



Procedures and Guidelines (PG)

DIRECTIVE NO. 740-PG-1410.2.1

EFFECTIVE DATE: November 20, 2013

EXPIRATION DATE: November 20, 2018

APPROVED BY Signature: Dennis Vander Tuig

NAME: Dennis Vander Tuig

TITLE: Chief Information Officer (Acting)

COMPLIANCE IS MANDATORY

Responsible Office: 740 / Program Integration & Management Division (PIMD)

Title: Configuration Management Procedures and Guidelines (CM PG)

PREFACE

P.1 PURPOSE

This procedures and guidelines (PG) establishes the standard practices for Configuration Management (CM) within Information Technology & Communication Directorate (ITCD) and establishes the requirements for the organization, programs, and projects to establish and execute efforts using a Configuration Management Plan (CMP). This Procedure defines the objectives, applicability, and responsibility for implementing and maintaining a Configuration Management Plan for the organization, programs, and projects.

This document, and the CM practices contained within, shall be adopted using one of the following approaches:

- Report the adoption of this PG as the CMP in its entirety via a reference within the documented Project Plan (PP) for the effort; or,
- Create an organization-, service-, activity-, or program/project-specific CMP using the Project Management Office (PMO) approved templates to document how the organization, service, activity, or program/project is adopting this CM PG in its entirety, stating any effort-specific data.

This PG can be adopted for use by other organizations following the process identified in Goddard Procedural Requirement (GPR) 1410.1G, Directives Management.

P.2 APPLICABILITY

This procedural guidance shall apply to all organizations, services, activities, programs and/or projects within ITCD.

Given this PG was developed using best practices for configuration management, any Goddard IT project required to follow NPR 7120.7 and/or 7150.2A can opt to use these configuration management processes to manage IT projects.

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P.3 AUTHORITY

- a. GPR 1410.2D Configuration Management
- b. NPR 7120.7 NASA Information Technology and Institutional Infrastructure Program and Project Management
- c. NPR 7123.1A NASA Systems Engineering Process and Requirements
- d. NPR 7150.2 NASA Software Engineering Requirements

P.4 REFERENCES

The primary requirements and NASA resources that this PG is based upon include the following:

NASA Document	Title
GPR 1410.2	Configuration Management
NASA STD-005	NASA Configuration Management Standard
NPR 7120.7	NASA Information Technology and Institutional Infrastructure Program and Project Management
NPR 7123.1A	NASA Systems Engineering Process and Requirements
NPR 7150.2	NASA Software Engineering Requirements

Additional NASA resources that provide reference information on configuration management include, but are not limited to:

NASA Document	Title
NPR 2800.1B	Managing Information Technology
NPR 7120.4D	NASA Engineering and Program/Project Management Policy
NASA SP-207-6105	NASA Systems Engineering Handbook
740-PG- 7120.7.2	Information Technology (IT) Project Management Lifecycle Process

Industry resources also used in the development of this PG include:

- a. Project Management Institute (PMI) Project Management Book of Knowledge (PMBOK, 4th edition)
- b. Carnegie Mellon’s Software Engineering Institute (SEI) Capability Maturity Model Integration – Service (CMMI-Svc), Version 1.3: Configuration Management

P.5 CANCