pictures, and votes of functional review groups, store and archive documents, and gives automatic notification to users when a document is ready for review. If at all possible MEARS shall be used to process ECPs and conduct CCBs.



Overview of the MEARS ECP Process

Figure 5-8

E. **Interface Control Board (ICBs)**. All ECPs shall be evaluated for interface impact. Interface specifications shall be used to manage interface requirements. Each interface agreement will define CM responsibilities, practices, and procedures for each interfacing manager (e.g., other project or CI managers, other Systems Commands and other applicable departments or services). Interface agreements shall be identified in the CM Plan and updated as required. If there is an interface impact within or between systems, equipment or computer software or firmware organizations or between CI level managers then the **interfacing technical manager affected shall be represented as a member of the CCB.**

1. **Multiple Impacts**. Systems and equipment, including computer software and firmware, change proposals having a platform level impact which impact a platform interface (e.g., a cascading change) should be presented to the appropriate CCB Chair. If a process, service, system, equipment or computer software or firmware change proposal requires PM/PLM/Sponsor review and approval, the ECP shall not be submitted formally to the PM/PLM/Sponsor concerned without having been previously approved by the system, equipment or computer software or firmware CCB; lower level CCB. Disagreements at any level or between voting members shall be forwarded to the next higher level CCB Chair for resolution.
2. **Interface Control Board (ICB)**. An ICB should be formed to control system interfaces if more than one project office is involved in the total project. An ICB may also be formed to control system interfaces within a single project if so warranted by that project's complexity. The purpose of the ICB is to develop mutual agreements on the means of identifying the interfaces between allocated CIs, level of configuration identification and

control and procedures for processing changes. The ICB will be chaired by the project office for the highest level CI. The ICB will review all proposed configuration changes that might affect the interface specification, ILS, or standardization of the higher level CI and will be represented via the CCB. However, the ICB will not have the authority to approve and authorize a proposed change. The ICB will ensure any approved changes that impact controlled interface documentation are properly reviewed and updated.

3. Foreign Military Sales. ECPs applicable to CIs acquired for foreign governments will not be presented for formal consideration to Foreign Military Sales case managers or Contractors providing services to foreign governments without first having been considered and approved by the project office CCB.

F. **Configuration Change Proposals**. The following amplification of the policy contained in this Manual shall be used by PM/PLM/Sponsors as required.

1. Engineering Change Proposals, Requests for Deviation. Configuration change proposals are defined as ECPs. References (a) and (b) define the requirements for use, content, format, classification, priority, justification, revisions or corrections, and target processing times of long and short form ECPs and RFDs. References (a) and (b) also define the purpose and use of NORs and discuss the purpose and use of SCN; however, MIL-HDBK-61A recommends that SCNs not be used in projects that operate in a near-real-time IPDE IT environment. ECPs shall be prepared per these standards. However, the requirements of these standards can and should be tailored. CM project tailoring, objectives and activities shall be documented in a CM Plan.
2. ECP Approval Authority. For products and/or services the level of authority required to approve a change shall be based on scope of authority and boundary of impact. The only restriction is that the authority for approval of Class I ECPs and Major RFDs during Acquisition is reserved to the PM/PLM. Class II ECPs and Minor RFDs approved by the local government representative's office such as by the PRO.

CHAPTER 6. CONFIGURATION VERIFICATION AND AUDITS

A. Policy.

1. The FCA verifies that the CI meets all the functional requirements, including performance. A final FCA shall be conducted after all testing is complete and concrete data is available demonstrating the solution meets its requirements. For Products (hardware & software) the FCA must be conducted prior to acceptance of the First Article, production decision (Low Rate Initial Production). The PCA is a final accounting that the technical data package exactly represents the physical item and shall be completed prior to the establishment of the product baseline.
2. The dictionary definition of the word “audit” as a final accounting gives some insight into the value and purpose of conducting configuration audits. Audits shall be used to perform a final accounting prior to the establishment of a baseline. Configuration audits result in the establishment of configuration baselines at which point formal change control shall begin.

B. Introduction.

1. Audits are an independent review of products and/or services for the purpose of assessing compliance with established performance requirements, specifications, standards (commercial and federal/military) and contractual requirements. Configuration audits verify the system and subsystem configuration documentation represents the functional and physical performance characteristics before acceptance into an architectural baseline.
2. The objective is to: ensure the solution design meets defined conformance characteristics, allocation of design characteristics to conformance characteristics is documented and design documentation reflects actual product/service being tested and then reproduced. The iterative audit process provides a level of confidence that the solution meets the need, tests confirm solution meets required performance, the solution is documented to the degree necessary for exact reproduction of product and/or service tested and required/delivered performance is sustainable until no longer required. Successful completion of audit activities results in the establishment of a configuration baseline.

C. Configuration Audit.

1. A configuration audit is the formal examination and verification that a product and/or service or any combination thereof provides the performance necessary to address a bonafide need. Audits shall include review of all CI artifacts existing at the time of the audit. Ensuring the system and its support resources (i.e., Technical Manuals, Maintenance Procedure Cards, Allowance Parts Lists), as applicable, conform to the established configuration identification documentation (i.e., Baselines, Performance Specification, Drawings, design documentation). Audits provide the framework, and the detailed requirements, for verifying that the development effort has successfully achieved all of the requirements specified in the configuration baselines. If there are any problems, it is the auditing activity’s responsibility to ensure that all action items are identified,

addressed and closed out before the configuration can be deemed to have successfully fulfilled the requirements.

Note:

Configuration Audits are to be established as key project/acquisition events represented by formal milestones along with other functional reviews, evaluations, tests, and inspections.

2. Performing an adequate audit in an efficient manner requires planning, preparation, and resourcing. Key phases of the audit process are:
 - a. Pre-audit: Set the schedule, agenda, facilities, the rules of conduct, and identification of audit team. This time is also used to gather materials, assess security requirements, develop a plan and conduct dry runs.
 - b. Perform audit: Execute the audit.
 - c. Post-audit: Audit report prepared and promulgated. Actions tracked until closed out. Appropriate baseline established, date stamped and recorded in CSA.

Note:

It should be noted that an audit is not a review. Design reviews are conducted on a periodic basis to assess the degree of completion of technical efforts related to identified milestones preceding further technical effort.

D. Types of Audits.

1. **Functional Configuration Audit.** The FCA is a formal audit used to verify that the actual performance of a CI(s), “as-designed”, meets required performance. FCAs shall be conducted prior to acceptance. The FCA shall be conducted on a production representative item or the first article, as appropriate. FCAs for systems of systems shall not be considered complete until completion of full integration testing. An FCA is a critical decision point, the product and/or service shall not be accepted until the FCA has been completed. This is of particularly importance in a performance based acquisition. FCAs shall be conducted on each CI designated for independent management. The FCA shall demonstrate through traceability to test data that specified performance has been demonstrated. FCAs should be scheduled after establishment of ACBs and PCBs. It is highly recommended that a preliminary FCA be conducted concurrent with the PCA prior to OT&E culminating in the final review once OT&E results are available. An FCA is required for major modification efforts or whenever a significant number of configuration changes have occurred over time. Individual engineering changes do not require full system performance verification and therefore cumulative performance may have been inadvertently altered; an FCA shall ensure the accumulated changes have not affected the end product and/or service performance envelope.
 - a. The FCA for complex products and/or services can be conducted on a progressive basis (specify in contract if approach is to be employed) and culminates at the completion of OT&E. A final comprehensive review after OT&E shall be completed prior to issuance of the FCA report and government establishment of the functional baseline.

- b. See Appendix C for instructions on how to conduct a FCA.
2. **Physical Configuration Audit.** PCA is an examination of the “as built” CI against its product data (design documentation and technical documentation). The PCA is used to establish the PCB informing the FCA for production and acceptance. In cases where the government does not plan to control the detail design, it is essential the PCA be conducted by the contractor prior to the government FCA and acceptance and/or full rate production decision; of course, this approach must be contractually identified. Additional PCAs may be required if circumstances such as the following apply no matter who controls the detailed production design:
 - a. The original production line is shut down for several years and then production is restarted.
 - b. A new build to print contract is awarded for the CI, particularly if not OEM.
 - c. Limited scope PCA shall be required for the introduction of new CIs due to design modification to include replacement of parts by a different manufacturer, within the structure of a product and/or service e.g., as a result of an ECP. In addition some retesting of the existing system elements with the new CI incorporated would be required to ensure the performance envelope remains intact. Again, the objective of the PCA is to ensure technical data accurately reflects the product and/or service.
 - d. See Appendix D for instructions on how to conduct a PCA.

E. Configuration Verification.

1. Physical configuration verifications are conducted through-out the life of a product and/or service to ensure no unauthorized changes of the physical item have occurred and to manage the integrity of the data contained within the logistics support information system. Specifically, that the configuration decomposition (tree), on-board parts, supplies and manuals are accurately reflected in the information system used to manage logistics support.

CAUTION

A PCA shall not be confused with the verifications conducted to ensure the logistics information system reflects the current configuration tree, on-board spare and repair parts and manuals typically performed through LCIs with results provided to the CDM for incorporation into CDMD-OA or other CG logistics information system. Verifications only audit what is there not what is required or should be there based on needed performance. Failure to do so will result in the inability to sustain performance delivered due to inadequate product data.

F. Roles and Responsibilities.

1. Sponsor/Project Manager/Project Lifecycle Manager.

- a. Product and/or Service Sponsors and PMs (PLMs in the case of post acquisition approved ECP/TCTO implementation) shall ensure FCA and PCA are executed prior to acceptance or issuance of a full rate production decision. The CM Mgr has incorporated FCA and PCA requirements within the contract and that the contractor shall ensure access (product and data), facilities, personnel and tools are available to conduct the FCA and PCA (regardless of who, Government or the contractor, conducts).
- b. Shall ensure FCAs and PCAs are properly resourced and scheduled to align appropriately with design reviews and milestones.
- c. An agreed upon agenda exists and has been reviewed to ensure conformance to the contractually specified Data Item Description (DID) and any unique requirements.
- d. Audit discrepancies are addressed and an agreement of discrepancy disposition with signatures.
- e. Shall ensure a Baseline Letter is prepared and signed.

2. Configuration Manager.

- a. Shall lead the audit team and assigned as the Audit Chairman.
- b. Shall be responsible for selecting the Government audit team. The composition of the Government audit team should be tailored to the specific audit requirements. For complex systems or major changes it is beneficial to have sufficient people to allow a thorough audit in the scheduled time frame. The audit team should include individuals familiar with the development history, operation and installation of the product and/or service, and specialists for ILS, technical manuals, computer software, etc., as dictated by the characteristics of the capability. Individuals familiar with engineering drawings and equipment fabrication techniques are required for PCAs and are an asset to the FCA team. The audit team should also consist of a member from the PRO and APO as applicable. Individuals with quality assurance experience are highly desirable. In addition to the individuals required to conduct the audit it should also be determined who, if anyone, should be invited for information or concurrence.

- c. The CM Mgr shall develop the Configuration Audit Agenda identifying access (product and data), facilities, personnel and tools required to conduct the FCA and PCA (regardless of who, Government or the contractor, conducts).
 - d. The agenda will include at a minimum the following data elements:
 - (1) Audit date and location.
 - (2) Audit schedule (identification of specific audit activity and schedule by day and hour).
 - (3) Identification of specific CIs to be audited during what period of time describing audit activity relationship to final report.
 - (4) Identification of the engineering documentation to be used in conducting the audit.
 - (5) Audit procedures to be employed.
 - (6) Identification of CIs to be audited.
 - (7) If a progressive FCA or follow-on PCA identify approved deviations and or proposed waivers applicable.
 - (8) Security clearance information, if required.
 - e. Prepare and sign Baseline Letter. Baseline will be considered established upon:
 - (1) Completion of the appropriate audit e.g., Product Baseline requires completion of PCA. The final Government Functional Baseline shall not be established until both Functional and Physical Configuration Audits have been completed.
 - (2) Audit discrepancies have been addressed.
 - f. Determine the level of PCA e.g., 100%, statistical sampling etc.
 - g. Audit strategy and activities recorded in CSA and CM plan.
3. **Configuration Audit Chairman.**
- a. Conduct Audit Chairman brief.
 - b. Authorized to recommend acceptance of product and/or service subject to condition/agreements of the audit as defined by the Baseline Letter, or recommend rejection. Reasons for rejection and disapproval must be noted and recorded in the CSA.
 - c. Prepare and jointly sign with the Contractor (if appropriate) a letter documenting the baseline establishment upon successful audit. The baseline letter identifies changes necessary to correct the deficiencies identified during the audit. Determine if deficiency resolution falls within scope of the contract; if not inform Sponsor/PM/PLM and the Contracting Officer. The Audit Chairman is responsible for ensuring only those activities necessary to address specific discrepancies shall be undertaken and technically authorized at that time by the Government see example as depicted in **Figure D-1**. Other changes must conform to normal engineering change procedures (i.e., ECP submittal). If uncertainty exists as to whether a particular change is audit-related the Audit Chairman or the CM Mgr should be contacted for

clarification. This procedure is mandatory to maintain configuration control. See Appendix D for an example of a baseline letter.

4. **Audit Team.** An acceptable audit team member will:
 - a. Focus on identifying discrepancies, not on resolving them during the audit.
 - b. Be capable of identifying errors of omission as well as of commission.
 - c. Document discrepancies in a clear, direct format.
 - d. Conduct themselves professionally and inspire trust (to do otherwise may induce personnel to withhold information for fear of personal consequences.).
 - e. Understand the difference between a design review, an FCA and a PCA.
5. **Verification Team.** An acceptable LCI verification team member will:
 - a. Be capable of generating and reading a validation record from logistics information system.
 - b. Be capable of identifying errors of omission as well as of commission.
 - c. Document discrepancies in a clear, direct format.
 - d. Conduct themselves professionally and inspire trust (to do otherwise may induce personnel to withhold information for fear of personal consequences.).
 - e. Understand the difference between Configuration audits and the verification activity.
 - f. Notify CM Mgr of results.
 - g. CM Mgr provides acceptable data to CDM for incorporation into the Information System.

CHAPTER 7. CM Life Cycle Management

A. **Life Cycle Management (LCM) Levels.** Configuration Management for USCG Products and/or Services, including data, information, computer software and firmware, must be an integral part of the CG operating philosophy.

1. **CM During an Acquisition Phase.** The USCG Enterprise is a CI, CM of a new product and/or service begins prior to the decision to acquire. Once the decision to acquire a CI is made a CM Mgr should be immediately assigned to continue management of functional requirements. Initiating and establishing CM immediately and maintaining CM discipline throughout the product and/or services life is essential to traceability (performance, interface, and organizational), report-ability, assess-ability and supportability. It is for this purpose that configurations are uniquely identified, audited, baselined and change controlled. [Chapter 5 of Reference \(a\) provides further guidance on approving and managing CIs.](#) During the Acquisition phase many ECPs are submitted and implemented through the contract and require a contract modification processed by the PCO. At a minimum, the establishment of configuration baselines and the interface control between and among baselines for GFE and Contractor Furnished Equipment (CFE), must be established and maintained. ECPs affecting programmatic issues (e.g., cost and schedule) or operational requirements must be addressed by the PM or cognizant project office.
2. **CM During Operational Phase.** Maintaining CM throughout a product and/or services life is essential to readiness. Baselines and interfaces and those approved changes are planned, authorized, supported, and installed with established procedures and collectively represent the CG's ability to meet the needs of the country therefore all changes must be managed. Approved changes are executed via change directives known as the TCTOs sometimes also referred to as ORDALT for NTNO equipment, and Machinery Alterations (MACHALT) which are used to direct a field or depot change. Authorized configuration changes may also be implemented outside of the Organizational and Depot (O&D) level maintenance by forces afloat, Aviation Logistics Center (ALC), Surface Forces Logistics Center (SFLC), Shore Infrastructure Logistics Center (SILC), Command, Control, Communications, Computers and Information Technology Service Center (C4ITSC) and other activities. These configuration changes are managed and funded through a variety of programs. In all cases, authorization for the change shall be a prerequisite of the change.

B. **CM Life Cycle Milestones.** The following outline provides specific CM milestone events that occur during a CI's life cycle.

1. **Analyze/ Select Phase.**
 - a. Develop CM Plan for Concept Exploration/Definition.
 - b. Document Functional Configuration Identification (FCI).
 - c. Develop Configuration Control Process, charter and organize CCB.
 - d. Capture and record interface requirements.
 - e. Provide information from the CSA and participate in System Requirements Review

(SRR).

- f. Establish CSA System.
- g. Update CM Plan for Concept Demonstration/Validation.
- h. Contractor Baseline established. Review contractor functional baseline.

2. Obtain Phase.

- a. Conduct Configuration Control over functional requirements.
- b. Implement project configuration management program.
- c. Review and recommend approval/disapproval of all configuration changes that will modify the systems functional characteristics or operational requirements.
- d. Conduct the FCA.
- e. Document Allocated Configuration Identification (ACI).
- f. Maintain CSA System.
- g. Participate in System Definition Review (SDR).
- h. Update CM Plan for Full Scale Development prior to Acquisition Decision Event (ADE) -3.
- i. Establish Allocated Baseline (ABL).
- j. Participate in Project Planning Review (PPR).
- k. Participate in Preliminary Design Review (PDR).
- l. Participate in Critical Design Review (CDR).
- m. Participate in Test Readiness Review (TRR).
- n. Conduct PCA prior to OT&E.
- o. Initiate preliminary FCA concurrent with PCA prior to OT&E.
- p. If possible participate in the Logistics Readiness Review (LRR).

3. Produce/Deploy and Support Phase.

- a. Based on Audit completion establish and manage Product Baseline (PBL) and Government Functional Baseline (FBL).
- b. Based on Audit status recommend acceptance and/or production decision.
- c. Document PCA and FCA in CSA.
- d. Document PBL and FBL in CSA.
- e. Conduct Configuration Verifications.
- f. Update CM Plan for Full Rate Production/Deployment.
- g. Conduct Follow-On Configuration Audits (if applicable).
- h. Update CM Plan for Operational Support.

- i. Maintain Configuration Control of FBL, ABL and PBL.

CHAPTER 8 CM OF COMMERCIAL OFF THE SHELF (COTS)

A. COTS Overview.

1. First, let's step back for a moment; the use of COTS is not new. There has always been COTS products at some level within a CI's structure if perhaps not always the end item. COTS products have been increasingly sought out either due to time or resource constraints. CM for COTS must be applied in the same manner as is for all other products with the only difference being who is executing the CM tasks and where are they occurring. CM requirements shall not be alleviated to take advantage of the technology enhancements that COTS provide. A perfect example would be industrial application of Capability Maturity Model Implementation (CMMI). CMMI is founded on the principles of CM by documenting the performance to the documented processes and auditing the output for both consistency and quality of a product or service. As we have said throughout the guide all Programs and Projects should tailor their CM approach as appropriate, this applies to COTS products as well. A tailored approach provides for the desired quick insertion of technology but not at the expense of safety, quality, reliability and supportability.
 - a. Early Planning - CM must be considered early, in fact for COTS procurements CM should be one of the determining factors effecting the decision to pursue a COTS solution. CM is also a very effective criterion for source selection using CM as a source selection qualifier reduces the risk to both the Government and the prime. It is also highly recommended that the prime/integrator require the stipulation be applied to vendor selection.
 - b. The performance specification is a foundational element of the functional baseline. Managing requirements is an essential CM activity which will enhance accuracy of the performance specification, a configuration artifact. In the design/down select phase it is essential to adequately convey performance requirements and only those that are absolutely required.
 - c. Development and management of Interface specifications (CM artifact) and boundary management.
 - d. Inclusion of interoperability as a requirement for all technology upgrades e.g., black box plug and play.
2. Vendors produce products; variations in product performance is liken to industrial suicide. If every time a customer purchased a vendors product, for illustrative purposes let's say fresh water pump style #1a45, and its performance varied the product and the vendor would be designated as unreliable and most likely not used in the future. Therefore one can surmise vendors execute a very effective, if not standard, CM program to ensure credibility. Major OEMs should levy the same CM standards on their vendor as the government does on them. As it is the government's responsibility to assess the OEM/Primes CM capability it is the Primes responsibility to assess their vendor's capability. In fact how well the Prime oversees a vendors CM efforts will be one of the Government's assessment criteria. COTS do invoke CM complexities such as identification, replacement, obsolescence and documentation but these are really no different today than they have been over the last 60 years. There will always be COTS

products contained within a configuration at various levels - think of a bolt. The bolt is a CI and is also COTS, the prime may not have managed the detail design of the bolt but he did expect the manufacturer of the bolt to do so. Now the bolt manufacturer will consider the bolt a top level CI (parent) with children such as: material; thread count, mold, tools and a manufacturing specification.

- B. COTS Source Selection.** As discussed above, CM can become a COTS source selection discriminator. CM issues need to be addressed as part of the vendor and product selection processes. Market analysis surveys in preparation for acquiring COTS items should include CM related questions to give the integrator's CM organization insight into the vendor's CM practices and an understanding of such vendor practices as serial and part number marking schemes.
- C. Configuration Identification.** COTS issues related to configuration identification that must be identified in the contract and addressed during market analysis include data deliverable identification, the rights required of that data, and specific identification both the data and the item itself. Specific identification requirements can be levied on a COTS vendor particularly for serialization and Item Unique Identification (IUID). It is also very important to understand the COTS manufacturer's protocol for rolling a new part number; this protocol should be requested and verified.
- D. Acquisition Documentation.**
1. COTS are best obtained when performance documentation is used by the project to specify and manage form, fit, function, and interface requirements. [Table 5-5 in section 5 of Reference \(a\)](#) (page 5-11) defines and provides the order of precedence for specification documents to be used for acquisition. Those documents which are performance documents are clearly indicated.
 2. The choice of the most appropriate documentation to use for acquisition of a COTS item varies according to the product end use, supportability requirements, system complexity and many other factors. The specific documentation to use for various types of COTS products can only be determined by understanding the full design, therefore it is best for the system designer to identify and justify level of documentation required for life cycle support. The performance specification should identify the requirement for the product to be interoperable with no changes to interfaces points, product configuration shall be managed so operational and depot level maintenance can be supported with spare and repair parts, etc. It is also very important to understand the difference between; (1) the traditional "acquire data"; (2) expressly directing delivery of data; and (3) designation of Government rights over that data. One method of making this determination is by constructing a decision matrix utilizing questions such as what is depicted in **Figure 8-1**. Typically the project prepares a Commercial Item Description(s) (CID) which defines the performance requirements and interface requirements and copies vendor data sheet information into Vendor Item Descriptions (VID) or Source Control Documents (SCD).
 3. Although documentation of COTS products is unregulated by the government, customers of those COTS products expect that product and data is available and demonstrate reliability and design stability. Additional data required for COTS may be limited to that which is normally provided to commercial buyers. Such data typically includes operating

instructions, basic maintenance instructions and parts replacement for the COTS product. Caution should be exercised in adopting these procedures wholesale; in fact the COTS data (operating instructions, basic maintenance instructions and parts replacement) may invalidate the end item product warranty. Data requirements should be considered carefully not just the initial delivery cost but the data maintenance cost as well, this applies to all acquisitions not just COTS. Bringing commercial design documentation up to government standard levels, as was often done in the past is not only a cost that should be avoided but is also unsustainable.

E. Performance Baseline. In a performance based acquisition, the USCG or its integrating Contractor must specify and control a COTS item via its functional baseline. This shall be executed in the same fashion as it is for any other project. The COTS Contractor may establish design (detail design specification) and product baselines and these may or may not be required as deliverables by the USCG based on the considerations discussed above. The Government will NEVER own (meaning control changes) a COTS design. In a COTS environment the government can only manage/control the functional baseline (Performance and interface (or interchangeability), supportability requirements). The COTS manufacturer owns the design and normally, will make changes to ensure customer satisfaction. The Contractor will make strategic market driven improvements in his product refreshing the technology by substituting improved or future state-of-the-art components. The only way to ensure this activity does not affect the government is to identify and manage interoperability, reliability, maintainability and sustainability performance requirements.

F. Item Identification.

1. There is little consistency in item identification practices among COTS producers, and often little consistency between two products provided by the same supplier. The implementation of the industry standard governing the IUID process will certainly improve standardization. Vendor supplied part numbers may be of little value beyond the ordering stage because part numbers may be obsolete even before the product is released. Many vendors do not consistently mark their parts, and some do not mark the parts at all. This, obviously, makes receiving inspection much more difficult. Software licenses, upgrades, and configuration files are difficult to manage because of this lack of consistency between vendors. If provisioning/sparing is to be done by other than the COTS supplier, it can be a complex issue.
2. Therefore these requirements should be stated as selection criteria. Again basic CM principles require unique identification of CIs which, as we discussed earlier, should already be a selection criteria. Assessment of the COTS supplier's CM process is the only way to ensure vendor consistency. Industry remedies include auxiliary identifiers and decals applied at the time of incoming inspection for inventory control, serialization, configuration control and accounting.

G. Configuration Control.

1. When managing COTS items, functional baselines (performance specifications) are the ONLY point of control. In fact, they are the only optimal basis that the project can use to ensure the delivered configuration meets the stated requirements. The project does not have change control authority (although they may have rights to the design data) over a COTS supplier, and **cannot** direct changes to it. The project is an application activity (authority extends only to the use of the product and its documentation) with respect to the suppliers product and its documentation, i.e., the project may request the supplier make a change to its product, but does not have the right to direct that change if the supplier is not in agreement. Selection of a COTS item is based in part on life cycle cost considerations; the project should be cautious about anticipating the cost benefit by attempting to over-control the supplier. The project also can choose not to use the supplier's product.
2. The supplier on the other hand has complete configuration control over their COTS product. The supplier may offer changes (improvements, added features) that are optional at extra cost at any time. On the other hand the supplier may make configuration changes to the product for competitive reasons without any knowledge or compliance by the project. COTS suppliers are also subject to unannounced changes by their own suppliers, which may in turn result in changes to the COTS product design. These supplier initiated changes, often improve the product, but are not always made with appropriate modification of technical data or in conjunction with the need of the ultimate end user.
3. Wherever possible, project to COTS supplier configuration control requirements should include the following as a minimum: Changes that affect the functional (performance) baseline must be conveyed to the government at which time the government may choose not to utilize the item and no cost will be paid to the contractor for stopping the contract. A penalty shall be applied should the COTS manufacture make a change affecting the functional (performance) baseline without informing the government. Again the functional (performance) baseline must include a statement regarding life cycle supportability and maintainability.

Something worth considering: Use Contractor CM capability and maturity of CM processes as a discriminator during Source Selection.

4. An effective CM process is the best mitigation of risk. The CM process will provide confidence in the produce-ability, reliability, sustainability and performance of the product.
5. The project can be the recipient of short-term notice of component and sub-component part obsolescence/changes, and is forced into a reactive mode. Without direct control of the product evolution, the project must compensate by being aware of pending changes as early as possible and performing change impact analysis that assesses alternate solutions to determine what action is in the best interests of the USCG.
6. The impact to the integrator and the Government is minimized by anticipating the likely level of change that will occur, including redesign efforts to the prime system to compensate for unplanned COTS iterations. The project and the USCG must take these

“marketplace” considerations into account when planning for and funding COTS projects. Budget reserves for these types of contingencies should be maintained.

7. The USCG must recognize that the “long-lead” change decision and funding process typical of projects in the past can seriously erode the savings anticipated from use of COTS. One benefit of controlling the project via a performance rather than a detail specification is the ability for the prime to react swiftly to implement the compensating changes that do not impact the performance of the end item.

H. Configuration Status Accounting. Obviously, given the many variables discussed in the previous paragraphs, the project’s CSA process is the place where the reconciliation between inconsistent COTS supplier CM practices and the clear accountability that is due the USCG must take place.

1. Typically, COTS product and document identifiers often exceed the character size. Similarly, revision identifiers and serial numbers can contain special characters, and exceed the field lengths for many CSA systems. As a federal agency, in the absence of a standard, we have had to address inconsistencies in CSAs and CM processes across our many products and/or services.
2. Very similar to the assignment of NSNs and the identification of alternative items categorized as “replace in kind”. An ancillary COTS part identifier can be assigned to the COTS part to establish an alias for the item. When this is necessary there shall be traceability between the alias and the original COTS part identifier. The project-assigned identifier (alias) for the COTS part is used to achieve supply support stability by building an interchangeable alternate part data base as the COTS item changes as a result of product/vendor discontinuance and upward compatible vendor changes.

I. Software Control. Special consideration should be given to the types of product baselines that need to be established and maintained on COTS software integration projects.

1. COTS Contractors need to establish and maintain a software PCB that provides integrity for the contractual developmental effort.
2. A unique baseline for each installation should be established to account for the hardware and software environment differences created by the use of multiple revision levels of COTS products at each installation location.
3. Contractors need to focus on tracking the versions of COTS tools as they apply to user-developed applications. To manage the relationship between COTS tools and developed applications:
 - a. Maintain a meta-file in a software version-control tool identifying all pertinent COTS utilities, operating systems, and compiler version information.
 - b. Store the files making up the applicable COTS tool, utility or compiler as part of the developmental product within the Contractor software version-control system or in a related Product Data Management (PDM) system.

J. Configuration Audit.

1. As stated previously, when managing COTS items, functional baselines (performance specifications, test plans, test reports, etc.) are the ONLY point of government control. Since the functional baseline is the only point of control it is important to conduct an FCA. The FCA is a formal audit used to verify the CI(s) has achieved, through demonstrated performance, the government's expectations and the demonstrated performance is supported by formal test results. Not only is an FCA a critical decision point but it is an excellent management tool for the program manager. The product and/or service shall not be accepted until the FCA has been completed. See Chapter 6 for further information concerning configuration audits and Appendix C for instructions on how to conduct a FCA.
2. When acquiring COTS products it is advantageous to require the OEM perform a PCA. A successful PCA provides the Government confidence in the OEM's ability to reproduce replicas of the tested unit thus supporting our expectations for consistent performance. If any aspect of the COTS acquisition is developmental in nature then conduct the configuration audits as required in the applicable acquisition instruction and in accordance with the instructions found in Chapter 6 and Appendix C of this manual. Conduct configuration audits as prescribed in the U.S. Coast Guard, System Development Life Cycle Practice when acquiring COTS SW products for integration into existing CG CI's (platform) or when customizing or configuring a COTS product.

1. Do you have a viable engineering drawing management and part numbering process? Explain.
2. What is your qualification for and method of re-identifying parts when changes are made? How do you relate part number changes to the serial numbers of the deliverable item?
3. How do you manage item modifications?
4. How do you inform your own personnel and customers of changes to your product?
5. Do you currently operate using all or any portions of any recognized CM standard?
6. Do you employ a formal change review process? Do you operate a change control board? A Material Review Board?
7. How do you assure the currency, integrity, and consistency of:
 - Material Specifications
 - Drawings
 - Indentured Lists
 - Parts Lists
 - Service Manuals
 - Operating Manuals
8. Do you have a release procedure for documentation? Explain.
9. Do you apply serial numbers and or lot numbers to your products? How are they assigned and marked?
10. By what methods do you assure that products delivered to your customers comply with the customer's order and specification?
11. What type of communication relative to change activity do you have with your suppliers?
12. Do you ever install refurbished components in your products?
13. If a product line is dropped, when is a customer notified? What options are offered the customer?
14. If a component that is supplied to the customer as a spare part is being changed, how and when is the customer notified?
15. How do you support your products? What options are typically available to the customer?
16. Are you CMMI certified? If so to what level?

COTS SUPPLIER CM MARKET ANALYSIS QUESTIONNAIRE

Figure 8-1

CHAPTER 9. CONTRACTING FOR CONFIGURATION MANAGEMENT

- A. **Policy.** Procurement Request (PR) packages for design, development, production, construction, or operational support of platforms, systems, and equipment, including computer software and firmware, shall incorporate specific CM requirements. These requirements are equally applicable to the acquisition of re-procurement items. Examples of CM contract requirements are provided in this chapter.
- B. **General.** The CM Mgr as the PM/PLM's functional lead has the responsibility of ensuring that CM provisions have been adequately addressed within the contract. This guide has been created to assist by providing a brief understanding of CM, and will hopefully aid in implementing CM. Coordination with the PM/PLM, SE, Data Manager and ILS personnel regarding all CDRLs and Statement of Work (SOW) paragraphs pertaining to CM is essential to ensure the CM effort has been tailored and aligned so as not to miss or duplicate requirements.
- C. **Design Reviews and CM.** At all Design reviews during development or modification make sure that the conference agenda contains a presentation of the Contractors CM profile. During these progress reviews ask to see the CSA records and other related CM data. At these progress reviews and other meetings reinforce to the Contractor which technical documents are under configuration control.
- D. **Functional and Physical Configuration Audit (FCA/PCA).** Ensure that the project or contract schedule contains an FCA and PCA as appropriate. FCA and PCA must be completed prior to acceptance. The FCA and PCA are audits designed to verify, to the government, the accuracy and establishment of the Functional and Product baselines and assure that the Product and/or Service are in fact, built to these baselines. Hence, the FCA shall always be conducted by the Government and PCA shall be conducted per the acquisition strategy. Audits will require contractor support, which shall be specifically defined in the contract. For additional information applicable to FCAs/PCAs, see Chapter 4.
- E. **Contractor CM Plans.** If a CM plan has been identified as a contract deliverable cite the appropriate DID to support delivery. Whether the contractor CM plan is a deliverable or not it is imperative to ensure that CM planning is being properly addressed by the contractor. This can be accomplished by conveying to prospective bidders, through the solicitation that their proposals will be evaluated on how they currently accomplish CM and what if anything they plan to change in support of this effort.

Something worth considering: Use Contractor CM capability and maturity of CM processes as a discriminator during Source Selection.

- F. **Recommended SOW paragraphs for CM.** Include the following paragraphs in each SOW and tailor as appropriate.
1. Configuration Management: The Contractor shall establish a CM program governing all products and services and shall specifically identify CM tasking to be executed in support of this effort. The Contractors CM program shall provide configuration identification,

configuration control, CSA of all products and services. The Contractor shall ensure these activities will be done to the extent necessary to provide traceability of requirements to demonstrated performance as allocated to specific design characteristics and documentation including Government Furnished Property for the duration of the contract.

2. Configuration Identification: The Contractor shall identify the product or service configuration by the Functional Baseline and Product Baseline. The Contractor shall include in the Functional Baseline all system/performance specifications, interface specifications, test specifications and reports and contract requirements. The Contractor shall define the Product Baseline by Engineering Drawings, Specifications and Standards, Provisioning Parts List, Computer Software Configuration Items, Engineering Analysis, Logistics Support Analysis, Operations and Maintenance Manuals and any other documentation required to produce and sustain product and/or service. The Contractor shall, in consonance with the Government, select the CIs to be identified and assign hierarchical identifiers to each CI (see **Figure 3-1** for CI Decision Tree), select the configuration documentation to be used to identify each CI, define and document interfaces between CIs and establish a release system for the control of configuration documentation and computer software source code.
3. Configuration Control (CC): The Contractor shall control the hardware and software PCB by Form, Fit, Function, Interchangeability and Interoperability in consonance with the Government maintenance concept. The Contractor shall control the Product Baseline; utilize a change process and engineering release process. However, proposed changes that impact the Form, Fit, Function, Interchangeability or Interoperability of the current system configuration shall be submitted for approval to the Government per the CDRL. Changes to the Product Baseline shall result in a common configuration for Government operational use and maintenance activities that provide interchangeability and interoperability per the Government maintenance concept.
4. Configuration Status Accounting: The Contractor shall document all baselines, ECPs, deviations and waivers in the Contractor's CSA database. The purpose of CSA is to provide an up-to-date accounting of the exact configuration of each device. Status includes part numbers with appropriate revision levels, approved waivers and deviations, and incorporated or unincorporated ECPs. The contractor shall review the data and assure its accuracy. The contractor shall provide CSA information from the contractor's information system to the maximum extent possible.
5. Physical Configuration Audits: The Contractor shall conduct a PCA as a formal examination of the as-built configuration of the CI against its design documentation. After successful completion of the audit and establishment of a PBL, all subsequent changes are processed by formal engineering change action. Additional PCA guidance can be found in Appendix D.
6. Functional Configuration Audit: The contractor shall conduct an FCA for each CI for which a separate development or requirements specification has been created. This audit verifies, for the government, the CI's performance against its configuration documentation.

G. CDRL Requirements.

1. The following are two lists of CM CDRLs to be considered in acquisition contracts. The first list (required CDRLs) is mandatory and should always be included. The second list (additional CDRLs) may or may not be required depending upon the specific requirements. Each project should review carefully the need for CDRLs included in the second list. Specific CM contract requirements should be tailored to the product being procured and to the applicable project life cycle phase.
2. Block (5) of each CDRL, DD Form 1423 should Reference the applicable SOW paragraph number as the requirements source vice MIL-STD-973. Additionally, the following statement should be added in Block 16: "Any military specification or standard which may be Referenced by this DID shall be considered for information only".
 - a. Required CDRLs.
 - (1) **Engineering Change Proposal (ECP)** shall be prepared per ANSI/EIA-649 and DID# DI-CMAN-80639.
 - (2) **Request for Deviations (RFD)** shall be prepared per ANSI/EIA-649 and DID# DI-CMAN-80640.
 - (3) **Training Equipment Change Directive (TECD)** shall be prepared per ANSI/EIA-649 and DID# DI-CMAN-81269A. Tailor CDRL to delete Reference to MIL-D-81992B.
 - b. Optional CDRLs.
 - (1) **Configuration Management Planning.** A Contractor's CM Plan shall be developed per ANSI/EIA-649 and DID# DI-CMAN- 80858.
 - (2) **Configuration Identification.**
 - (a) A ship work breakdown structure shall be developed and maintained per MIL-HDBK-881.
 - (b) Request for assignment of Joint Electronics Type Designation System (JETDS) "AN/" nomenclature shall be per MIL-STD-196E and DID# DI-CMAN-81254.
 - (c) Requests for assignment of MARK and MOD nomenclature shall be per MIL-STD-1661 and DID# DI-CMAN-81212.
 - (d) Product drawings shall be developed per MIL-STD-31000 and DID# DI-DRPR-81000.
 - (e) Technical Data Packages shall be developed per DID# DI-SESS-80776A.
 - (f) Baseline description documents shall be prepared per DID# DI-CMAN-81121.
 - (g) Requests for Mark and MOD Nomenclature and Serial Numbers shall be per DID# DI-CMAN-81211 and DI-CMAN-81212.
 - (3) **Configuration Control.**

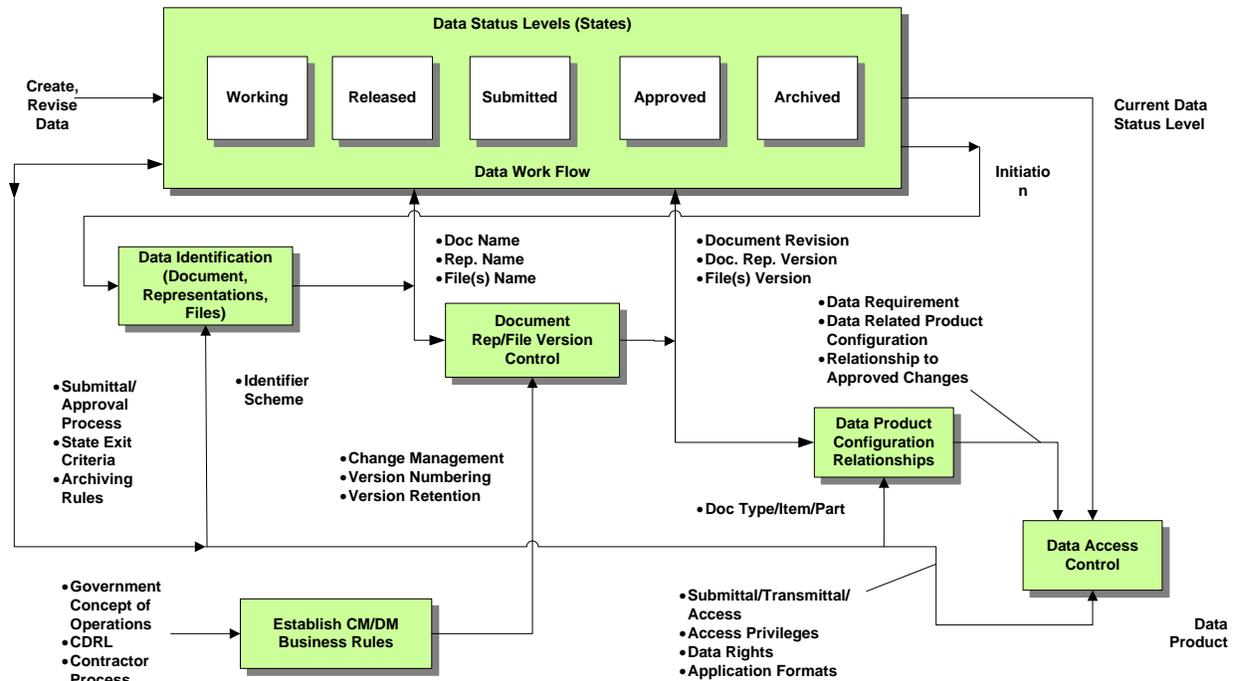
- (a) Notices of Revision (NOR) shall be prepared per ANSI/EIA-649 and DID# DI-CMAN-80642C.
 - (b) Specification Change Notices (SCN) shall be prepared per ANSI/EIA-649 and DID# DI-CMAN-80643.
 - (c) Field Change Bulletins shall be per DID# DI-TMSS-81393.
 - (d) ORDALTs shall be prepared per MIL-STD- 1662C and DID# DI-CMAN-80225.
 - (e) MACHALTs shall be prepared per DID# DICMAN- 81182.
- (4) **Configuration Status Accounting.**
- (a) Configuration Status Accounting (CSA) Reports shall be prepared per DID# DI-CMAN-81253 and ANSI/EIA-649.
 - (b) Interface Control Documents shall be prepared per DID# DI-CMAN-81248A.
- (5) **Configuration Audits.**
- (a) Configuration Audit Agenda and/or Reports shall be prepared per ANSI/EIA-649 and DID# DI-CMAN-81022C.
 - (b) Quality Assurance Provisions shall be conducted per DID# DI-CMAN-80789.
 - (c) Validation reports shall be prepared per DID# DI-CMAN-80792A.
- (6) **Technical Reviews.** Technical or Design Review Reports shall be prepared per ANSI/EIA-649.

H. **Data Management.** The following chapter has been taken directly out of the MIL-HDBK-61B drafted several years ago and approved but not released. Terminology has been updated for currency. The data management content of this chapter is extremely relevant and fills the void until such time as the COMDTINSTs regarding product data management are published.

CHAPTER 10. DATA MANAGEMENT

A. CM Related Data Management Activity.

1. In this age of rapidly developing information technology, data management and particularly in the management of digital data is an essential prerequisite to the performance of CM. Digital data is information prepared by electronic means and made available to users by electronic data access, interchange, transfer, or on electronic/magnetic media. There is virtually no data today, short of handwritten notes that do not fall into this category. CM of data is therefore part of the data management activity; and management of the configuration of the product configuration cannot be accomplished without it.
2. **Figure 10-1** is an activity model for CM data. All the activities shown apply to configuration documentation. Most of the activities apply to all data. The model illustrates that the process is driven by business rules established based on the Contractor processes as adjusted to accommodate the Government's concept of operations for the processing of digital data, and specific contract data requirements. It assumes a data workflow that encompasses four progressive status categories of digital data files.
 - a. Working data, where the data is under the originator's control only.
 - b. Released data, where working data has been approved by the contractors established approval process, released for its intended use, and is now subject to contractor configuration control procedures.
 - c. Submitting data, where the contractor released data has been formally submitted to the government for approval.
 - d. Approved data, where contractor submitted data has been approved for its intended use by the government.
3. When the data process is initiated to create or revise an item of data, or to perform any of the actions necessary to bring it from one status level to the next, the various rule sets illustrated in the figure are triggered to facilitate the workflow. The result is a data product with:
 - a. Appropriate document, document representation and data file identification.
 - b. Version-control.
 - c. Clear and unambiguous relationships to the product configuration with which it is associated, and to the changes which delineate each configuration of the product.
 - d. Refer to the EIA -836 Document Identification Group and identifying products, and documents schemas.
4. In addition, the data is available for access per contractually agreed to rules for submittal, transmission, or on-line access (as appropriate), in the prescribed format (document representation) that can be used by the application software available to the authorized user.



CM Related Data Management Activity Model
Figure 10-1

B. CM Related Data Management Concepts and Principles.

1. CM principles ensure the integrity of digital representations of product information and other data and enhance good data management practice. The concepts are described, as follows, based on elements and principles expressed in ANSI/EIA standard 649 EIA-836: Document identification, data status level management, data and product configuration relationships, data version control and management of review, comments, annotation, and disposition, digital data transmittal, data access control.

a. Document identification.

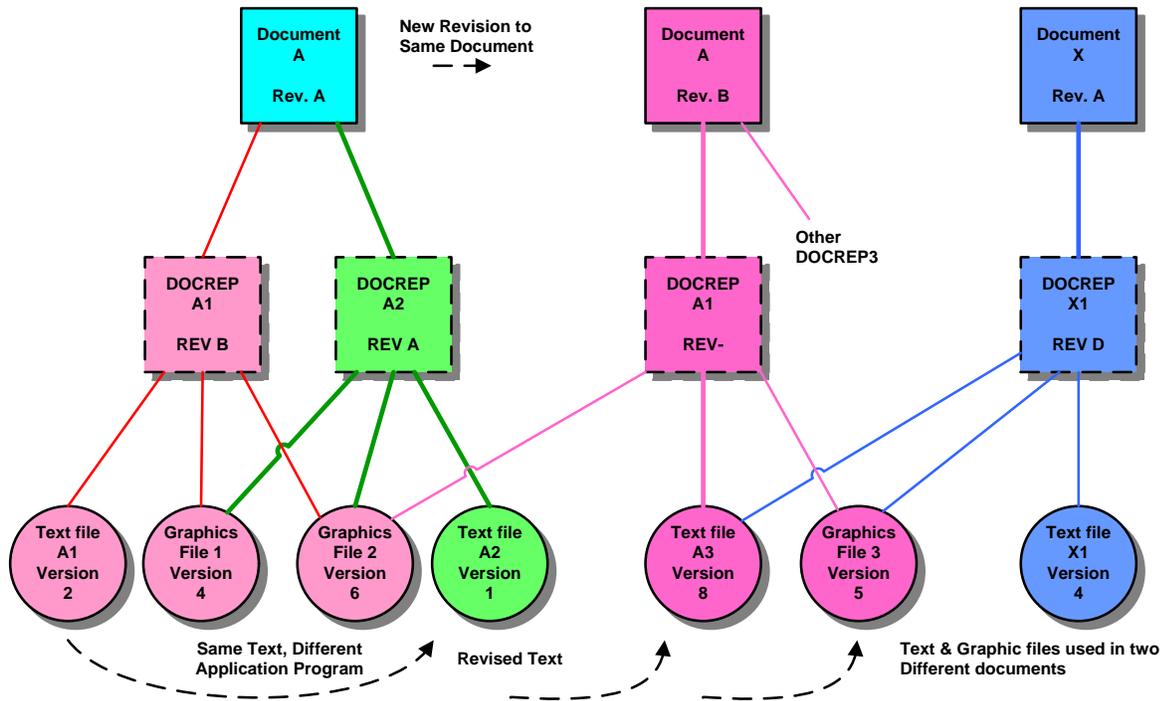
- (1) Each document reflecting performance, functional or physical requirements or other product related information must be given a unique identifier so that it can be:
 - (a) Correctly associated with the applicable configuration (product identifier and revision) of the associated item,
 - (b) Referred to precisely,
 - (c) Retrieved when necessary.
- (2) With emphasis on the acquisition of commercial products and the use of industry methods, it is inappropriate for the military to specify one format for document identifiers. Except for MIL documents and project-unique specifications, whose identifiers are governed by MIL-STD 961 and 962, document identifier formats are determined by the document originators. Generally they include all or most of the following parameters:

- (a) Date
 - (b) Assigned numeric or alphanumeric identifier and unique to the document
 - (c) Revision indicator
 - (d) Type of document
 - (e) Title or subject
 - (f) Originator/organization
- (3) This listing is substantiated by the following business rule for document identification: Document iteration is uniquely identified by a combination of document source (CAGE code, organizational acronym, or company name), document identifier (Number or title), document type (usually part of the identifier or title) and the Revision indicator (Letter, number or date). Refer to the **EIA-836** core component Document Identification for more technical detail.
- (4) A document is digitally represented by one or more electronic data files. Each document representation is the complete set of all the individual digital files (e.g., word processor, Computer Aided Drafting (CAD)/Computer Aided Manufacturing (CAM), graphics, database, spreadsheet, software) constituting one document.
- (5) As shown in **Figure 10-2**, the same document can have several different, equally valid, representations such as different word processing or standard measure formats (IGES, American Standard Code for Information and Interchange (ASCII), SGML-tagged ASCII). Any individual file such as a raster graphics file, an ASCII file, or a spreadsheet file may be part of several document representations of the same document/same revision; same document/different revision, or different document.
- (6) The business rules relating documents, documentation representations and files are as follows:
- (a) Each document iteration exists as one or more document representations, identified by: Document identifier, document representation identifier, document representation revision identifier.
 - (b) Each document representation is comprised of zero or more files.
 - (c) Refer to the **EIA-836** core components document representation and file for more technical detail.
- (7) To facilitate the proper relationships, apply the following digital data identification rules to maintain document, document representation, and file version relationships:
- (a) Assign a unique identifier to each file;
 - (b) Assign a unique identifier to each document representation;
 - (c) Assign a version identifier to each file; and
 - (d) Maintain, in a database, the relationship between:

- [1] Document identifier and its revision level.
 - [2] Associated document representation(s).
 - [3] File identifiers in version.
 - [4] Retain multiple versions of files as necessary to recreate prior document revisions in providing a traceable history of each document.
- (e) Identify the tool, in version of that tool (e.g., MSWORD) used to generate the document when the document is not neutral format.

b. Data Status Level Management.

- (1) Document status level is important as a foundation for the business rules defining access, change management, and archiving of digital data documents. It is the basis for establishing data workflow management and enhances data integrity: **[Refer back to Figure 10-1.]** The standard data lifecycle model shows that data status levels (also refer to as states) that a specific document/document revision is processed through in its lifecycle.



**Illustration of Document Representation Concepts
Figure 10-2**

- (2) Data status levels were initially defined in MIL -HDBK – 59A (Continuous Acquisition and Lifecycle Support (CAL) Handbook, now canceled). They were also detailed in MIL-STD-974 *Contractor Integrated Technical Information Services (CITIS)* and in APL/EIA Standard 649. The definitions of data status terms follow:

- (a) Working is the status used to identify data (document representations or document revisions) that are in preparation - a work in progress that is subject to unilateral change by the originator. Each design activity may define any number of subordinate states within the working category, to define the unique processes that different document types go through before release in their organization.
 - (b) Released is the status of document representations, and revisions thereto, that have been reviewed and authorized for use (such as for manufacture, or for submittal to, or access by, a customer or supplier). Released data are under originating organization (for example, a contractor) change management rules, which prevent a new revision of the document representation from replacing a release revision of a document representation until it has also been reviewed and authorized by the appropriate authority. The content of the document representation revision is fixed, once it is in the release date. It is only changed by release of a superseding document representation revision. Once a document (or document revision) is in the approved state, changes are made only by release of a new document representation related to the next document revision.
 - (c) Submit data is proposed or approved document revision in the form of a released document representation that has been made available for customer review. This status applies only to data that requires submittal to or access by a customer (usually the Government).
 - [1] If a submitted document revision that has not been approved, is commented to or disapproved, a new working revision of the related document representation may be started and eventually submitted to replace the original document representation without affecting the identifier proposed for the new document revision.
 - [2] If a submitted document revision that has been approved is commented to, or disapproved by the customer, a new working representation of the next document revision may be started and eventually replace the original document revision.
 - (d) Approved is the status of documents and document revisions signifying that the data (document revision) has been approved by the CDCA of the document. The content of a document revision is fixed, once it is in the approved state. It is only changed by approval of a superseding document revision.
 - (e) Some tools include Archived as a data status for document representations and/or documents. This status is independent of the approval status (released, submitted, and approved) and merely means that has the data been removed from an active acts and storage mode.
- (3) No changes are allowed in the document representations that progress to the released state or in document revisions that progress to the approved state. If

there are changes to be made, they are accomplished by the generation and release or approval of a new revision. Document must have at least one release document representation to be approved by the CDCA or submitted to a non – CDCA customer for review and adoption. Some data will exist only at the working level. Business rules related to document data status applied to each document type by defining requirements such as the following:

- (a) Whether submittal to (or access by) customers is required.
- (b) In which application software and data format is submittal/access required.
- (c) Who will be granted access privileges to the data in each of the applicable states?
- (d) What are the approval requirements (reviewers/approvers) and method of approval (e.g., electronic signature) to promote a document to the release date; the approved state?
- (e) What are the archiving rules for this document type (e.g., all released versions of upon release of a superseding version, all released versions, 90 days after release of a superseding version, etc.)?
- (f) Refer to the **EIA-836** releasing and approving documents schema in the document, a record business object.

c. Data and Product Configuration Relationships.

- (1) The PDM system must provide an effective system to maintain the key relationships between digital data, data requirements, and a related product configuration so that the correct revision of an item of data can be accessed or retrieved when needed. Data files are related to documents via document representations. Each product document, with a specific source, document type, document identifier (title, name and number) and document revision identifier may have the following relationships:
 - (a) Project/project and/or contractual agreement.
 - (b) Contract data item identifiers.
 - (c) Document revision change authorization.
 - (d) Associated product (hardware or software) name.
 - (e) Associated product (end item) part or software identifying number and revision identifier where applicable.
 - (f) The effectivity in terms of the end item serial numbers for the associated product, part, software item.
 - (g) Status (working, released, submitted, approved, archived) of the data.
 - (h) Associated correspondence–document number, subject, date, References.
- (2) The requisite relationships are fully documented and defined in the EIA-836 Schema and Data Dictionary.

- (3) The business rules for document retrieval should use these key relationships within a database to ensure the integrity of the data that users may extract. Thus information concerning a given product or part is associated with the configuration and effectivity (group serial number) of the end item that uses the part. This capability is particularly significant during the operation and support phase, when data is needed to support maintenance activity and to determine the appropriate replacement parts for a specific end item.

d. Data Version Control.

- (1) Disciplined version control of data files is the prerequisite to effective electronic management of digital documentation and must be encompassed within the product data management software. Version identification occurs whenever a file is changed. The simplest form of version management is the file save feature incorporated in applications software, which advances the file date and time identification each time a file was saved. However to retain a superseding version, it must be renamed. True version control business rules require automatic version identifier in advance whenever a file is revised and not when the file is saved without change. Furthermore, they require all versions to be retained, subject to archiving guidelines and special rules permit a specific document types.
- (2) Since a single document representation can consist of many files, a much disciplined process is necessary to manage a document review process electronically. Version-control rules facilitate the establishment of an audit trail of comments and annotations by reviewers, and the disposition of each comment. Each version of each document representation provided to, or received from, each reviewer is uniquely identified and associated with the source of the comment. Essentially this means that a reviewer's version of a set of files (document representation) constituting a document being reviewed is renamed to enable the annotated comment to be distinguished from the official current version of the document.

e. Digital Data Transmittal.

- (1) Part of the obligation of the sender of any document, regardless of transmission method is to make sure that the document is in a format (up document representation) they can be read by the receiver and converted to human readable form. Appropriate identification is affixed to physical media to clearly identify its contents. If all the file identifications cannot be included on the label, a directory, and Reference to an accompanying listing or to a read me file is used. Refer to **EIA-836** Business Object Document Transfer.
- (2) The following are common sense guidelines for information to be provided to the user (such means as "readme" files, reference to standard protocols, on-line help), where applicable:
 - (a) Identification of the files included in the transfer by file name, description, version, data status level, application file type and application version.

- (b) Applicable references to associate the data with the basis (requirement) for its transmittal, approval, and payment, where applicable.
- (c) If there are multiple files, such as separate text and graphics, how to assemble each included data item for reading, review or annotation as applicable.
- (d) The naming convention for file versions and data status level distinguishes altered (For example, annotated or red-line/strike-out) file versions from unaltered files.
- (e) If and how changes from previous versions are indicated.
- (f) How to acknowledge receipt of the data, provide comments, and/or indicate disposition of the data digitally.
- (g) Time constraints, if any, relating to review and disposition.

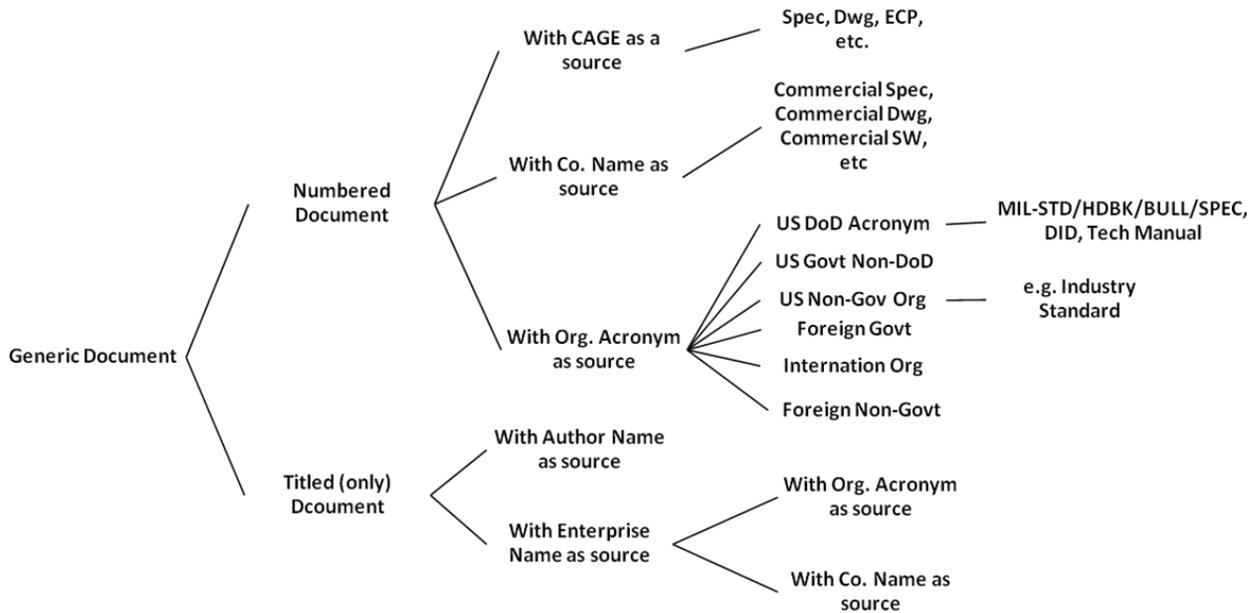
f. Data Access Control.

- (1) Access to digital data involves retrieving the appropriate files necessary to compile the correct version of each digital data document, view it, and perform the prescribed processing. Seeking digital data access should be as user-friendly as possible. Users should be provided with data/documents they are entitled to in the correct revision/version. Before this can be accomplished, there are a number of pertinent parameters concerning access privileges, security and protection of data rights that must be set-up.
- (2) Access privileges limit access to applicable users. Access privileges vary according to the individual's credentials (security clearance, need to know, organizational affiliation, etc.), data status level, the document type, project milestones, and the user need predetermined from the Government's concept of operations. Users of accessed data must respect all contractual and legal requirements for data rights, security, licenses, copyrights, and other distribution restrictions that apply to the data. The applicable distribution code, which represents the type of distribution statement, must be affixed to a document or viewable file to indicate the authorized circulation or dissemination of the information contained in the item.
- (3) Typically, working data should be made available only to the originating individual, group, or team (such as an integrated product development team); or to other designated reviewers of the data. If the Government is a direct participant in the team, the Government team members should be afforded the same access as the other members. In plant Government representatives have the right to request any and all data generated as part of the contract to which they have oversight responsibility; the contractor can determine the means of providing that access. With these exceptions, Government access to digital data (including data retrieved from databases) should be limited to contractually stipulated, released, submitted, and approved data.
- (4) The following checklist of ground rules should be pre-established prior to initiating interactive access (i.e., pre-defined query and extraction of data):

- (a) How data is to be accessed;
 - (b) Request for access and logging of access for read-only or annotation;
 - (c) Naming of temporary working version of the file(s) for purpose of annotation/mark up;
 - (d) Means of indicating whether a comment annotation is essential/suggested;
 - (e) Re-identification of marked up versions, as required;
 - (f) Method of indicating acceptance, approval, or rejection, as applicable;
 - (g) Time constraints, if any, on data acceptance;
 - (h) Tracking of disposition of required actions; and
 - (i) Re-identification of changed files.
- (5) The following EIA-836 Product Protection schema, which apply to documents (which are also products) all relate to pertinent considerations in determining appropriate access and provide the necessary data elements:
- (a) Product Protection, a container schema for the others;
 - (b) Copyright;
 - (c) Data Rights;
 - (d) Distribution Restriction;
 - (e) Export Control;
 - (f) License Agreement;
 - (g) Patent;
 - (h) Security Classification; and
 - (i) Trademark.

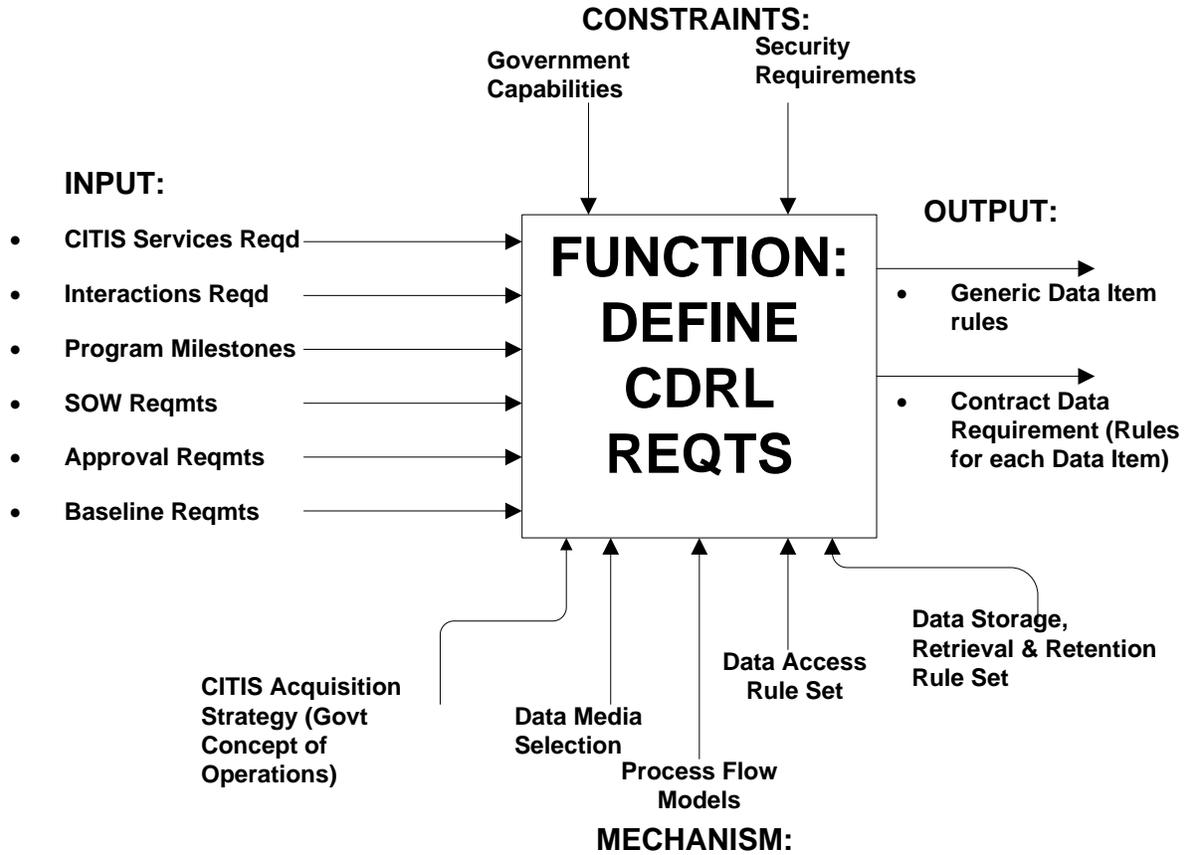
C. Data Management Activity Guides.

1. **Document Identification.** **Figure 10-3**, which is a diagram of a generic document identification schema, provides guidance in understanding the possible data identification relationships that the Government can expect to see when dealing with a variety of documents originating from many different sources. Each document is identified uniquely by the combination of its source, its identifier, and its document type. A document identifier can include a number and a title, or either a number or a title. A numbered document may have a CAGE code, a company name, or an organizational acronym identifying its source. Certain document types are associated with each type of source.



Generic Document Identifier Characteristics
Figure 10-3

2. **Configuration Management Data Acquisition Guidance.** This section provides details on the actions required to define digital data for delivery to or access by the Government in general, and for CM data in particular. With interactive access, the emphasis is on Government access to contractor maintained databases. It is most important to precisely define the requirements for digital data in the CDRL. **Figure 10-4** and **Table 10-1** model and provide explanation of the factors involved in defining a CDRL item for digital data.



**CM Data Acquisition Definition Model
Figure 10-4**

| Type of Factor | Description | Considerations, Notes |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INPUT | | |
| <ul style="list-style-type: none"> CITIS services required | A determination that documents will be required to be made available using Contractor integrated Technical Information Services | The Government Concept of operations and the Contract must call for CITIS services |
| <ul style="list-style-type: none"> Interactions required | The actions that the Government intends to take with each particular type of data | e.g., View, comment, approve, combine, download, edit, forward, query, sort |
| <ul style="list-style-type: none"> Project Milestones | Delivery requirement with respect to specific project events | e.g., 30 days prior to PDR |
| <ul style="list-style-type: none"> SOW requirement | If the document(s) submitted pursuant to each CDRL are required to be approved by the Government or are merely for information purposes | Documents that are approved by the Government should be limited to Government configuration baseline documents, whenever possible |
| <ul style="list-style-type: none"> Baseline requirement | Whether the document type when approved will constitute a Government configuration baseline | |
| CONSTRAINTS | | |
| <ul style="list-style-type: none"> Government infrastructure | The capabilities of each of the Government activities which need to view or use the data | The means of data access (e.g., CITIS direct input to Content Management Interoperability Services (CMS), etc.) must be matched to the facilities, equipment and environment of the using community |
| <ul style="list-style-type: none"> Security Classification; data rights | Whether the data will be classified and to what levels of classification. Whether the Government anticipates that they will have unlimited rights to the data provided. | These factors can influence the processing rules and choices of output media |
| MECHANISMS/FACILITATORS | | |
| <ul style="list-style-type: none"> Government Concept of Operations | GCO identifies expected Government infrastructure at all of the participating sites and agencies | Influences services, media and access to be ordered |
| <ul style="list-style-type: none"> Data media selection guidelines | Government preferences for types of media to be used for various document types | Helpful to have a pre-planned priority list of media preferences to match with contractor proposals |
| <ul style="list-style-type: none"> Data work flow process | A work flow process defining the actions that Government will perform on data that is submitted or provided for access | Aides in determining necessary lead time. Documents Government process from submittal by contractor to disposition |
| <ul style="list-style-type: none"> Data access rules | A set of ground rules that is agreed upon with the contractor governing both government and contractor access to data | Use to formulate specific access privileges |
| OUTPUTS | | |
| <ul style="list-style-type: none"> Generic data item rules | Defined set of business rules specific to the project to determine: <ul style="list-style-type: none"> Data item life cycle processing Data naming and revision/version scheme(s) Means of change annotation revised data Retention requirements for superseded data Change authorization process Validation of transmittal Times of day/night that data will be accessible for Government use Requirements for demonstration and certification of sender/receiver compatibility, indexing, accounting and audit trails | These rules apply to all CDRL items |
| <ul style="list-style-type: none"> Specific data item requirements for each CDRL | Specification for the type of document representation required for delivery or access to each CDRL item including, as appropriate: <ul style="list-style-type: none"> Media or access mode Data representation form Standards, specifications, protocols If on-line service, the type of query, pre-defined, or ad-hoc If pre-defined, a specification of or Reference to a description of the queries/response formats | These rules apply individually to specific CDRL items |

**CM Data Acquisition Factors
Table 10-1**

APPENDIX A. CONFIGURATION MANAGEMENT PLAN

A. Scope. Configuration Management Plan (CMP) Content Guidance and Practical Application. Plans should define how CM will be performed, kept as a living document and maintained under CM control. CMPs should be prepared for every project (Product/Service/Major/Minor), tailored as appropriate and available for use as a contractual document. They should be written at a level that is easily comprehended and utilize at least 40% of the plan as graphics. Graphically depicted information is more easily understood.

B. Types of CM Plans.

1. Internal.
2. Contracted, deliverable CMP.
3. Software specific.
4. Facility and prototype.
5. Joint.
6. International teaming.
7. Customer.
8. Asset Management or post development.

C. Tailoring the CMP.

1. Tailor for specific use and project:
 - a. Product
 - (1) Hardware, software or both.
 - (2) Development, post development or off the shelf.
 - b. Service
 - (1) Enterprise Architecture Business Model.
 - (2) Functional alignment.
 - (3) Capability Maturity Model Integration.
2. Tailor by life cycle
 - a. Particular lifecycle phase.
 - b. Full life cycle.
3. Tailor by application
 - a. Build to print.
 - b. CI scope and complexity.
 - c. Interoperability.

D. Preparation Methodology. The preparation methodology is as important as the content of

the plan. A good process will produce acceptable results.

1. Generate a CM requirement matrix.
 2. Perform an assessment if necessary.
 3. Develop an outline:
 - a. Introduction;
 - b. CM Organization;
 - c. CM Planning (phasing and milestones);
 - d. Configuration Identification;
 - e. Technical Reviews ;
 - f. Configuration Control;
 - g. Data Management;
 - h. Configuration Status Accounting;
 - i. Configuration Audits; and
 - j. Subcontractor and Vendor Control
 4. Prepare rough art (graphics, tables, figures).
 5. Create active figure titles.
 6. Prepare an annotated mockup.
 7. Write to the mockup and art.
 8. Reviews and rewrite.
- E. **Cover Page/Signature Page.** A signature page similar to that of **Figure A-1** should be included with each CM Plan. The cover page should identify the CI (product and/or service) that the plan is being developed as well as the lifecycle phase, distribution and classification if necessary.

| | |
|--------------------------------------------------------------------|-------|
| CONFIGURATION MANAGEMENT PLAN | |
| _____ (Provide Name of Product and/or Service) | |
| Acquisition Category (ACAT) _____ | |
| EA Reference Model _____ | |
| (Identify Life Cycle Phase) | |
| <u>APPROVAL SIGNATURES</u> | |
| _____ | _____ |
| Sponsor/Functional Lea/Project Manager/Product Line Manager & Code | Date |
| _____ | _____ |
| Configuration Manager and Code | Date |

**Configuration Management Plan Cover Page
Figure A-1**

- F. **Introduction.** This section should provide a brief background and description of the CI, the current status of the effort, and any special features or interfaces. Also, this section should address the purpose, scope and general applicability of the CM plan.
- G. **Background and Description.** Sufficient detail should be presented to permit a basic understanding of the CI and its complexity. The following information should be provided in a manner that will preclude security classification of the plan, if possible (if not mark accordingly):
1. Description of the CI (product and/or service) capability its relationship to CG operations and/or mission support and high level CI decomposition.
 2. Supporting products and/or services description.
 3. A block diagram or pictorial overview of the CI hierarchy.
- H. **Applicable Documents.** List all referenced specifications, standards, drawings, process models, manuals and documents. Identify each document by title, number (version) and date of issue.

- I. **CM Organization.** This section defines all the responsibilities and coordination requirements of the CI's CM project. Identify appropriate codes, departments, etc., and include supporting Contractors and Government field activities. Detail the authority and responsibility for CM of each activity or individual shown on the organization chart(s) discussed in the following organizational structure:
1. **CM Project Structure.** Provide an organizational chart depicting the various organizations (internal and external to the CG) and general relationship among organizations involved in CM. Using the chart, supplemented by a brief narrative, define the authority and responsibility of all participating groups and key organizational activities.
 2. **CI CM Support Structure.** Provide an organizational chart depicting roles and responsibilities of personnel responsible for managing the CI's configuration, supplemented by a brief narrative description of each position and responsibility. Include the CM Mgr, PM, PLM, Sponsor, KO, PRO, Safety Mgr, Lead Engineer, Systems Engineer, Requirements Management (RM) Administrator, ILS Manager and Contractors to the extent employed and any other offices that are involved.
 3. **Configuration Control Board (CCB).** Describe each CCB with their level of authority. Product and/or Service CCB (Top level) and its delegation for the management of sub-level CIs by lower level CCBs. Include CCB Charters with authority boundaries identified.
 4. **The CCB Charters** can be an appendix to the CM Plan and should include the following:
 - a. CCB membership by functional responsibilities.
 - b. Relationship of CCBs if there is more than one change proposal approval level or separate CCBs.
- J. **CM Planning.** Define the current status of the CI's CM effort and identify the specific life cycle phase at the time of preparation or update of the plan. CM plan may be tailored. Include a product and/or service project milestone chart with CM milestones imbedded depicting planned and completed CM actions. The following information should be provided or discussed. Provide the Concept of Operations and Acquisition Strategy (if appropriate).
1. The CM Concept of Operations for the CI answers such questions as:
 - a. What are the CM objectives for the coming phase?
 - b. What is the rationale for these CM objectives?
 - c. How is each CM objective related to Organizational and project objectives and risks?
 - d. What is the risk associated with not meeting the objectives?
 - e. How can achievement of the objectives be measured?
 - f. What information is required to support the CM goals for the next phase and who will be the Current Document Change Authority (CDCA)? Future phases?
 - g. How can that information best be accessed?

2. The CM acquisition strategy addresses what CM activities are going to be contracted for the roles and responsibilities by answering such questions as:
 - a. What are the deliverables from the next phase?
 - b. Which deliverables have been designated as CIs? Will Contractors propose candidate CIs? How will the final listing of CIs be officially designated?
 - c. What is the end use of each CI? How does it interface with the other CIs?
 - d. How are they to be supported?
 - e. To what extent will the Government support them?
 - f. To what extent will the manufacturer support them?
 - g. To what level are performance specifications required? CIs? Repairable components? Replaceable components?
 - h. Will the USCG prepare performance specifications, or will Contractors?
 - i. Who in the Contractor organization will be responsible for approving the performance specifications? In the USCG?
 - j. What level of configuration documentation (e.g., performance specifications, detail specifications, complete technical data package) will the USCG and the Contractor require by the end of the next phase?
 - k. What kinds of configuration identifiers (e.g., part numbers, serial numbers, nomenclature, NSNs) will the USCG and the Contractor require by the end of the next phase?
 - l. Which baselines (and documents) will already be subject to Government Configuration Control at the start of the next phase?
 - m. What baselines will be established and by whom during the next phase? Functional? Allocated? Product?
 - n. What documents need to be included in those baselines?
 - o. Will control of any of the baseline documents transfer from the Contractor to the Government during the next phase? When is the transfer planned to occur? What is the criterion for determining the transfer is complete?
 - p. What status accounting will be needed in the next phase?
 - q. Which specific information should the Government provide? Which specific information should the Contractor provide?
 - r. Does the project have approval to obtain the information in other than digital format?
3. Provide a chart for each phase of the CI's life cycle, depicting specific scheduled and completion dates or milestones of CM actions, events, and products.
4. Provide guidance and description of interface agreements that need to be or have been established with other functional areas, project offices, DHS, DoD, CG offices, CI Managers or other services, etc.

5. Authorized or proposed exceptions to CG CM policy requirements, their justification, and identification of the approving authority.
6. Product and/or service specific and unique policy directives related to CM.

K. Special Features. Describe special features of the CI affecting its CM effort. For example: introduction of new capability (underwater surveillance), modernization, major product improvement that result in more than one baseline being supported in the field; depot rebuild programs designed to reduce the differences among models; major model differences, system variants, business process re-engineering or applications. Describe peculiarities of the CI's CM efforts due to large or extensive ICWG participation or unique contracting methods (e.g., service provided, preproduction evaluation, and use of many commercial items, use of existing drawings and specifications, and employment of an integrating Contractor). Also describe any innovations intended to optimize the effectiveness of the CI's CM effort.

L. Configuration Identification. This section defines the process for the selection of CIs, uniquely identification of each CI, development of CI documentation, and establishment of configuration baselines. The following information should be provided or discussed:

1. Application and tailoring of standardization documents used for configuration identification purposes e.g., Nomenclature Assignment, IUID, and NSN.
2. Identification of artifacts required to support the product and/or services CONOP. This includes identification of baseline documentation (3D models, specifications or drawings, test plans, test reports, analysis, etc.) by title, number, revision, and date. Document change authorities captured.
3. Graphical depiction of functional and physical unique CI identifiers, including specific nomenclatures, designators, hierarchical structuring systems and codes, and part or drawing numbers, WBSs as applicable.
4. Identification of documentation developed as part of the interface control program.
5. Identification of interface control boundary/specification documents.
6. The relationship between top level CI and related CIs, and how they interface with other CIs if more than one CI is involved.
7. Process for preparing, numbering, disseminating, controlling, maintaining, amending, storing, and identifying the custodian and user activities for each configuration artifact and amendments or revisions thereto.
8. Process for requesting official CI nomenclature assignments.
9. Process for CI part identification particularly identification of CIs requiring serialization.
10. If at all possible have clear, visual traceability between the CI number, the item drawing number and/or the specification number. For example, keeping the same human factors: Pump 123, Pump Drawing 123, and Pump Spec 123.

Something worth considering: Use technical data as part of the source selection, particularly useful in performance based acquisitions.

M. Technical Reviews. This section defines the planning and conduct of technical or design

reviews; this is where the Systems Engineering and CM efforts align. Information will include:

1. Technical or design reviews required for the CI, basis for review approach e.g., a single event or on an incremental basis, and the required CM activities (design support, interface or impact resulting from the review).
2. Requirements for additional technical or design reviews to ensure functional and performance characteristics have been adequately addressed.
3. The process for conducting, coordinating, monitoring, documenting, and reporting applicable technical or design reviews.
4. Participants and their responsibilities, including engineering and quality assurance coordination.
5. Identification of the CI/CI(s) to be reviewed and the level and degree to which the technical or design reviews will be conducted.

N. **Configuration Control.** This section defines the responsibilities and procedures for configuration control of the CI and its subordinate CIs. Specify interfaces within or between government activities and Contractor activities. Information should include:

1. The configuration change control process specifics, including participants (by function and organization). Define major vs. minor change, what forms will be required to propose a change, degree proposal shall be completed prior to submission to CCB (e.g., proposal will include from/to drawings, test reports, safety evaluation, etc.).
2. CCB operations, including change proposal approval and disapproval authority, limits of authority, and requirements for coordinating and interfacing with other CCBs and higher authority.
3. ICWG and participants.
4. Government approval and disapproval authority for ECP, RFDs, and Waivers (RFW).
 - a. A deviation is a change that is temporary, usually planned and applied once.
 - b. A waiver is a change that is permanent, usually due to an error, and is unplanned. The approval of a RFW generally absolves the Contractor of a requirement.
5. Process and procedures for implementing the approved and/or authorized change into the CI, its configuration identification documents, its logistics support products, and in follow-on contract requirements, including the use of SCN and NOR.
6. Process for ensuring the approved and authorized ECP is incorporated on schedule and the incorporated change satisfies its intended purpose(s) (e.g., TCTO).
7. If applicable, procedures for preparing, reviewing, approving, authorizing, and installing retrofit kits e.g., unscheduled maintenance procedure.
8. Use of preliminary ECPs (PECP) or early assessment forms. Criteria for this process (e.g., a PECP will be submitted for approval prior to expenditure of funds for non-recurring engineering).

9. Provisions for maintaining copies of ECPs, RFDs, and RFWs, including location and custodian.
10. Provisions for maintaining a change proposal tracking system.
11. Process and activities responsible for incorporating approved and authorized ECPs.

O. Data Management/Logistics Interface and Update. This section of the CM plan describes logistics and CM interface. Discussion should include the following:

1. A process for ensuring all approved and authorized Class I ECPs are properly reviewed for logistics impact.
2. Responsibilities for logistics impact assessment (e.g., on training, technical data, maintenance and supply support) for CI and subordinate CIs.
3. Closed loop and feedback system to ensure ECP logistics element actions are completed training updated, maintenance manuals modified, operations manuals modified, spare and repair parts provisioned, updated and placed under configuration control.
4. Update ILSP as appropriate to support changes or possible impacts to logistics support for unapproved change proposals.

P. Configuration Status Accounting (CSA). This section defines the process for collecting, storing, handling, verifying, validating, maintaining, and presenting CI information. This section will specify the techniques for providing an information system responsive to the needs of the team and higher levels of management. Discussion will include the following:

1. Application and tailoring of reference(s).
2. Procedures (including provisions for maintaining an automated CSA system) and participants involved in CSA data collection, processing, maintenance, and distribution of CSA reports.
3. Content, format, and data elements of the CSA data collection, file, and distribution system.
4. Additional information including distribution of data from the CSA system, purpose for the data, frequency of publication, timeliness of each part of the CSA system, and distribution requirements.
5. Define the activity(s) responsible for developing and maintaining the CSA system.
6. Discuss the configuration data flow network using ANSI/EIA-649 and [MIL-HDBK-61A](#) to define how CSA data is collected, managed and reported. CDMD-OA only provides a very limited set of the required CSA data and only represents what is there not what is suppose to be there. CSAs may be a combination of many IT systems and data elements within those systems. For instance the CI's detailed design information may be in AutoCAD/Ship design, physical construct in CDMD-OA/ALMIS, maintenance information in 3M system and Technical Manuals in NESSS, ATIMS or TMAPS. The appropriate elements of each of their interfaces and data element owners should be described in detail here with a supporting graphic.

Q. Configuration Audits. This section defines the planning and conduct of configuration

audits. Information should include:

1. Application and tailoring of appendices (c) and (d).
2. The process for conducting, coordinating, monitoring, documenting, and reporting functional and physical configuration audits.
3. The decision for conducting each configuration audit as a single event or on an incremental basis.
4. Participants or activities and their responsibilities, including engineering and quality assurance coordination.
5. Requirements for additional configuration audits during the Production or Construction, follow-on Production or Construction, and Operational Support phases.
6. Identification of the CI(s), the configuration baseline documentation and other configuration identification documentation to be audited, as well as the level and degree to which the configuration audits will be conducted.
7. Process for identifying and correcting audit findings and discrepancies.

R. Configuration Verifications. This section defines the planning and conduct of configuration verifications. Information should include:

1. Application and tailoring of applicable reference guides (e.g., CDMD-OA (SFLC Process Guide (PG)), CG-LIMS and LCIs.)
2. The process for conducting, coordinating, monitoring, documenting, and reporting the verification of logistics system information against the “as is” asset.
3. Criteria for initiation of configuration verification.
4. Participants or activities and their responsibilities.
5. Process for identifying and correcting verification discrepancies. PLM role in final approval.

S. Practical Applications of the CM Plan. The CM Plan documents CM activities planned and executed. The plan depicts milestones and schedules required to manage the CI and specific responsibilities, practices, and procedures. It may be used as a contract exhibit requiring the Contractor's CM program to be compatible with the government CM program. Also, the Plan informs and provides PM/PLMs for functional leads information necessary for resource planning.

APPENDIX B. PREPARATION OF AN ENGINEERING CHANGE PROPOSAL

CAUTION

A TCTO is NOT an ECP. Failure to develop ECPs per CG policy and guidance may result in injury to personnel and/or loss of capability.

- A. **Scope.** This Appendix establishes uniform requirements for preparing an ECP.
- B. **Application.** The provisions of this Appendix apply to all ECP preparing activities and to proposed engineering changes for all CIs to include but limited to platforms, systems and equipment including software and firmware.
- C. **Definitions used in this Appendix.** For purposes of this Appendix the definitions in Section 3, [MIL-HDBK-61A](#) shall apply.
- D. **General Requirements.**
1. **Use of the ECP forms.** [ECP, DD Form 1692](#) is highly recommended to be used for the submission and processing of all class I engineering changes. When ECP Short Form procedures are specified, only ECP, [DD Form 1693](#), with applicable enclosures is required. Supplemental pages(s) may be used with the ECP forms as necessary. For change classification guide see **Figure 5-2**.
 2. **Supporting Data.** In addition to the information required by this Appendix, the ECP package shall include supporting data such as red lined drawings and other data (as specified in the contract if applicable) to justify and describe the change. The ECP package should be inclusive of all information necessary for the CCB to make an informed decision and will address total impact including assessments of changes to product and/or service operations and life cycle support (e.g., logistics support analysis data, detailed cost proposal data, test data and analyses).
 3. **Distribution.** The appropriate distribution markings shall be affixed to the ECP package per the requirements of the contract. If a stocked item is effected the appropriate item management activity shall be included.
 4. **Classification.** All ECP documentation will be marked with the appropriate classification per References (c) and (d).
 - a. The ECP package will be marked conspicuously with a Security Classification (Top Secret, Secret, or Confidential), as unclassified but having limited access, or unclassified and available to the public, see Reference (d). The highest classification level of any portion of a document is the overall classification of the document. Conspicuously place the overall classification at the top and bottom of the document as shown in the example below. If the document contains more than one page, place the overall marking at the top and bottom of the outside cover, on the title page, on the first page, and on the outside of the back cover. Mark other internal pages either with the overall classification or with a marking indicating the highest classification level of information contained on that page.

SECRET

MEMO:

(U) Unclassified words, words, words...

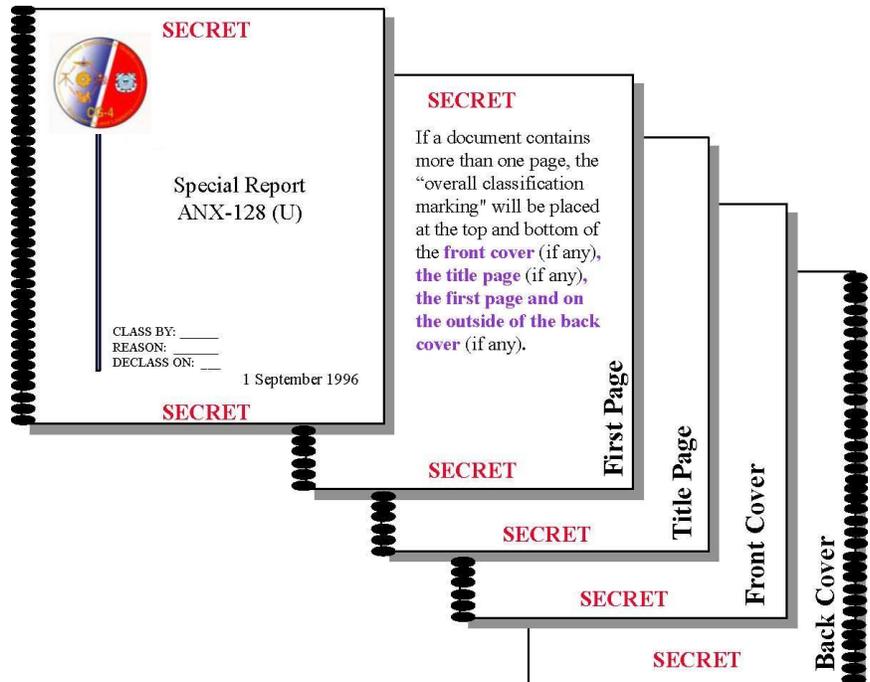
(S) Secret words, words, words...

(C) Confidential words, words, words...

(U) More unclassified words, words, words...

SECRET

Overall classification of this document would be Secret the highest classification of any paragraph.



Portion markings and overall classification markings.

**Classification Example
Figure B-1**

- b. When practical, the ECP should be unclassified. Classified data essential to the evaluation and disposition of an ECP shall be submitted separately per approved security procedures, Reference (d), and referenced in the unclassified portion of the ECP.
5. **Export-Control Warning** (if applicable).
- a. Care is to be taken to ensure any Classified or Limited Access information is not exported intentionally or unintentionally. The U.S. Munitions List (USML) and Commerce Control List (CCL) define what types of equipment and related information cannot be exported or released to unauthorized entities. The USML

specifically states any information pertaining to CG surface vessels as well as any aircraft used by the military may not be unlawfully exported.

- b. Examples of exporting information unlawfully:
 - (1) Allowing access by an unauthorized individual to limited access information such as pages from a technical document, manual, or maintenance instruction.
 - (2) E-mailing a limited access document to unauthorized individuals.
 - (3) Communicating limited access information to unauthorized individuals.
- c. Allowing this information to be unlawfully exported can result in serious penalties toward an individual and/or agency.
- d. Released export-controlled, classified or limited access information to an authorized agent outside of the U.S. Government must contain the Full Export-Control Warning Statement as shown in **Figure B-1**.

E. Instructions.

Please complete items which you know and send form to the Configuration Manager via e-mail or FAX. CM will review form and fill in the blanks.

Block 1. Date. Enter the submittal date of the ECP or of the revision to the ECP.

Block 2. Procuring/Submitting activity number. To be used by Government for entry of internal processing number, if desired.

Block 3. Department of Defense Activity Address Code (DoDAAC). Enter the DoDAAC of the procuring/submitting activity.

Block 4. Originator name. Enter the name of the Contractor or Government activity, submitting the ECP.

Block 5. Originator address. Enter the address of the Contractor or Government activity, submitting the ECP.

Block 6. Justification code. Enter the justification code, which is applicable to the proposed Class I engineering change.

Codes.

- B - Interface
- C - Compatibility
- D - Deficiency
- O - Operational or logistics support
- P - Production stoppage
- R - Cost Reduction
- S - Safety
- V - Value engineering ECP.

When the contract contains a value engineering clause, each value engineering ECP shall be identified both by the "V" in Block 6 and by the entry of the following notation at the top of Page

I of the ECP form: "VALUE ENGINEERING CHANGE PURSUANT TO CONTRACT CLAUSE."

NOTICE TO ACCOMPANY THE DISSEMINATION OF EXPORT-CONTROLLED TECHNICAL DATA

Export of the attached information which includes, in some circumstances, release to foreign nationals within the United States, without first obtaining approval or license from the Department of State for items controlled by the International Traffic in Arms Regulations (ITAR) or the Department of Commerce for controlled by the Export Administration Regulations (EAR), may constitute a violation of the law.

Under 22 U.S.C. 2778, the penalty for unlawful export of items or information controlled under the ITAR is up to 2 years imprisonment, or a fine of \$100,000 or both. Under U.S.C., Appendix 2410, the penalty for unlawful export of items or information controlled under the EAR is a fine of up to \$1,000,000, or five times the value of the exports, whichever is greater, or for an individual, imprisonment of up to 10 years, or a fine of up to \$250,000, or both.

In accordance with your certification that establishes you as a "qualified U.S. Contractor," unauthorized dissemination of this information is prohibited and may result in your disqualification as a qualified U.S. Contractor, and may be considered in determining your eligibility for future contract with the Department of Defense.

The U.S. Government assumes no liability for direct patent infringement, contributory patent infringement, or misuse of technical data.

The U.S. Government does not warrant the adequacy, accuracy, currency, or completeness of the technical data.

The U.S. Government assumes no liability for loss, damage, or injury, resulting from the manufacture or use for any purpose of any product, article, system, or material involving reliance upon any or all technical data furnished in response to the request for technical data.

If the technical data furnished by the Government will be used for commercial manufacturing or other profit potential, a license for such use may be necessary. Any payments made in support of the request for data do not include or involve any license rights.

A copy of this notice shall be provided with any partial or complete reproduction of these data that are provided to qualified U.S. Contractors.

**Full Export-Control Warning Statement
Figure B-2**

Block 7. Priority. The Contractor/Submitting Activity shall recommend a priority to the Government and enter an "E", "U", or "R" (Emergency, Urgent or Routine). See **Figure B-2**.

| Priority Code | Criteria |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Emergency | <p>An emergency priority is assigned to an ECP for any of the following reasons:</p> <ul style="list-style-type: none"> (1) To effect a change in operational characteristics which, if not accomplished without delay, may seriously compromise national security; (2) To correct a hazardous condition which may result in fatal or serious injury to personnel or in extensive damage or destruction of equipment? (A hazardous condition usually will require withdrawing the item from service temporarily, or suspension of the item operation, or discontinuance of further testing or development pending resolution of the condition); or (3) To correct a system halt (abnormal termination) in the production environment such that CSCI mission accomplishment is prohibited. |
| Urgent | <p>An urgent priority is assigned to an ECP for any of the following reasons:</p> <ul style="list-style-type: none"> (1) To effect a change which, if not accomplished expeditiously, may seriously compromise the mission effectiveness of deployed equipment, software, or forces (2) To correct a potentially hazardous condition, the un-corrected existence of which could result in injury to personnel or damage to equipment. (A potentially hazardous condition compromises safety and embodies risk, but within reasonable limits, permits continued use of the affected item provided the operator has been informed of the hazard and appropriate precautions have been defined and distributed to the user.) (3) To meet significant contractual requirements (for example, when lead time will necessitate slipping approved production or deployment schedules if the change was not incorporated) (4) To effect an interface change which, if delayed, would cause a schedule slippage or increase cost (5) To effect a significant net life cycle cost savings to the tasking activity, as defined in the contract, where expedited processing of the change will be a major factor in realizing lower costs (6) To correct a condition causing unusable output information that is critical to mission accomplishment (7) To correct critical CI files that are being degraded (8) To effect a change in operational characteristics to implement a new or changed regulatory requirement with stringent completion date requirements issued by an authority higher than that of the functional proponent. |
| Routine | <p>A routine priority is assigned to an ECP when emergency or urgent implementation is not applicable, required or justifiable.</p> |

ECP Priorities
Figure B-3

Block 8. ECP designation.

Block 8a. Model type. Enter model or type designation of the CI for which this proposal is being filled out. For SCIs, enter the SCI identification number.

Block 8b. CAGE code. Enter the CAGE code for the activity originating the ECP.

Block 8e. System designation. The system or top-level CI designation or nomenclature assigned by the Government shall be entered, if known.

Block 8d. ECP number assigned by CM Mgr. Once an ECP number is assigned to the first submission of a change proposal, that number shall be retained for all subsequent submissions of that change proposal. ECP numbers shall run consecutively commencing with number 100001.

Block 8e. Type. Enter either a "P" for preliminary, or "F" for formal. See **Figure B-3**.

| Type of ECP | Function |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Message | Although not formally considered a type of ECP, Engineering changes with an emergency priority are often submitted in a message that provides less detail than a preliminary ECP; urgent priority ECPs sometimes are also initially documented in messages, as are notifications of compatibility changes. They should be followed up by a complete ECP package within 30 days (or a PECP, see below, if that is not practical) because they normally do not include sufficient detail for the government to determine the full impact on project requirements. |
| Preliminary, (Type P) | <p>Preliminary ECPs are used to address the impact of proposed changes in general terms sufficient enough for the government to determine if final ECPs are warranted. They are the used by project managers when:</p> <ul style="list-style-type: none"> • The complexity of a proposed change may require extensive funding, development or engineering. • A choice of alternative proposals is appropriate; especially if a solicitation or contracting requirement is being competed between two or more contractors. • Authority is required to expend resources to fully develop a change proposal. • The government wishes to restrict configuration change activity. • Approval is required to proceed with software engineering development. • As follow-up to a message ECP when it is impractical to submit a complete Formal ECP within 30 days. This preliminary ECP would provide additional detail information supplementing the message ECP to provide the Government with a more considered analysis of the impacts and scope of the proposed change. In many cases such as Emergency, Urgent, Compatibility, the Government may have already authorized the contractor to proceed with the work based on the initial message. |
| Formal (Type F) | A formal ECP is the type which provides engineering information and other data sufficient to support formal CCB approval and contractual implementation by the Government |

ECP Types and Their Functions
Figure B-4

- Block 8f. Revision. If an ECP is being revised, enter the proper identification of the revision, i.e., RI for the first revision; R for subsequent revisions. (The date submitted shall be the date of the revised ECP.)
- Block 9. Baseline affected. Place an "X" in the box(es) according to the baseline(s) affected.
- Block 10. Other systems/configuration items affected. Enter an "X" in the "yes" or "no" box, as applicable, to indicate whether there is an effect on other systems or CIs which will require the submittal of related Class I ECPs.
- Block 11. Specifications affected. If specifications cited in the contract are affected by the ECP, their identity by the CAGE code of the design activity, document number, revision letter, and the SCN (or NOR) number of the SCN (or NOR) being submitted with the ECP shall be entered.
- Block 12. Drawings affected. Enter the indicated information for all drawings affected by the ECP. The CAGE code to be entered is that of the design activity whose number is assigned to the listed drawing(s). If more than three drawings are affected, enter the information required in the first line for the top-level drawing affected by the ECP and make direct reference on the second line to the enclosure and paragraph containing the list of all the affected drawings. If using MEARS append drawings.
- Block 13. Title of change. Enter a brief title to identify the component or system affected by the ECP.
- Block 14. Contract number(s) and line item(s). Enter the number(s) of all currently active contract(s), and the affected contract line item number(s) at the originating CAGE-coded activity that are affected by the engineering change. If more contracts are affected than can be fit in the block, make reference to the enclosure and paragraph where this information is provided. In the case of a Government-prepared change, the task number under which the ECP will be funded and implemented shall be provided in this block.
- Block 15. Procuring contracting officer. Enter the procuring contracting officer's name, code and telephone number applicable to the CI shown in Block 16.
- Block 16. CI nomenclature. Enter the Government assigned name and type designation, SCI name and number if applicable, or authorized name and number of the CI(s) affected by the ECP.
- Block 17. In production. The "yes" box shall be marked if deliveries have not been completed on the contract(s). The "no" box shall be marked if the deliveries have been completed. This block is not always applicable to software. If not applicable, so indicate.
- Block 18. All lower level items affected. For hardware, an appropriate, complete descriptive name of the part(s) shall be given here without resorting to such terms as "Numerous bits and pieces". The number(s) of the part(s) shall also be entered. Additionally, applicable NSNs shall be entered. An attached list may be used when necessary. For SCIs, enter the name and identifier of each lower level CI and computer software unit affected.

- Block 19. Description of change. The description of the proposed change shall include the purpose and shall be given in sufficient detail to adequately describe what is to be accomplished. It shall be phrased in definitive language such that, if it is repeated in a contractual document authorizing the change, it will provide the authorization desired. A description as to which part of the item or system is being changed shall be provided. Supplemental drawings and sketches shall be provided to the extent necessary to clearly portray the proposed change. If the proposed change is an interim solution, it shall be so stated. If additional space is needed, use continuation pages for details but provide an overview in this block. Information should be included as to whether the revision is a re-submittal, replacing the existing ECP in its entirety, or provides change pages to the existing ECP.
- Block 20. Need for change. Enter an explanation of the need for the change to include specifically identifying the benefit of the change to the Government. The nature of the defect, failure, incident, malfunction, etc., substantiating the need for the change shall be described in detail. Full utilization shall be made of available failure data. Failure data should be included in the package. If a new capability is to be provided, improvements in range, speed, performance, endurance, striking power, defensive or offensive capabilities, etc., shall be described in quantitative terms. Correspondence establishing requirements for the change and any testing accomplished prior to the submission shall be identified and summarized. If the ECP is needed to correct maintenance/logistics problems, that fact will be included with sufficient detail to identify the issues. If the ECP is being submitted as a response to a request for ECP or Government direction, cite that authority herein. Additional pages may be added as required.
- Block 21. Production effectivity by serial number. For hardware, enter the Contractor's estimated production effectivity point for the production items including serial number, or other item identification (e.g., block or lot number) as approved by the Government. In determining the effectivity point for the proposed change, in addition to the time factors, the availability of all support elements affected and the most economical point of introduction consistent with all the salient factors involved. The earliest production incorporation is not necessarily the singular or most important factor in the establishment of a proposed change effectivity point. The effectivity point will be based on concurrent availability of all logistics support elements and materials affected by the change to the item. For SCIs identify the SCI version number into which the change will be incorporated. Where applicable, the effectivity of the end item CI and classroom into which the capability represented by the new version of the software is proposed to be incorporated, shall also be provided. If the impact of the ECP merits the release of a new software version, Block 21 of the ECP submittal shall include a recommendation to this effect. Serial numbers may be used in lieu of version numbers if approved by the Government.
- Block 22. Effect on production/overhaul delivery schedule. State the estimated delivery schedule of items incorporating the change, either in terms of days after contractual and/or PLM approval, or by specific dates, contingent upon contractual approval by a specified date. If there will be no effect on the delivery schedule, so state. For a

complex ECP, or for related ECPs, this delivery date will be repeated on the milestone chart together with the schedule for other interrelated actions.

Block 23. Retrofit.

Block 23a. Recommended item effectivity. When the Contractor recommends that the engineering change be accomplished in accepted items by retrofit, the quantities and serial (or lot) numbers of accepted items in which the change will be incorporated by retrofit shall be entered in Block 23a, or in a Referenced enclosure. Such statement regarding items currently in production shall be based upon the estimated approval date of the ECP.

Block 23b. Estimated kit delivery schedule. State estimated kit delivery schedule by quantity and date. When special tooling for retrofit is required, reference an enclosure in Block 23c on which is specified the dates of availability of tools, jigs, and test equipment required in conjunction with the kits to accomplish the change.

Block 23c. Classroom type(s) affected. When the delivered CI is installed in one or more classrooms identify the affected classroom type.

Block 23d. Number of each type affected. Enter the change in quantity of each item.

Block 23e. Number remaining after change. Enter the quantity of each item remaining per classroom type after the change has been implemented.

Block 24. Estimated costs/savings. Enter the total estimated costs/savings impact of the ECP. This Figure normally will be the same as that in column 5, line e, of ECP, DD Form 1692/3 (Page 4). (Savings shall be shown in parentheses.)

Block 25. Estimated net total costs/savings. Enter the total estimated costs/savings impact of the basic and all related ECPs, including other costs/savings to the Government. This Figure normally will be the same as that in column 6 the bottom line of Page 4 or, if there are related ECPs, in column 4, line e, of Page 5. (Savings shall be shown in parentheses)

Block 26. Submitting activity authorized signature. An authorized official of the activity entered in Block 4 shall sign this block and provide title in Block 26b. This indicates the ECP has the official sanction of the submitting activity.

Block 27. Approval/disapproval. This block is for use by the Government. Instructions associated with Effects on Functional/Allocated Configuration Identification. The information for these Blocks is to be completed ONLY if the proposed change affects the system specification or the item development specification(s). If a separate product function specification is used, effects on such specification of changes proposed after the PBL has been established shall be described as required by Block Number 37 through 50. ECP number: Enter the same ECP number as in Block 8d of DO Form 1692 (Page I). If the ECP number is assigned on the basis of the system, the system designation also shall be given.

Block 28. Other systems affected. Insert data when Block 10 of DO Form J692 (Page I) is checked "yes".

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- Block 29. Other activities/Contractors affected. Identify the other Contractors or Government activities which will be affected by this engineering change.
- Block 30. Configuration items affected. Enter the names and numbers of all CIs, maintenance and operator training equipment, and support equipment affected.
- Block 31. Effects on performance allocations and interfaces in system specification. Describe in this block the changes in performance allocations and in the functional/physical interfaces defined in the system specification.
- Block 32. Effects on employment, integrated logistics support, training, operational effectiveness, or software.
- Block 33. Effects on CI specifications. The effect of the proposed change on performance shall be described in quantitative terms as it relates to the parameters contained in the CI development specifications.
- Block 34. Developmental requirements and status.
- For hardware, when the proposed engineering change requires a major revision of the development program (e.g., new prototypes, additional design review activity, tests to be re-accomplished), the nature of the new development program shall be described in detail, including the status of programs already begun.
 - For SCIs, the Contractor shall identify the scheduled sequence of computer software design and test activities which will be required. ECPs initiated after preliminary design which affects the FBL and/or the ABL shall identify, as appropriate, significant requirements for computer software redesign, recoding, repetition of testing, changes to the software engineering/test environments, special installation, adaptation, checkout, and live environment testing. In addition, the specific impact of these factors on approved schedules shall be identified. The impact of the software change on the hardware design and input/output cabling shall also be detailed.
- Block 35. Trade-offs and alternative solutions. A summary of the various solutions considered shall be included with the associated analysis showing the reasons for adopting the solution proposed by the ECP.
- Block 36. Date by which approval authority is needed. Enter the date contractual authority will be required to maintain the established schedule.
- Block 37. Effect on product configuration documentation or contract. The effects on the approved CI product specifications shall be described by reference to the SCNs, NORs or other enclosure(s) which cover such proposed text changes in detail. The effects on performance, weight, moment, etc., which are covered in the enclosure(s), shall be indexed by proper identification adjacent to the factor affected. The effects on drawings, when not completely covered on Page 1, shall be described in general terms by means of a referenced enclosure. Such enclosure may consist of a list of enclosed SCNs (or NORs) if submittal of an SCN (or NOR) for each drawing affected is a requirement of the contract. Indicate any technical data submittal which is not provided for in the CDRL by means of a Referenced enclosure. Address nomenclature change when applicable.

Block 38. Effect on operational employment. The effects of the engineering change of CI utilization shall be indicated by checking the appropriate factors and providing details by enclosures. Quantitative values shall be used whenever practicable but are required when reliability and service life are impacted.

Block 39. Effect on integrated logistics support elements. The effects of the engineering change on logistics support of the item shall be indicated by checking the appropriate boxes. These effects shall be explained in detail on an enclosure indexed by appropriate identification adjacent to the subject under discussion. The information required shall indicate the method to be used to determine the ILS plans and items which will be required for the support of the new configuration as well as retrofitting previously delivered items to the same configuration. The following shall be covered as applicable:

- Effects on schedule and content of the ILS plan.
- Effect on maintenance concept and plans for the levels of maintenance and procedures.
- System and/or Logistics Support Analysis (LSA) tasks to be accomplished and LSA data requiring update wherever it exists in the contract.
- Extension/revision of the interim support plan.
- Spares and repair parts that are changed, modified, obsolete or added, including detailed supply data for interim support spares.

NOTE: *Failure to include detailed supply data will delay ECP processing.*

- Revised or new technical manuals.
- Revised or new facilities requirements and site activation plan.
- New, revised, obsolete or additional support equipment (SE), test procedures and software. For items of SE and trainers which require change, furnish a cross reference to the related ECPs, and for any related ECP not furnished with the basic ECP, furnish a brief description of the proposed change(s) in SE and trainers.
- Qualitative and quantitative personnel requirements data which identify additions or deletions to operator or maintenance manpower in terms of personnel skill levels, knowledge and numbers required to support the CI as modified by the change.
- New operator and maintenance training requirements in terms of training equipment, trainers and training software for operator and maintenance courses. This information should include identification of specific courses, equipment, technical manuals, personnel, etc., required to set up the course at either the Contractor or Government facility.
- Any effect on contract maintenance that increases the scope or dollar limitation established in the contract.

- Effects on packaging, handling, storage, and transportability resulting from changes in materials, dimensions, fragility, inherent environmental or operating conditions.

Block 40. Other considerations. The effects of the proposed engineering change on the following shall be identified on an enclosure indexed by appropriate identification adjacent to the factor affected:

- Interfaces having an effect on adjacent or related items, (output, input, size, mating connections, etc.).
- GFE or Government Furnished Data (GFD) changed, modified or obsolete.
- Physical constraints. Removal or repositioning of items, structural rework, increase or decrease in overall dimensions.
- Software (other than operational, maintenance, and training software) requiring a change to existing code and/or, resources or addition of new software.
- Rework required on other equipment not included previously which will affect the existing operational configuration.
- Additional or modified system test procedures required.
- Any new or additional changes having an effect on existing warranties or guarantees.
- Changes or updates to the parts control program.
- Effects on life cycle cost projections for the CI or program, including projections of operation and support costs/savings for the item(s) affected over the contractually defined life and projections of the costs/savings to be realized in planned future production and spares buys of the item(s) affected.

Block 41. Alternate solutions. A summary of the various alternative solutions considered, including the use of revised operation or maintenance procedures, revised inspection or servicing requirements, revised part replacement schedules, etc., shall be included. The Contractor shall provide an analysis of the alternatives, identify the advantages and disadvantages inherent in each feasible alternative approach, and show the reasons for adopting the alternative solution proposed by the ECP. When the Contractor's analysis addresses new concepts or new technology, supporting data (to include LSA if contractually required) should be presented with the proposal to authenticate the trade-off analysis.

Block 42. Developmental status. When applicable, the Contractor shall make recommendations as to the additional tests, trials, installations, prototypes, fit checks, etc., which will be required to substantiate the proposed engineering change. These recommendations shall include the test objective and test vehicle(s) to be used. The Contractor shall indicate the development status of the major items of GFE which will be used in conjunction with the change and the availability of the equipment in terms of the estimated production incorporation point.

Block 43. Recommendations for retrofit. When applicable, the Contractor shall make recommendations for retrofit of the engineering change into accepted items with

- substantiating data, any implications thereto, and a brief description of the action required. Where retrofit is not recommended, an explanation of this determination shall be provided. Reference shall be made to any enclosure required to state recommended retrofit effectivity.
- Block 44. Work-hours per unit to install retrofit kits. Complete Blocks 44a through 44d to show the amount of work which must be programmed for various activities to install retrofit kits. Estimate work-hours to install retrofit kits when classroom is undergoing overhaul.
- Block 45. Work-hours to conduct system tests after retrofit. Enter the work-hours required to test the system or the item following installation of the retrofit kit.
- Block 46. When this change must be accomplished. Where previously approved engineering changes must be incorporated in a specific order in relation to the proposed change, such order should be specified.
- Block 47. Is Contractor field service engineering required? Check applicable box. If "yes" attach proposed program for Contractor participation.
- Block 48. Out of service time. Estimate the total time period from removal of the equipment from operational service until equipment will be returned to operational status after being retrofitted.
- Block 49. Effect of this ECP and previously approved ECPs on item. The Contractor shall summarize the cumulative effect upon performance, weight, electrical load, etc., of this ECP and previously approved ECPs when design limitations are being approached or exceeded. Consequences of ECP disapproval may be stated in this block or in a referenced enclosure.
- Block 50. Date contractual authority needed. The Contractor shall provide the date by which contractual authority to proceed is needed to maintain the estimated effectiveness specified in the ECP and to provide concurrent ILS and logistics support item deliveries.
- Block 51. Estimated Net Total Cost Impact.
- Block 51a. Production costs/savings. Enter the estimate of costs/savings applicable to production of the CI resulting from incorporation of the change. Show redesign costs for the CI in the block titled "engineering, engineering data revisions" when the item is in production. Enter the projected life cycle costs/savings applicable to the planned production and spares buys of the item that are not yet on contract on the CI/SCI line in column (f). Enter the subtotal of production costs (both nonrecurring and recurring) in the fifth column.
- Block 51b. Retrofit costs. Enter the estimate of costs applicable to retrofit of the item, including installation and testing costs. When Government personnel accomplish, or are involved in, the installation and/or testing activities, the estimated costs shall be entered in column (f) on the affected lines. Show design costs of the retrofit kit and data revision costs strictly related to retrofit when the CI is in production; show all redesign and data revision costs when the item is not in production. Costs of modifications required to existing GFE and subsequent testing also shall be shown.

Enter the subtotal of retrofit costs in the fifth column. If some or all of the retrofit activities and costs will have to be deferred and placed on contract at a future date, show that deferred portion of the cost applicable to each line of Block 51 b in column (f).

Block 51c. Integrated logistics support costs/ savings. Enter the estimated cost of the various elements of ILS applicable to the item covered by the ECP. On the line titled "interim support," estimated costs shall be entered based upon the period of time between initial installation/operation of the item (aircraft, tank, etc.) as modified by the ECP and Government attainment of support capability. Such "interim support" costs shall include costs estimates of Contractor recommended/provided spares and repair parts, special support equipment, training equipment and personnel training program. On the line titled "maintenance manpower" shall be entered the estimated costs/savings for the contracted maintenance support for the remainder of existing maintenance contracts. Other ILS costs/savings associated with ILS elements for which appropriate titles do not appear in Block 51c may be entered in place of a factor not used unless such costs are covered on ECP, DD Form 1692/4 (Page 5) or in related ECPs. Enter the subtotal of ILS costs/savings in column (e). Enter the operation and support portion of the life cycle cost/savings on the subtotal line in column (f).

Block 51d. Other costs/savings. If there are other costs under the contract which do not fall under the production, retrofit or ILS headings, enter the total of such costs in Block 51d, column (e). If there are other costs to the Government which do not fall under the production, retrofit or ILS headings or under Block 51g, "coordination changes by Government, enter the total of such costs in Block 51d, column (f).

Block 51e. Subtotal costs/savings. Enter the subtotals of columns (a), (d), (e), and (f) on this line. The subtotal in column (e) shall be the sum of columns (a) and (d). This subtotal under the contract then shall be entered on the line so titled in column (f) and on ECP, DD Form 1692 (page 1), Block 24.

Block 51f. Coordination of changes with other Contractors. This term applies to interface changes to items other than GFE, and changes to GFE being covered under 51b. If such coordination changes are covered by related ECPs and summarized on ECP, DD Form 1692/4 (Page 5), the estimated costs thereof shall not be entered in Block 51 f. However, if Page 5 is not required, or if costs of certain coordination changes are not tabulated on Page 5, an estimate of such costs shall be entered in Block 51f, when available.

Block 51g. Coordination changes by Government. Enter in this block an estimate of the cost to the Government of interface changes which must be accomplished in delivered items (classrooms) to the extent such costs are not covered in Block 51b or on ECP, DD Form 1692/4 (page 5).

Block 51h. Estimated net total costs/savings. Enter the sum of all cost savings on column (f) and on ECP, DD Form 1692 (Page 1), Block 25. Instructions associated with Block 52, estimated costs/savings summary, related ECPs. Block 52 is intended as the summary of the estimated net total cost impact of both the package of related ECPs and other associated new requirements which are needed to support the modified

items. A few revised requirements for ILS, such as ILS plans and maintenance concepts do not appear as headings in Block 51. When only a single ECP is involved, these additional costs for revision of ILS plans, etc., should be shown in Block 51 under the ILS heading, and Block 52 may be omitted.

Responsibility for preparation:

Prime Contractor. The prime Contractor shall summarize the costs/savings of all related ECPs for which the Contractor is responsible in Block 52. If there is no system integrating Contractor, the prime Contractor submitting the basic ECP shall include the costs of related ECPs being submitted by other affected Contractors to the extent such information is available.

System Integrator. When a system integrating Activity has responsibility for ECP coordination the Integrator shall summarize the costs of related ECPs of the several primes involved in an interface or interrelated ECP in Block 52 and shall attach it to the ECP package.

Summarization Techniques. The costs of certain related ECPs are entirely ILS costs. Thus costs of ECPs for trainers, other training equipment and SE shall be listed in total under the ILS costs" heading. Other ECPs (applicable to weapons, aircraft, tanks, and subsystems thereof, etc.) shall be split into the four subtotals of "production", "retrofit", "ILS", and "other costs" for entry in Block 52. The sum of the four subtotals attributed in Block 52, column (c), to an individual ECP should agree with the subtotal of costs/savings under contract, line e, column (e) of Block 51 of that ECP. Cost breakdowns should be arranged in such manner that costs/savings are neither included more than once on the summary nor omitted. The purpose of the grouping on the cost summary is to arrive at a total ILS cost, and a net total cost of all actions for the complete group of related ECPs.

Block 52a. Production costs/savings. Enter the ECP number in column (b). Enter the production subtotals from columns (e) and (f) of Block 51a of each ECP applicable to each type of classroom thereof, etc., in columns (c) and (d) respectively. (Note that total costs of ECPs on trainers, training equipment and SE are entered in Block 52c.)

Block 52b. Retrofit costs. Retrofit costs may be charged by the Government to production funds or maintenance funds or may be split between the two. The type of funds used depends upon the phase in the item's life cycle. If the practice of the Government in this regard is known to the originator of Page 5, retrofit costs shall be entered in, or split between, Blocks 52b and 52.c.I, as appropriate. If such practice is unknown, enter in Block 52b the ECP number and the retrofit subtotals from the columns (e) and (I) of Block 51b for each applicable ECP.

Block 52c. ILS costs/savings. Enter retrofit costs in Block 52.c.I, if appropriate. Enter in Block 52.c.2 the ILS subtotals from columns (e) and (f) of Block 51c of each ECP applicable to each type of classroom thereof, etc. As stated in D.5.4.4, enter costs of ECPs for ILS items in Blocks 52.c.3, 4, 5 and 6. Enter costs of revision or preparation of ILS plans and LSA records for the CI or complete system in Block 52.c.7. Enter in Block 52.c.9 costs of revision of the interim support plan to the extent such costs have not already been covered under Block 51c of ECP, DD Form 1692 (Page 4) of the applicable ECPs. Enter in Blocks 52.c.10 through 52.c.18 the costs of all new requirements for ILS not covered by ECPs, such costs being broken down into nonrecurring and recurring costs, as appropriate, and totaled in column (c).

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Block 52d. Other costs/savings. Enter in Block 52d the sum of the "other costs" totals from column (e) and (f) of Block 51d of each ECP applicable to each type of classroom thereof, etc. Enter the subtotals of columns (c) and (d) on this line. The subtotal under contract(s) shall then be entered on the line so titled in column (d).

Block 52e. Estimated net total costs/savings. Enter the sum of the preceding two lines of column (d).

Block 53. CAGE code. Enter the CAGE code for the activity originating the ECP.

Block 54. Configuration item nomenclature. Enter the information from Block 16.

Block 55. Title of change. Enter the information from Block 13.

Block 56. Milestone chart. Enter the symbols (see legend on form), as appropriate for the activity, to show the time phasing of the various deliveries of items, support equipment, training equipment, and documentation incorporating the basic and related ECPs. Enter other symbols and notations to show the initiation or termination of significant actions. All dates are based upon months after contractual approval of the basic ECPs.

Block 57. CAGE Code. Enter the CAGE code for the activity originating the ECP.

Block 58. SCI nomenclature. Enter the SCI name and identification number if applicable, or authorized name and number of the CI(s) affected by the ECP.

Block 59. Title of change. Enter the information from Block 10.

Block 60. Milestone chart. Enter the symbols (See legend on form.), as appropriate for the activity, to show the time phasing of the various deliveries of items, training equipment and documentation incorporating the basic and related ECPs. Enter other symbols and notations to show the initiation or termination of significant actions. All dates are based upon months after contractual approval of the basic ECP.

APPENDIX C. FUNCTIONAL CONFIGURATION AUDIT (FCA)

- A. **Introduction.** This document provides guidance in the procedures to be followed in preparing for, conducting, and documenting a FCA. It defines the requirements for reports and data to be generated and delivered in support of the FCA. It defines Government and Contractor responsibilities related to the foregoing items. Nothing herein should be construed as amending any contract requirement in any manner. FCAs shall be conducted by the government prior to acceptance or issuance of a decision to proceed to production or low rate initial production. Additional guidance and/or comments concerning this appendix should be directed to Commandant (CG-444).
- B. **Background.** A FCA verifies that the CI meets all the functional requirements, including performance. The dictionary definition of the word “audit” as a final accounting gives some insight into the value of conducting configuration audits. Audits are used to define and control configuration baselines. The FCA represents a review of the item's performance, to ensure it not only meets the specification but that there are no unintended functional characteristics. Preliminary FCAs may be conducted early in the prototype stage, to provide confidence that the design will meet the requirements. A final FCA will be conducted after all testing is complete and concrete data is available demonstrating the solution meets its requirements. The FCA must be conducted prior to the final PCA but it is highly recommended that a preliminary PCA be conducted prior to OT&E and the FCA. This will insure the configuration being tested is the one documented enabling analysis should a failure occur during OT&E. A test traceability matrix should be maintained, evaluated during the test readiness review and assessed prior to commencing OT&E.
- C. **FCA Process.**
1. **WHEN:**
 - a. The FCA is performed prior to acceptance, production decision (Low Rate Initial Production) and a PCA. Although an FCA is only required once for each CI or system, a number of FCA-like activities may be accomplished at other times during the life cycle of the CI or system.
 - b. The time frame for audits will vary depending on the particular project. The CI's complexity may dictate an incremental audit approach throughout development until the completion of qualification testing. The FCA schedule should be outlined in the CM Plan but may be outlined in the system engineering management plan as long as signed by both the CM Mgr and SE.
 - c. Care should be taken when scoping the functional baseline. Most CM standards are created as joint efforts with industry and only address those acquired CIs. This means the functional boundaries are defined by the system or performance specification contained within the contract. In general, a performance specification is used to define the essential performance requirements and constraints that the CI must meet. When a performance specification is baselined by the Government, those requirements are contractual, so it is prudent for the Government to ascertain that the contractor has provided the expected performance capabilities. ANSI/EIA 649 states

that the FCA should be executed after the functional baseline and allocated baseline have been established and submittal of the draft item detail specification (following Critical Design Review and/or Test Readiness Review) for the CI to be audited. Within in the Coast Guard 90% of the time this situation would be considered an incremental approach and apply to our assets only but not to our “Programs” because full functional baseline for the “Programs capability” would include functional and performance requirements for personnel, facilities, training, life cycle support, depot, etc., as well as those for the asset therefore our FCA could not be completed until after OT&E at which point the functional baseline could be set.

- d. Software FCA should be performed prior to the hardware/software integration phase. When performed incrementally throughout the system development, the audit process should end with completion of the design qualification test. A review of CIs and discrepancies at the final system-level FCA should be captured in a final report.

2. **WHO:**

- a. The PM is ultimately responsible for the performance of audits. The PM has overall disposition authority on audit results and reports. The PM's designee, who may be the CM Mgr or Product Line Manager, will ensure audit requirements are properly delineated in the contract and the FCA is properly executed.
- b. The FCA is conducted by Government and Contractor personnel. Government personnel include representatives of:
 - (1) Project Office (i.e., PM, contracting officer, etc.);
 - (2) Configuration Management (i.e., Systems Engineering, quality, environmental safety and health, manufacturing, reliability, maintainability, etc.);
 - (3) Operators;
 - (4) Engineers;
 - (5) CSA personnel (representing the software support activity and/or supply chain management);
 - (6) Acquisition logistics personnel; and
 - (7) Others, as required.
- c. The Contractor participates in the FCA as provided in the contract. The Contractor is responsible for the participation of subcontractors, vendors, and suppliers as appropriate.

3. **WHERE:** The FCA is normally conducted at the Contractor's facility because of the availability of technical information and equipment.

4. **HOW:** The PM's designee usually the CM Mgr. will serve as FCA team chairman and perform the following:
 - a. Conduct pre-audit assessment.
 - b. Ensure necessary resources, documentation, and facilities are available for the audit.
 - c. Perform or delegate responsibility for conducting the audit.
 - d. Ensure access to Contractor technical staff, for example, quality assurance specialist and project system engineer.
 - e. In the case of software, ensure access to the Software Development Library (SDL) such as source code and related documentation and the Software Development File (SDF).
 - f. Establish multidisciplinary technical team.
 - g. Provide audit results to the Project Manager for disposition.
 - h. In the case of software, ensure availability of personnel skilled in the particular language(s) being used as well as familiarity with the specifications and standards imposed by the contract.
 - i. In the case of hardware, ensure availability of personnel knowledgeable of testing techniques, equipment and familiar with the specifications and standards.
 - j. The audit team will perform the following functions:
 - k. Determine the configuration item to be audited.
 - l. Ensure Test Plans and Procedures documents have been reviewed and approved by the CG.
 - m. In the case of software, examine the Verification Requirements Traceability Matrix to ensure requirements in the System Specification, Computer Program Functional Specification (CPFS), Software Design Documentation (SDD), Software Design Product Package (SDPP), and Interface Design Product (IDP), as applicable, have been successfully tested and documented in the associated Test Plan, Procedures, and Descriptions. Was the software tested? Do the test plans for the software cover all of the requirements in the software specification documents? Did all the tests pass?
 - n. Ensure testing follows approved procedures.
 - o. Review approved changes to determine the extent to which the item varies from applicable specification and standards and to form a basis for satisfactory compliance with those specifications and standards.
 - p. Review and sample the drawings of parts to ensure the availability of essential manufacturing test data.
 - q. Ensure the validity of data, reports, and analyses for final configuration.
 - r. Ensure all documentation used by the team become part of the FCA minutes.
 - s. Certify satisfactory completion of the audit.

D. Inputs (Data).

1. Primary inputs for the FCA are the functional requirements for the Capability and test or operational data showing how the solution will be implemented. Functional requirement information should include verification methods (test, demonstration, analysis, etc.) and the test method used (if applicable).
2. FCAs may use, but need not be limited to, data from the following processes and tests:
 - a. Environmental testing.

- b. Reliability, availability and maintainability tests and trials.
 - c. User trials.
 - d. Interface checks and tests.
 - e. Software testing, including independent verification and validation if safety critical software is involved.
3. If not already provided, construct a matrix (spreadsheet) showing the requirements, verification method, and testing procedure name. Ensure that all requirements have a verification method (and procedure) defined.
 4. Add columns to the matrix for test status (Pass, Fail, and Outstanding Action Items). Add columns to record other details of interest, such as the date the test was conducted and the quality assurance person who witnessed the test. Add a column for information on open action items.
 5. Review the as-run test documentation (or inspection/analysis reports) that are called out as verifications for each requirement. Record the appropriate information in the matrix. When reviewing, ensure that the test was adequate to verify the requirement.
 6. Identify any requirements that are open (failed or outstanding action item).
 7. Write a report documenting the audit and findings.
 8. Resolve any findings and other issues with the Project and Contractor.
- E. **Output.** FCA Report. Audit Template/Checklists are provided to help conduct the audit (see **Figures C-1, C-2** and **C-3**). The template covers all assurance levels and development phases. Tailor the template to fit the needs of the audit.

**FUNCTIONAL CONFIGURATION AUDIT
FOR [PROJECT NAME]**

Prepared by: _____
Name, Organization

Prepared by: _____
Name, Organization

Date: _____

Intro/Background

(Project Name) has completed the Functional Configuration Audit on the PROJECT NAME project. The purpose of this audit is to:

- 1) Assure that the (Project) is of the highest quality possible, and that it is reliable, safe, and ready to deliver the required functionality.
- 2) Help the project identify areas that need to be addressed to meet delivery requirements.
- 3) Identify areas of risk which may need to be addressed to meet requirements, agreements, standards, etc.
- 4) Provide some lessons learned insight for future projects.

Thank you for your assistance in conducting this audit. What follows are the findings, observations, and recommendations from our audit, plus supporting documents. We ask that the findings be addressed by DATE, and include a plan for correcting or rationale for disputing the problems. Responses to observations and recommendations are optional. The observations indicate areas where we feel PROJECT NAME has room for improvement, but may be impractical to change at this time. Additionally, positive areas of PROJECT NAME development were noted, and these are documented in the observations. Recommendations are suggestions to consider in response to the findings and observations.

Findings

1. List your findings here.
2. List here the items the audit discovered that need to be corrected. You can reference project documents, best practices, etc. that you need to support the finding.
3. Example. No worst case timing simulation done.

Observations

1. List concerns here.
2. These are items that although not a problem can become one so should be looked at. These do not necessarily have to be corrected.

Recommendations

1. List recommendations here.
2. List here suggested way(s) to fix each item in the findings. Each finding does not need a recommendation. Specific fixes are best left to the project.

What follows is a recommended list of items to include in the audit. You may add items you feel relevant and use items from a higher classification if desired. An item with high assurance should include all questions. Do not forget to explore safety issues if the CI includes safety critical functions.

**Audit Template
Figure C-1**

Figure C-2 Functional Configuration Audit Checklist

| Question | Assurance |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Does a Configuration Management Plan exist and is it being followed? | Low |
| Does a Requirements Document exist and is it complete? | |
| What activities have been performed to identify, assess, track, and verify safety-related (critical) functions? | |
| What is the requirements change process? Who reviews and who approves requirement changes? Show the documentation for the last change to the CI requirements. | |
| | |
| Is a Configuration Management System being used? | Moderate |
| Is a Problem Reporting and Corrective Action system being used? | |
| Were all design documents reviewed? If so, show the review records for two of them. If not, what is the plan for document review? | |
| Do all the CI requirements trace to a higher-level document or are they derived? Do the CI requirements trace into the software design? Do the CI requirements trace to the verification tests being performed? | |
| Select a Code module and show that it meets the coding standards/best practices. Also verify that the module has sufficient comments and that the comments provide useful information, and not just rephrase the code. | |
| Were any previous audits conducted? Has all findings in those audits been addressed? What observations have been addressed? | |
| How are real-time deviations from the process plan approved and documented? | |
| Obtain the current CI schedule from project management. When was the last time the CI schedule was updated? How reasonable is the schedule? | |
| Were all safety/mission critical functions fully tested? Were they retested when the CI was integrated into the XXXXX? | |
| | |
| Does a CI Test Plan exist and has it been reviewed? | High |
| What Internet Protocol (IP) modules does the CI use? How are they controlled? | |
| Does the CI implement the states required by requirements document? Does it communicate that it has entered an off-nominal state? | |
| How were verification methods for CI requirements evaluated and approved? | |
| Has the interface between the CI and the next higher assembly been defined? Is it complete and been checked for errors/omissions? | |
| The Interface Control document lists the signals that CI may need to handle. What is the status of the CI signal identification, valid range determination, and actions? | |
| What are the logical subsystems that the CI was divided into? How did the CE software design and development address interfaces between these subsystems? | |
| Where are the errors or failures the CE deals with documented? | |
| What is the current status of the documents listed in the Complex Electronics Assurance Plan? Are they complete and under configuration management control? | |
| Were design reviews held and documented? Were the results documented in a database? Was the CI device baselined or under configuration management control when the review was held? | |
| Show the unit testing documentation/test bench for the CI or IP module. | |
| What is the process when a problem is identified during a unit test? What about problems noted during informal activities and simulation runs? | |

| Question | Assurance |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Are there any deviations or waivers for CI? If so, what was the approval process? | |
| Describe the CI test environment. What aspects of the CI cannot be adequately tested in the development/test environment? | |
| What is the plan for CI verification reports? Will verification reports include best and worst case timing analysis, as well as test results? | |
| For the CI, what is the process followed to acquire the software code and program applicable devices? | |
| When the CI software baseline is changed, <ol style="list-style-type: none"> 1. How are the impacts of those changes identified and analyzed? 2. Who reviews and/or approves the changes? Is the CI code differences checked to verify that the documented changes were implemented, and that no other changes were made in the software? | |
| What length of time has the device been operating to verify it performs correctly? | |
| Has the device been tested as part of the system to verify it performs correctly? | |
| Does the Design Engineer participate in the risk management process? Are there any current CI related risks? How are these being mitigated? | |
| What is the status of the CI metrics collection? Show the metric for units that completed code review, completed Unit testing, and completed integration testing. | |
| To what extent was the CI development progress tracked against the planned progress? If tracking has not occurred for at least a three months, what are the factors that lead to ceasing to track CI development progress? | |

**Functional Configuration Audit Checklist
Figure C-2**

CI Nomenclature: _____

Date: _____

CI/SCI Identifier: _____

Release # _____

| Requirements | Yes | No | NA |
|---------------------|------------|-----------|-----------|
|---------------------|------------|-----------|-----------|

1. Facilities for Conducting FCA Available.
2. Audit Team members have been identified and informed of audit.
3. Audit Team members are aware of their responsibilities.
4. Software Requirements Specification (SRS).
5. Design Documentation (SDD).
6. Acceptance Test Procedures Reviewed and Approved.
7. Acceptance Test witnessed.
8. Completed Acceptance Test with Results.

Signature of FCA Team Members:

Date:

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Check one:

- Results reviewed satisfy the requirements and are accepted (See attached comments).
- Results reviewed do not satisfy requirements (See attached comments and list of deficiencies).

Approved by: _____ *Date:* _____

**Example Software Functional Configuration Audit Checklist
Figure C-3**

APPENDIX D. PHYSICAL CONFIGURATION AUDIT

A. **Introduction.** This document provides guidance in the procedures to be followed in preparing for, conducting, and documenting a PCA. It defines the requirements for reports and data to be generated and delivered in support of the PCA. It provides direction relating to formal acceptance of the first article and subsequent deliveries of each CI, and defines Government and Contractor responsibilities related to the foregoing items. Nothing herein should be construed as amending any contract requirement in any manner. A PCA is required prior to acceptance. Comments concerning this appendix should be directed to Commandant (CG-444).

WARNING

Audit personnel must at all times observe all safety precautions. Verify with Contractor technicians that the equipment has been de-energized before beginning inspection. Dangerous electrical potentials may exist when power controls are in the off position. Capacitors may retain charges.

- B. **PCA Team Composition.** The PM/PLM/CM Mgr will serve as the lead for the conduct of PCAs. Assistance and support of other Government personnel may include the Systems Engineer, In-Service Engineers, Software Engineers, Test Engineers, Equipment Specialist, Maintenance Specialist, etc., Contractor personnel also support this effort as required.
1. Selection of the Government audit team is the responsibility of the CM Mgr. The composition of the Government audit team should be tailored to the specific audit requirements. For example, equipment or major changes thereto, it is beneficial to have sufficient people to allow a thorough audit of individual units by sub-teams. The Government audit team should include a Configuration Manager, individuals familiar with the development history, operation and Installation of the equipment, and maintenance specialists, technical manuals, computer software, etc., as dictated by equipment and program characteristics. Individuals familiar with engineering drawing practices and equipment fabrication techniques are an essential asset to most audits. The Configuration audit team should also include one or more representatives from the APO/PRO and LC/Service Center (SC). PRO and APO representatives with Quality Assurance experience are highly desirable audit team members, particularly if they are independent representatives at the Contractor's manufacturing facility.
 2. Although only a limited number of people usually exist from which the Audit team may be selected; individuals should be selected who have the personal abilities that will allow them to perform well. An acceptable audit team member will:
 - a. Focus on identifying discrepancies, not on resolving them during the audit;
 - b. Be capable of identifying errors of omission as well as of commission;
 - c. Document discrepancies in a clear direct manner;
 - d. Conduct themselves professionally and inspire trust (to do otherwise may induce Contractor personnel to withhold information for fear of personal consequences);

- e. Understand the difference between a design review and a PCA; and
- f. Understand the difference between a PCA and a Configuration Verification of the Data System.

C. PCA Scheduling. The PM is responsible for insuring the PCA is scheduled and must carefully review the contract schedule. When the Contractor notifies the Government of their readiness for a PCA based on contract requirements, the CM Mgr will coordinate the formal scheduling of the PCA, in close coordination with the PM and other project team members.

D. Configuration Audit Agenda.

1. The Contractor, in cooperation with the CG Configuration Manager or Project Manager (PM) shall develop the Configuration Audit Agenda for use at the PCA. The Audit Agenda identifies documentation, hardware and computer software to be available at the audit site, and the tasks to be accomplished and the schedule. The actual date of the audit is influenced by the date of completion of acceptance testing, a mandatory prerequisite to conducting the physical audit. The audit should be scheduled sufficiently in advance to allow adequate preparation by all parties involved (CG and Contractor). The Audit Agenda is a deliverable data item, which is subject to CG approval, provides evidence of the hardware, Contractor's understanding of Configuration Audit requirements, and the extent to which preparations for the Audit have been made.
2. In reviewing the Configuration Audit Agenda, particular attention should be directed to the Contractor's understanding of what is to be accomplished, the amount of time that will be required, and what hardware, computer software, firmware, and supporting documentation is to be readily available to the Government audit team. The term "readily available" means at the audit site, near the system or equipment being audited. For example, much time can be wasted while waiting for Contractor representatives to obtain a drawing from a reproduction center in a different area of the plant. The Contractor can better prepare for the audit if he is made aware of the number of auditors to be utilized. An understanding of the PCA process, as detailed in later sections of this handbook, is necessary to perform an adequate review of the Configuration Audit Agenda. Other key review factors are:
 - a. Is the baseline documentation identified? Drawings, Specifications, Parts Lists, tools.
 - b. Is reference documentation identified, i.e., Technical Manuals, Contract Development Specification, Provisioning Technical Documentation, and Quality Assurance Plan?
 - c. Does the agenda schedule allow sufficient time for accomplishment of all audit activities, particularly the comparison of the documentation to the hardware/software/firmware and a critique at the audit conclusion?

E. PCA Planning.

1. The Preliminary Audit information identified below should be considered during the planning and preparation for a PCA.
2. Prior to the actual PCA, there are several areas for the CM Mgr to review to coordinate a smooth PCA as follows:
 - a. Assemble government audit team and inform them of upcoming responsibilities. Discussions with team members of designator assignments could lead to revisions of assignments.
 - b. Advise Contractor of Statement of Limitation of Authority (see below). This will be addressed once again at the kick off meeting, but is important enough to address now to minimize any possibility of omission.
 - c. Review configuration control system. If documentation is available, a thorough knowledge of the Contractor CM system now will save valuable time during the PCA.
 - d. Provide copies of PCA checklists to each team member.

F. PCA Kickoff Meeting.

1. A PCA Kickoff Meeting should be conducted to establish a mutual understanding of PCA requirements between Government and Contractor personnel. A sample checklist of items to be covered during a PCA Kickoff Meeting is provided below.
2. Before the PCA commences, the PM (in conjunction with the Contractor co-chairman) should convene a kickoff meeting, with all government and Contractor participants, to address ground rules to be followed during the PCA. Suggested ground rules are as follows:
 - a. Cite disclaimer for PCA team comments/suggestions.
 - b. STATEMENT OF LIMITATION OF AUTHORITY:

YOU ARE HEREBY NOTIFIED THAT I DO NOT HAVE THE AUTHORITY TO DIRECT YOU IN ANY WAY TO ALTER YOUR OBLIGATIONS OR CHANGE THE STATEMENT OF WORK IN YOUR CONTRACT. FURTHER, IF THE UNITED STATES COAST GUARD, AS A RESULT OF THE INFORMATION OBTAINED FROM TODAY'S DISCUSSION, DOES DESIRE TO ALTER YOUR CONTRACT OBLIGATIONS OR TO CHANGE THE CONTRACT STATEMENT OF WORK, CHANGES WILL BE ISSUED IN WRITING AND SIGNED BY THE CONTRACTING OFFICER. YOU SHOULD TAKE NO ACTION ON ANY CHANGE UNLESS AND UNTIL YOU RECEIVE SUCH A CHANGE ORDER.
 - c. Ground rules for disassembly of any hardware (in most cases, the Contractor will perform all disassembly tasks).
 - d. Review results of FCA.
 - e. Review shortages/deviations/waivers.

- f. Review ECP(s) status.
- g. Establish sub-teams and assign areas for PCA.
- h. Establish Deficiency Report (DR) rules, numbering.
- i. Establish schedule for daily meeting.

G. PCA Checklist.

1. The conduct of the PCA will encompass reviews of engineering drawings, technical documentation, and hardware. A 100% review of all documentation and hardware would be time prohibitive for most large acquisitions. For this reason, a 10-20% sampling is recommended. If the PCA uncovers few discrepancies and is acceptable with the 10-20% review, it is low risk to assume that the entire system and associated support documentation is also acceptable.
2. The PM should, however, reserve the right to expand the review to as much as 100%, if necessary, to assure that the government receives a quality product. This provision would be applied to any area suspected by the CM Mgr to be potentially high risk if not reviewed in more detail. A Specific list of items to be reviewed is impractical because each contract brings unique systems and criteria. Each CM Mgr should create his own PCA checklist tailored to the specific needs of his contract. To aid in the creation of this list, the following is provided as a general guideline:
 - a. **ENGINEERING DRAWING REVIEW.**
 - (1) During the PCA, engineering drawings will be reviewed for format. Some suggested areas to review are as follows:
 - (2) Drawings continuity - Top drawing down to piece part drawing.
 - (3) Parts Lists/Part Numbers.
 - (4) ECP Incorporation/Contract MOD.
 - (5) ECNs Outstanding.
 - (6) Deviations Requested/Approved.
 - (7) Waivers Requested/Approved.
 - (8) Vendor Manuals.
 - (9) Vendor change control
 - (10) Compliance with ASME Y14.100 (series).
 - b. **HARDWARE TO BE AUDITED.** Below are listed suggested items to be included in a PCA checklist. The list is not all inclusive and should be scrutinized by the CM Mgr to meet his own specific needs. In general, however, identification markings, decals, labels, and warnings should be included in any review. Also included should be any provisions involving operator safety:
 - (1) Unit Numbers/Product Marking.
 - (2) Cable Marking - To/From.

- (3) Assembly Number Marking.
 - (4) Reference Designator Marking.
 - (5) ESD Marking/Warning Decals.
 - (6) High Voltage/Safety Decals.
 - (7) Labeling of Functional Controls.
 - (8) Labeling of Jacks/TPs.
 - (9) Labeling of Fuse Sizes.
 - (10) Labeling of Terminal Boards/Wires.
 - (11) Trainer ID Tag.
 - (12) Component Identification - Ref. Des.
 - (13) Firmware Identification.
 - (14) Grounding/Bonding.
 - (15) EMI Provisions.
 - (16) PC Boards Ident/Rev Levels.
 - (17) Spare PC Boards Ident/Rev Levels.
 - (18) Over Temp/Emergency Shutdown System.
 - (19) GFI Provisions, Personnel Safety, IAW applicable industry standards such as UL-943 (5MA).
 - (20) General Workmanship/Cable Slack.
- c. TECHNICAL DOCUMENTATION AUDIT. Review of all ILS documentation is part of the PCA. The detailed review will be accomplished during the verification period, but a cursory review can be accomplished by reviewing the following:
- (1) Review general format to assure that it is per contract specification Technical Manual Contract Requirements (TMCR).
 - (2) Assure that all manuals are present.
 - (3) Assure that all documents are controlled per Contractor configuration management procedures.
 - (4) Assure each noncompliance from the FCA has been appropriately resolved.
 - (5) Review all of the CI(s) meet the standards required by the project and/or the organization (e.g., coding standards).
 - (6) Assure that the system has been built from the correct components and per the specifications (including procedures).
 - (7) Assure patches and temporary fixes (e.g., last minute) has been reviewed for correctness and documentation.
 - (8) Review the documentation set to ensure consistency with the requirements.

- (9) Review the documentation set to ensure consistency with the as built application or system.
 - (10) Assure the documentation set is complete.
 - (11) Review that the final delivery media has been appropriately marked/labeled.
 - (12) Assure required license requirements have been met (e.g., 3rd party).
 - d. **DOCUMENTATION.** The following documentation shall be available at the PCA.
 - (1) A list delineating both approved and outstanding changes against the CI.
 - (2) Complete shortage list.
 - (3) Operating, maintenance, and illustrated parts breakdown manuals.
 - (4) List of approved waivers.
 - (5) Manuscript copy of all software CI manuals
 - (6) Computer Software Version Description Document
 - (7) Current set of listings and updated design descriptions or other means of design portrayal for each software CI.
 - e. **TASKS.** The following tasks shall be accomplished at the PCA.
 - (1) Drawing Review.
 - (2) Review shortages and unincorporated design changes.
 - (3) Review Software User's Manuals, Software Programmer's Manuals, Computer System Operator's Manual, & Firmware Support Manual, Operation and Maintenance Manual, Planned Maintenance System, and Instructor Utilization Handbook.
 - (4) Review software CIs for the following:
 - (a) Preliminary and detailed Software Component design descriptions.
 - (b) Preliminary and detailed Software interface requirements.
 - (c) Data base characteristics, storage allocation charts and timing and sequencing characteristics.
- H. PCA Close-out Meeting.** Following the review of all hardware/documentation, a final meeting of the PCA team should be convened. A sample of items to be covered during a PCA Close-out Meeting is provided below:
- 1. Review all DRs written by PCA Team.
 - 2. Ensure Contractor and Government agreement that each DR represents a valid discrepancy.
 - 3. Corrective action and disposition is identified and agreed to.
 - 4. Action for resolution is assigned and agreed to and an approximate date is set when the solution/correction action can be expected to be completed.
 - 5. If PCA is unacceptable consult with SE/PLM and arrange for re-audit.

6. Establish ground rules for DR signoffs.
7. Sign PCA certification sheets (as applicable). Although sign off is possible at this time, it is not expected until all DR's have been completed.
8. Review proposed Material Inspection and Receiving Report Form, DD-250 for acceptance.
9. Complete minutes and post-audit report or instruct Contractor on submission of minutes and post-audit report.
10. Complete and submit final audit report or instruct Contractor on submission of final audit report.

I. Baseline Letter Preparation and Signature. The Product Baseline will be considered established upon:

- a. Completion of the functional audit.
- b. Successful completion of the PCA.
- c. Mutually agreeable resolution of discrepancies revealed during the audit.
- d. Acceptance of the Product Baseline equipment under the contract.
 - (1) On the basis of the foregoing, the Government Audit Chairman has the authority to recommend acceptance of the equipment and its documentation and approval subject to conditions/agreements of the audit as defined by the Baseline Letter, or recommend rejection of the equipment and its documentation. Reasons for rejection and disapproval must be fully documented by the audit team and the specific deficiencies must be noted for further CG review.
 - (2) Upon completion of the preceding actions, the Government Audit Chairman will prepare and jointly sign with the Contractor a letter documenting the establishment of the Product Baseline for the system or equipment audited. The baseline letter authorizes the Contractor to make the changes necessary to correct the deficiencies identified during the audit. An example of a baseline letter appears in **FigureD-1**. It is necessary for the Government Audit Chairman to explain to the Contractor that only those changes necessary to correct the discrepancies identified on the audit worksheets are authorized at that time by the Government. Audit worksheet examples are depicted in **Figure D-2**. Other changes must conform to the normal engineering change procedures defined in the contract (ECP submittal). The Contractor should be further advised to contact the Government Audit Chairman for his determination if he is unsure whether a particular change is audit-related. This procedure is mandatory to maintaining adequate Configuration control.

J. Configuration Audits.

1. Configuration Audits shall be performed to validate that CIs (including Software Configuration Items (SCI)) have been developed satisfactorily, to establish the Product Baseline, and to confirm compatibility of the Product Baseline documentation with its higher level design documentation. The Audit consists of a FCA and a PCA. The PCA shall be accomplished subsequent to FCA and prior to acceptance of the final product.

The completion of the Configuration Audit marks the beginning of the Product Baseline configuration control management phase.

2. The end product of the Configuration Audit is validated documentation. The audits themselves, however, are not intended as the sole justification for such validation. The local Government representative is responsible for continuing surveillance of the Contractor's quality control practices before, during, and after the audit: this, in effect, constitutes a continuous audit of the Contractor's manufacturing operations.

K. Functional Configuration Audit. A FCA serves to verify that the system is compliant with the equipment specification by successful execution of the requirements of the equipment specification. It is not required that all tests or inspections be conducted on the same equipment.

L. Physical Configuration Audit.

1. The Contractor shall provide the necessary facilities, personnel, and documentation to conduct the Audit. Documentation shall include the Product Baseline and functional design documentation identified above, plus the Configuration Identification Manual or Design Certification Baseline Report, technical manuals, allocated parts list, listing of outstanding changes (to hardware, computer software and documentation, and forms for recording Audit findings/corrective action.
2. When the Physical Audit is conducted on the system, a moratorium on changes shall be imposed during the period of the audit. All changes in the process of being incorporated into the hardware, software and documentation shall be presented to the audit team as the listing of outstanding changes.
3. A Configuration Audit agenda and report shall be provided per the CDRL. The agenda will describe the detailed plans and procedures that will be employed for conduct of the audit. The report will document the audit findings and planned corrective actions for reported discrepancies.
4. The audit team will consist of Government personnel and Contractor personnel, and will be chaired by the CG project representative or his designated representative.

Note:

Depending on the capabilities of the local Government representative organization and the complexity of the project, CG may delegate all or part of the responsibility for the audit to the local Government representative (e.g., PRO or APO).

5. The team chairman shall have the authority to:
 - a. Recommend acceptance of the equipment and its documentation, and approval of the Preliminary Configuration Manual or Design Certification Baseline Report, subject to condition/agreements of the audit.
 - b. Recommend rejection of the equipment and its documentation and disapproval of the Preliminary Configuration Manual or Design Certification Baseline Report.

6. Reasons for rejection and disapproval must be fully documented by the Audit team, and the specific deficiencies must be noted for further CG review.
 7. The total time required to conduct the audit will depend on scheduling the availability of equipment. The level of the audit will be such that disassembly of the hardware will not be required, but removal of modular/replaceable assemblies shall be accomplished to make visible all assemblies for audits. The audit will be limited to a comparison with the baseline documentations including the applicable listed engineering drawings.
 8. Any difference observed shall be considered a potential discrepancy, recognizing that there will be allowable differences between the single set of drawings and a given serial numbered production unit, the Contractor will be given the opportunity to prove to the audit team during the audit that any potential discrepancy is in fact an allowable difference and therefore not a discrepancy. If the audit team concurs, then the potential discrepancy shall be omitted from the audit worksheet.
 9. In the event that the audit should incidentally disclose a workmanship problem as opposed to a difference between hardware and baseline documentation, the problem shall be referred to the Government's acceptance agency for handling in the normal manner.
 10. Upon completion of the audit the Contractor shall prepare an updated Preliminary Configuration Identification Manual or Design Certification Baseline Report which will be submitted as part of the Audit report. It will differ only in that it will incorporate any and all changes required as a result of the audit. Such changes shall be appropriately flagged for ready identification, and the Contractor shall certify that all such changes are flagged.
 11. The Product Baseline will be considered established upon: completion of the functional audit; completion of the physical audit; mutually agreeable resolution of discrepancies revealed during the audit; and acceptance of the Product Baseline equipment under the contract.
- M. **Configuration Status Accounting.** Changes that affect the Functional/Product Baseline shall be reported in the CSA Report, Preliminary Configuration Identification Manual or Design Certification Baseline Report per the CDRL.

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| SAMPLE BASELINE LETTER | |
| (date) | |
| Subject: Establishment of the Product Baseline for the _____. | |
| Reference (a) COMPANY NAME letter, Subj: Readiness for PCA. | |
| 1. A physical configuration audit of the _____, Part Number _____, Serial Number _____ was completed on (date) per the requirements of Contract (Contract Number) at COMPANY NAME and FACILITY. | |
| 2. The PCB for the audited equipment is hereby established. Items listed below shall be reflected in the PCB as first article audit corrections and shall be retrofitted into all configuration items and support resources called for under this contract: | |
| a. Discrepancies documented in the audit worksheets; | |
| b. Update of the Configuration Identification Manual to define the _____ PCB; | |
| c. Correction of outstanding hardware deficiencies and completion of tests identified as incomplete in the Contractor Certificate of Completion of FCA identified in Reference (a); | |
| d. Submission of the audit report per the Contract Data Requirements List. | |
| 3. The Coast Guard Technical Representative will verify by audit the accomplishment of the audit discrepancy corrections into the engineering documentation and/or hardware. | |
| 4. Accomplishment of the audit and establishment of the PCB does not authorize any change or relieve any requirements stated in Contract (Contract Number). | |
| _____ Signature Name and Title Contractor Representative | _____ Date |
| _____ Signature Name and Title Coast Guard Representative | _____ Date |

**Example Baseline Letter
Figure D-1**

| | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------|------------|---------------------------|
| <p>Example Physical Configuration Audit Worksheet</p> | | | | |
| <p>COAST GUARD NAME OF EQUIPMENT TO BE AUDITED PHYSICAL CONFIGURATION AUDIT WORKSHEET (Enter contract number)</p> | | | | |
| <p>CONFIGURATION DISCREPANCY</p> | | | | <p>Sheet ____ of ____</p> |
| Unit | No. _____ | Part/Dwg. _____ | Rev. _____ | Serial |
| <p>No. _____</p> | | | | |
| <p>Nomenclature _____</p> <p>_____</p> | | | | |
| <p>Location and Description of Discrepancy</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> | | | | |
| <p>_____</p> <p>Government Representative</p> | | <p>_____</p> <p>Contractor Representative</p> | | <p>_____</p> <p>Date</p> |
| <p>Corrective Action/Disposition</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> | | | | |
| <p>_____</p> <p>Government Representative</p> | | <p>_____</p> <p>Contractor Representative</p> | | <p>_____</p> <p>Date</p> |

**Example Physical Configuration Audit Worksheet
Figure D-2**

N. Examples of Specific Configuration Audit Discrepancies.**12. Typical Configuration Discrepancies.****a. HARDWARE:**

- (1) Item exhibits obvious signs of modification not reflected in the drawing, i.e., elongation of holes to accomplish hole alignment, jumper wires on circuit card, etc.
- (2) Items exist on an assembly which are not identified in the parts list and assembly drawing.
- (3) Part number shown on identification plate does not agree with part number on drawing.
- (4) Cable designations have not been marked on equipment adjacent to connectors.
- (5) Revision level letters marked on replaceable assemblies do not agree with the revision level letters indicated in the Configuration Identification Manual.
- (6) Electrical values (i.e., resistance, capacitance, inductance, voltage) shown on schematic do not agree with the values marked on the component part.
- (7) Reference designation is not marked on item.
- (8) Part number on parts list does not agree with part number on part.
- (9) Panel markings (i.e., POWER ON, etc.) on equipment do not agree with marking instructions on drawing.
- (10) Reference designator markings adjacent to electronic components do not agree with the schematic diagram.
- (11) Original part identification markings have not been obliterated when remarking an altered item or source control item.
- (12) Jumper wires exist on a circuit card assembly where the reference designation markings indicate a component should appear.
- (13) Attaching hardware (screws, washers, nuts) has not been listed on the parts list.
- (14) The quantity of an item shown on the parts list does not agree with the actual quantity used.
- (15) An assembly exhibits modifications which are not identified on the drawing.
- (16) Firmware has not been marked per the contract configuration management requirements.
- (17) Parts have been substituted without an approved waiver or deviation.
- (18) Drawing has been revised without the approval required by the Contractor's internal procedures.

b. SOFTWARE:

- (1) A complete set of documentation is not available for the audit.

- (2) Insufficient project performance criteria is given in the PPS.
- (3) References or terms are not adequately defined or qualified.
- (4) Acronyms used are not consistent within a document or between documents.
- (5) The timing, resolution or accuracy requirements for data exchanges between the unit under audit and peripheral equipment have been omitted.
- (6) A document contains insufficient information to meet its intended purpose.
- (7) All software requirements are not addressed, insufficient link of software requirements between different documents.
- (8) A lack of correlation of Inputs/Outputs exists.
- (9) The inputs listed as used in the POS are not indicated as being used in the program listing.
- (10) More tasks are listed than are described.
- (11) The program is too large (not the required amount of reserve\memory).
- (12) A comment on listing is incorrect.
- (13) A computer program identification number does not agree with the related drawing number.
- (14) Information is Referenced which is in a non-deliverable document.
- (15) The operator's manual References a document which will not normally be on board or otherwise available to the operator.
- (16) An operation step in the operator's manual is omitted.
- (17) An occurrence observed in executing the software is not described in the operator's manual.
- (18) A check-out procedure in the operator's manual is incomplete.
- (19) A portion of the computer program listing is not adequately commented or is incorrectly commented.

13. Typical Documentation Deficiencies.

- a. A parts list or assembly drawing does not identify factory acceptance testing for a replaceable item (i.e., circuit card assembly) which may in the future be procured separately as a spare part.
- b. A parts list does not identify all materials required for production (e.g., paint, primer, adhesive, solder, aluminum stock, etc.).
- c. A drawing does not specify part identification marking requirements.
- d. Dimensional tolerances shown on a drawing could allow production of an item unsuitable for its intended function.
- e. An engineering drawing contains insufficient data to ensure item reproducibility by another qualified manufacturer.

- f. Federal Supply Code for Manufacturers (FSCM) shown on parts list is not correct or FSCM is not shown.
 - g. Control drawings have not been specifically identified as such, i.e., Source Control Drawing, Specification Control Drawing, etc.
 - h. An unnecessary control drawing has been prepared for a standard military specification part.
 - i. Excessively loose dimensional tolerances for two or more interfacing parts (e.g., hole patterns) will allow unacceptable interference if was manufactured to a worst case tolerance extreme.
 - j. Source(s) of supply on a source control drawing have not been identified as "Approved Sources of Supply."
 - k. A drawing with a separate parts list does not contain the notation "SEE SEPARATE PARTS LIST" above the title block.
 - l. Source(s) of supply on a specification control drawing have not been identified as "Suggested Sources of Supply."
 - m. A drawing does not adequately identify raw materials (e.g., steel, aluminum) by reference to an Industry (ASTM) or federal (QQ-) specification.
 - n. An approved change has been incorporated to the engineering documentation but not all impacted documents have been revised (i.e., resistor added or changed on parts list but not on schematic).
 - o. The standard dimensional tolerance provided in the drawing title block is inadequate for a dimension which is not otherwise toleranced.
 - p. A parts list does not identify all specifications and standards referred to on other documents associated with the assembly (e.g., painting specification, test procedure, wiring instructions, welding process procedure, schematic diagram, etc.
 - q. A drawing copy utilized by the Contractor in the manufacturing process is not a released and controlled copy as noted by stamps indicating "NOT FOR MANUFACTURING," "UNCONTROLLED PRINT," "REFERENCE ONLY," etc.
14. Typical Workmanship Type Defects.
- a. Wiring has been routed in a manner that subjects it to unnecessary damage or wear.
 - b. Interference exists between adjacent items which prevent slides, drawers, or doors from operating smoothly.
 - c. Screws or other fasteners are missing.
 - d. Component loose or not adequately secured.
 - e. Reference designation markings were located in a position that causes them to be unnecessarily obscured from view.
 - f. Rust or corrosion appears on equipment.
 - g. Protective finish has been damaged on fastener heads.

- h. Part identification markings are not legible.
- i. Loose washers, nuts, wire clippings, etc., were not removed from the bottoms of cabinets or drawers after final assembly.

APPENDIX E. CONFIGURATION MANAGEMENT PERFORMANCE ASSESSMENT

A. Scope.

1. This performance assessment guide for CM will be used to carry out the oversight responsibility of the USCG. This guide was prepared to assist in conducting performance-based assessments of both USCG prime contractors and subcontractors to ensure that their CM programs identify, disposition, and take corrective action on issues that affect satisfactory program performance. The goals are to ensure that the Prime Contractor is capable of maintaining synchronization of design requirements, physical configurations, and configuration information and that they have a systematic means for establishing, documenting and controlling products, facilities, and processes through effective baseline management to ensure little or no economic loss to the Government. The CM process applies to all information impacting performance, safety, quality, schedule, cost, environment, and/or budget, and provides managers with the ability to regulate operational performance, readiness, total life-cycle costs, contract requirements, schedules and Integrated Logistics Support (ILS).
2. CM assessments will be directed at all USCG prime contractors and subcontractors. It is highly advisable that a CM assessment is conducted on all potential USCG prime contractors and subcontractors to utilize the evaluation as a discriminatory factor in source selection. USCG Project Managers (PM) and Product Line Managers (PLM) must ensure that these contractors comply with USCG regulations and Federal and State regulations. Information developed from this assessment will determine the degree to which this is being done as well as the effectiveness of the Prime Contractor's program. Metrics should be established to record deficiencies, rectified deficiencies and non compliance.

B. Guidance to Assessor.

1. This assessment guide is intended to assist in conducting a performance assessment of CM. It is not to be considered all-inclusive, inflexible, or limiting when lines of inquiry responses dictate that an area be more thoroughly probed.
2. The assessment of CM at USCG prime contractors and subcontractors facilities requires the assessment team to focus on two areas: CM responsibilities of the USCG, and the Prime Contractor's responsibilities concerning CM. This CIM has specific requirements for both organizations for setting up and maintaining a program for compliance. The two issues must be clearly separated in the assessment.
3. For assessing the USCG configuration management function, it is suggested, for example, that the assessor review the Prime Contractor's Engineering Change Proposal (ECP) area. Not only for compliance with the CM requirements but also the USCG responsibilities in the area; that is, what does the USCG do to ensure the program is in compliance? Pick a few criteria to evaluate the program is working correctly. This will ensure confidence that the USCG receives an asset that meets its requirements.

C. CM Assessment Attributes and Lines of Inquiry. This section provides lines of inquiry to help assess whether the Prime Contractor has implemented a program that ensures that CM requirements are incorporated into line activities. This section will be used to evaluate the Prime Contractor's organization. For additional guidance, see paragraph B., "Guidance to Assessor."

1. Both the USCG and Prime Contractor organizations define an appropriate method of configuration management for the specific work or project being performed.
 - a. Does a CM plan exist?
 - b. Is the CM plan updated as required pursuant to contract award?
 - c. Does the plan establish the technical interface requirements and procedures for a specific project?
 - d. Is the CM plan used as a project management tool to determine and control baselines and to ensure and document that all components of a project interface both physically and functionally?
 - e. Does the chosen method of CM ensure that the product acquired satisfies the technical and operational requirements?
 - f. Is the CM plan the means through which the integrity and traceability of the hardware/software systems are recorded, communicated, and controlled during development, operation, and maintenance?
 - g. Does the chosen method of CM ensure that the technical requirements are clearly defined and controlled throughout the development and acquisition process?
 - h. Does the CM plan promote adequate configuration control during the design and test evolution in a software environment?
 - i. Does the CM plan control configuration changes with respect to their necessity, benefit, cost, timing, and implementation?
 - j. Are changes to the applicable configuration systematically reviewed to ensure that all effects of a proposed change are identified and that proper authorization is given in making a decision to incorporate a change?
 - k. Is the CM plan consistent with the quantity, size, scope, and complexity of the project involved?
 - l. Is the selection of facilities, equipment, or other items used for formal CM determined by the need to control inherent characteristics or to control the interface with other items?
 - m. Is the chosen CM plan tailored to the specific project and to particular products?
2. The Prime Contractor has established requirements for configuration identification.
 - a. Does technical documentation (baselines) exist that establishes the configuration identification?
 - b. Are technical baselines initially identified in the project plan controlled, detailed, and updated through conceptual design, preliminary design, definitive design, and the as

- built process?
- c. Does the basis for configuration identification change as an item progresses from initial conceptual design to final detailed design? Is the final identification the basis for technical, administrative, and management documents that concern or depend on configuration?
 - d. Are permanent copies of the controlled identification documents maintained throughout the life cycle of the project? Do these records include proposed and approved changes from the initial baselines?
 - e. The Prime Contractor has established requirements for configuration change control.
 - f. Is technical documentation changed as agreed to by USCG and as described in the Prime Contractor's CM plan?
 - g. Are changes proposed by the Prime Contractor screened by the Prime Contractor to determine whether USCG approval is required prior to implementation?
 - h. Are changes affecting the configuration of an item limited to those that are necessary or that offer significant benefit to USCG?
 - i. Are changes required under the following conditions: correcting deficiencies; incorporating approved changes in operational or logistic support characteristics; effecting substantial life-cycle cost savings; and correcting safety deficiencies?
 - j. Does the USCG project office ensure that all data required for effective evaluation of changes are made available to those individuals responsible for change decisions?
 - k. If prior approval is required, are the changes formally proposed to the USCG project office prior to implementation?
 - l. Does the USCG project office approve or disapprove changes or endorse and forward the proposed change to the next higher board if the change exceeds the project office approval authority?
 - m. If USCG approval is not required and the Prime Contractor implements the change, does the Prime Contractor's control system include the following: identifying the status of a proposed change; identifying the status of change implementation; and providing a method for auditing the change history?
 - n. Does the USCG project office establish priorities and time requirements for change proposal processing based on the nature of the change and its relative priority?
 - o. When a configuration change is approved by USCG, are the necessary instructions issued to ensure timely and economical implementation?
 - p. Are all affected project activities, such as engineering, logistics support, quality assurance, maintenance, and procurement involved in evaluating proposed changes?
 - q. Is change control accomplished through an established USCG configuration control board when required?
3. The Prime Contractor has established requirements for configuration recording and reporting.

- a. Are the status of proposed changes and the progress on approved changes identified and reported?
 - b. Is the USCG project office selecting specific data, choosing record and report formats, and maintaining the actual records?
 - c. Does the USCG project manager tailor the recording and reporting requirements contained in the request for proposal and contract to ensure that only the minimum information necessary to manage the configuration effectively and economically is provided?
 - d. Are the Prime Contractor's records and report formats accepted when they provide the necessary information?
 - e. Is the following information included in the configuration records and reports: technical documentation comprising the approved configuration identification; essential data (e.g., engineering test data); and contractual information required for each item subject to CM?
 - f. In addition, is the following information on changes included in the configuration records and reports: proposed changes to the configuration and the status, including the individual responsible for the change decisions; and approved changes to configuration, including the specific items to which the changes apply, and the activity responsible for implementation?
 - g. Does the CM plan have requirements for collecting, storing, handling, verifying, and reporting configuration status information?
4. The Prime Contractor has established requirements for waivers and deviations.
- a. Does the change process include a procedure for converting change proposals to an approved waiver or deviation?
 - b. Does a waiver constitute contractual relief after producing the end product?
 - c. Does a deviation constitute contractual relief prior to producing the end product?
 - d. Use of a CM plan is controlled and well defined.
 - e. Does planning for CM start with preparation of the project plan and continue as part of the project planning process?
 - f. Does CM continue throughout the product's life cycle until the product is removed from inventory?
 - g. Does the Prime Contractor submit a CM plan, detailing how it will manage and conduct CM in response to the requirements of a solicitation?
 - h. For major system acquisitions and major projects, does the project office include a CM plan as a component of the project management plan?
 - i. For projects that may not require a project management plan, is a CM plan still used?
 - j. Does each non-USCG organization participating in the engineering effort prepare and maintain a CM plan that integrates with the project-level plan?
 - k. If there are multiple participating organizations, is the project-level CM plan a

- cohesive assembly of the individual plans?
- l. Does the Prime Contractor identify in the plan the items proposed for inclusion in the contract? Are only those items that are basic to the satisfaction of the project objectives placed on contract?
 - m. Are Prime Contractor procedures and planning baselines prepared in sufficient detail to support USCG requirements for visibility, validation, and verification of the contractual items?
5. The basis for configuration technical baselines is well defined.
- a. Has the Prime Contractor defined the functional requirements baseline as the initial technical baseline founded on the functional requirements of the end product that are derived from the mission needs?
 - b. Has the Prime Contractor defined the technical requirements baseline as the basis for preliminary design that is established at the completion of conceptual design?
 - c. Does the technical requirements baseline consist of the documentation that describes the selected design approach and specifies its design and performance requirements?
 - d. Has the organization defined the design requirements baseline as the collection of documentation that defines the preliminary design?
 - e. Is the design requirements baseline established at the completion of preliminary design and is it the basis for the definitive design?
 - f. Is the final product configuration baseline established when the definitive design is complete?
 - g. Does the final product configuration baseline describe all the details of the design necessary for fabrication, assembly, construction, installation, and checkout of the facilities and equipment?
 - h. Is the final product configuration baseline composed of the specifications, "as-built" drawings, quality assurance provisions, test procedures, and operation and maintenance manuals?
6. The CM plans submitted by the Prime Contractor contain specific information and conform to a specified outline.
- a. Does the CM plan include a cover sheet that provides the nomenclature of the system or product, Prime Contractor, contract number, and date of issue?
 - b. Does the plan include an introductory section with a table of contents that describes the Prime Contractor's facilities, material features, organizational features, and other capabilities that have a determining effect on the CM plan?
 - c. Does the plan include an organization section describing the individual responsibilities, activities, policy directives, and organizational relationships/structures involved in the CM plan?
 - d. Does the plan include a technical baseline identification section that establishes the requirements for preparation, submission for USCG approval, and release of the USCG approved documentation that defines each required baseline?

- e. Does the Prime Contractor describe the method under which this will be done and the time period for accomplishment of each step?
 - f. Does the plan include a configuration change control section outlining the procedures for processing ECPs and requests for deviations or waivers?
 - g. Does the configuration change control section include specific requirements for interface control between respective groups?
 - h. Does the plan include a status recording and reporting section outlining the plans for data bank establishment, collecting, storing, handling, verifying, auditing, and reporting configuration status information?
 - i. Does the plan include a special considerations section addressing issues such as multiple organizations, use of commercial items, use of existing drawings or specifications, and innovations to improve the CM process?
7. The CM process flow will vary from project to project; however, a general flow in the CM process within USCG will occur.
- a. Does the USCG Headquarters Program Office approve baseline identification documents?
 - b. Does the USCG Headquarters Program Office approve an ECP if cost, schedule, or technical impact exceeds thresholds prescribed by the project charter or project management plan?
 - c. Does the USCG Field Organization/Project Office establish project procedures, define engineering change classes, and establish the CCB?
 - d. Does the USCG Field Organization/Project Office develop the functional requirements baseline in support of the objectives delineated in the justification for new start?
 - e. Does the USCG Field Organization/Project Office supply the Prime Contractor with copies of the technical requirements baseline documents?
 - f. Does the USCG Field Organization/Project Office review the Prime Contractor's ECPs, ensuring that all required elements are included?
 - g. Does the USCG Field Organization/Project Office notify the Prime Contractor of approval of the baseline and authorize the Prime Contractor to issue the baseline identification documents?
 - h. Does the USCG Field Organization/Project Office receive, evaluate, and approve or disapprove Class 1 ECP and engineering changes that require contract modifications?
 - i. Does the USCG Field Organization/Project Office authorize change implementation through the appropriate authority?
 - j. Does the USCG Field Organization/Project Office initiate any required revisions to an earlier or higher level baseline document and provide the results to all affected parties?
 - k. Does the USCG Field Organization/Project Office review Class 2 changes? If the project office does not concur with the Class 2 designation, do they notify the Prime

- Contractor to resubmit the change as Class 1?
8. The CM process flow will vary from project to project; however, a general flow in the CM process within the Prime Contractor's organization will occur.
 - a. On contract award, does the Prime Contractor implement the contractually required configuration management plan?
 - b. Does the Prime Contractor develop the configuration identification in support of the current baseline requirements?
 - c. Using the ECP format, does the Prime Contractor submit the proposal to issue baseline identification documents?
 - d. Does the Prime Contractor issue the baseline identification documents and maintain the document masters?
 - e. Does the Prime Contractor develop changes to configuration identification documents that may result from the normal engineering process, from other Prime Contractor-initiated ECPs, or from changes in project requirements directed by the USCG Project Office?
 - f. Does the Prime Contractor prepare and process ECPs per the configuration management plan?
 - g. Does the Prime Contractor segregate Class 1 and Class 2 ECPs and forward them to the USCG Project Office?
 - h. Does the Prime Contractor issue the revised configuration identification?
 - i. Does the Prime Contractor incorporate the authorized changes into the hardware/software per the revised documentation and track the incorporation of these changes?
 - j. Does the Prime Contractor oversee the inspection, acceptance, and checkout to verify that the "as-built" configuration of hardware/software is consistent with its current configuration identification?
 - k. If a change is required due to an identified deficiency, does the Prime Contractor develop new configuration identification, an ECP, and supporting documentation?
 - l. Does the Prime Contractor establish and maintain the administrative records and files necessary for support of the configuration management process?
 - m. Does the Prime Contractor prepare and distribute periodic configuration status reports per contract reporting instructions?
 9. The Prime Contractor has a method for controlling subcontractors and vendors.
 - a. Does the Prime Contractor have a plan for incorporating the externally developed items into the configuration identification?
 - b. Does the Prime Contractor have a method for coordinating changes to externally developed items?
 - c. Does the CM plan detail how contractors or vendors will be monitored for compliance?

- d. Does the CM plan detail how external documentation, data, and equipment will be tested, verified, accepted, and ultimately merged with the final project configuration?
10. The Prime Contractor has administrative methods for maintaining configuration management throughout the life cycle of the project.
- a. Has the Prime Contractor established administrative control programs to handle configuration changes resulting from maintenance, modifications, and testing activities?
 - b. For a project that is in operation, are the "as-built" drawings current and do they match the actual field configuration?
 - c. Are systems and equipment returned to their original design configuration following maintenance?
 - d. Is control over equipment and system status during the conduct of operations adequate to maintain the design configuration? Specific requirements for conduct of operations can be found in the Administrative Procedure for that topic.
 - e. Are operating personnel receiving and using the latest revisions of engineering drawings and specifications?
 - f. Are administrative controls established for the installation of temporary modifications that change the design configuration?
 - g. Do the temporary modification administrative controls make provisions for safety reviews, pre-installation design approval, independent verification of correct installation and removal, documentation of the temporary modification, update of the operating documents, training, marking of the temporary modification, and periodic audits of outstanding temporary modifications?
 - h. Are audits performed by the Prime Contractor to determine the effectiveness of the CM plan? Are the results of the audits definitive, identifying deficiencies and initiating corrective action where required?

APPENDIX F. ACRONYMS AND ABBREVIATIONS

| | |
|---------|---------------------------------------------------------------------------------------|
| ABL | Allocated Baseline |
| ACAT | Acquisition Category |
| ACI | Acquisition Configuration Identification |
| ADE | Acquisition Decision Event |
| ALC | Aviation Logistics Center |
| ALMIS | Asset Logistics Management Information System |
| ALT | Alteration |
| ANSI | American National Standards Institute |
| APL | Allocated Parts List |
| APO | Asset Project Office |
| ASCII | American Standard Code for Information Interchange |
| ASME | American Society of Mechanical Engineers |
| ASTM | American Society for Testing and Materials |
| ATIMS | Aviation Technical Information Management System |
| BLM | Business Line Manager |
| C4IT | Command, Control, Communications, Computers and Information Technology |
| C4ITSC | Command, Control, Communications, Computers and Information Technology Service Center |
| CAD | Computer Aided Drafting |
| CAGE | Commercial and Government Entity |
| CALS | Continuous Acquisition and Life-cycle Support |
| CAM | Computer Aided Manufacturing |
| CC | Configuration Control |
| CCB | Configuration Control Board |
| CCL | Commerce Control List |
| CDCA | Current Document Control Authority |
| CDM | Configuration Data Manager |
| CDMD-OA | Configuration Data Managers Database-Open Architecture |
| CDR | Critical Design Review |
| CDRL | Contract Data Requirements List |
| CFE | Contractor Furnished Equipment |
| CFO | Chief Financial Officer |
| CFR | Code of Federal Regulations |
| CG | Coast Guard |
| CGEA | Coast Guard Enterprise Architecture |
| CG-LIMS | Coast Guard Logistics Information Management System |
| CI | Configuration Item |
| CID | Commercial Item Descriptions |
| CITIS | Contractor Integrated Technical Information Services |
| CM | Configuration Management |

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| | |
|----------|-------------------------------------------------------------|
| CMIS | Content Management Interoperability Services |
| CM Mgr | Configuration Management Manager |
| CMMI | Capability Maturity Model Implementation |
| CMP | Configuration Management |
| CO | Commanding Officer |
| COM | Computer Operator Manual |
| CONOPS | Concept of Operations |
| COTS | Commercial Off the Shelf |
| CPARS | Contractor Performance Assessment Reporting System |
| CPFS | Computer Program Functional Specification |
| CPM | Computer Programming Manual |
| CSA | Configuration Status Accounting |
| DBDD | Data Base Design Description |
| DFAR | Defense Federal Acquisition Regulation |
| DHS | Department of Homeland Security |
| DID | Data Item Description |
| DoD | Department of Defense |
| DoDAAC | Department of Defense Activity Address Code |
| DoDISS | Department of Defense Index of Specifications and Standards |
| DR | Deficiency Report |
| DRM | Drawing Requirements Manual |
| DSP | Defense Standardization Program |
| DTL | Detail |
| DWG | Drawing Requirements Manual |
| EA | Enterprise Architecture |
| EAL | Electronic Asset Logbook |
| EAR | Export Administration Regulations |
| ECP | Engineering Change Proposal |
| EIA | Electronics and Information Technology Association |
| ELEXALTS | Electrical Alterations |
| EPROM | Erasable Programmable Read Only Memory |
| FAR | Federal Acquisition Regulation |
| FBL | Functional Baseline |
| FCA | Functional Configuration Audit |
| FCI | Functional Configuration Identification |
| FED | Federal |
| FMR | Federal Management Regulation |
| FSCM | Federal Supply Code for Manufacturers |
| FSM | Firmware Support Manual |
| GCO | Government Concept of Operations |
| GFD | Government Furnished Data |
| GFE | Government Furnished Equipment |
| GFP | Government Furnished Property |
| GSA | General Services Administration |

| | |
|---------|---------------------------------------------------|
| HW | Hardware |
| ICAPS | Interactive Computer Aided Provisioning System |
| ICWG | Interface Control Working Group |
| IDD | Interface Design Description |
| IDE | Integrated Data Environments |
| IDP | Interface Design Product |
| IEC | International Electro technical Commission |
| IEEE | Institute of Electrical and Electronics Engineers |
| IGES | Initial Graphics Exchange Specification |
| ILS | Integrated Logistics Support |
| ILSP | Integrated Logistics Support Plan |
| IP | Internet Protocol |
| IPDE | Integrated Product Data Environment |
| IPPD | Integrated Product and Process Development |
| IPT | Integrated Product Team |
| IRS | Interface Requirements Specification |
| ISO | International Organization for Standardization |
| IT | Information Technology |
| ITAR | International Traffic in Arms |
| IUID | Item Unique Identification |
| JETDS | Joint Electronics Type Designation System |
| KM | Knowledge Management |
| KO | Contracting Officer |
| LC | Life Cycle |
| LCI | Logistics Compliance Inspection |
| LCM | Life Cycle Management |
| LoB | Line of Business |
| LRR | Logistics Readiness Review |
| LSA | Logistics Support Analysis |
| MACHALT | Machine Alteration |
| MAR | Mission Analysis Report |
| MEARS | Multi-User ECP Automated Review System |
| MIL | Military |
| MOD | Modification |
| MPC | Maintenance Procedure Card |
| MSAM | Major Systems Acquisition Manual |
| MWO | Modification Work Order |
| NASA | National Aeronautics and Space Administration |
| NDI | Non-Developmental Item |
| NESSS | Naval and Electronic Supply Support System |
| NGS | Non Government Standards |
| NOR | Notice of Revision |
| NSN | National Stock Number |
| NTNO | Navy Type Navy Owned |

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| | |
|---------|-----------------------------------------|
| O&D | Organizational and Depot |
| O&M | Operations and Maintenance |
| OCD | Operational Concept Document |
| OEM | Original Equipment Manufacturer |
| OJT | On the Job Training |
| ORD | Operational Requirements Document |
| ORDALTS | Ordnance Alterations |
| OT&E | Operational Test and Evaluation |
| PBL | Product Baseline |
| PCA | Physical Configuration Audit |
| PCO | Procuring Contracting Officer |
| PDES | Product Data Exchange Using Step |
| PDM | Product Data Management |
| PDR | Preliminary Design Review |
| PECP | Preliminary Engineering Change Proposal |
| PG | Process Guide |
| PLM | Product Line Managers |
| PM | Program Managers |
| PPL | Provisional Parts List |
| PPR | Project Planning Review |
| PR | Procurement Request |
| PRF | Performance |
| PRO | Project Residence Office |
| PROM | Programmable Read Only Memory |
| QA | Quality Assurance |
| RFD | Request for Deviation |
| RFP | Request for Proposal |
| RFW | Request for Waiver |
| RM | Requirements Management |
| ROM | Read Only Memory |
| SAE | Society of Automobile Engineers |
| SAM | Shore Asset Management |
| SC | Service Center |
| SCI | Software Configuration Item |
| SCM | Software Configuration Management |
| SCN | Specification Change Notice |
| SCOM | Software Center Operator Manual |
| SDD | Software Design Document |
| SDF | Software Development file |
| SDL | Software Development Library |
| SDP | Software Development Plan |
| SDPP | Software Design Product Package |
| SDR | System Definition Review |
| SE | Systems Engineering |

| | |
|----------|--------------------------------------------------|
| SFLC | Surface Forces Logistics Center |
| SGML | Standard Generalized Markup Language |
| SHIPALTS | Ship Alterations |
| SILC | Shore Infrastructure Logistics Center |
| SIOM | Software Input/Output Manual |
| SIP | Software Installation Plan |
| SOW | Statement of Work |
| SPS | Software Product Specification |
| SQA | Software Quality Assurance |
| SRR | System Requirements Review |
| SRS | System Requirements Specification |
| SSDD | System/Subsystem Design Description |
| SSS | System/Subsystem Specification |
| STD | Software Test Description |
| STEP | Standard for the Exchange of Product Model Data |
| STINFO | Scientific and Technical Information |
| STP | Software Test Plan |
| STR | Software Test Report |
| STrP | Software Transition Plan |
| SUM | Software User Manual |
| SVD | Software Version Description |
| SW | Software |
| T&E | Test and Evaluation |
| TCTO | Time Compliance Technical Order |
| TD | Technical Data |
| TDP | Technical Data Package |
| TECD | Training Equipment Change Directive |
| TLR | Top Level Requirement |
| TMAPS | Technical Manual Application System |
| TMCR | Technical Manual Contract Requirements |
| TMINS | Technical Manual Identification Numbering System |
| TRR | Test Readiness Review |
| TSR | Technical Scope Review |
| TT&P | Tactics, Techniques and Procedures |
| UID | Unique Identification |
| USCG | United States Coast Guard |
| USML | United States Munitions List |
| USN | United States Navy |
| VID | Vendor Item Description |
| VLS | Vessel Logistics System |
| WBS | Work Breakdown Structure |
| XRIC | X-Repairable Identification Code |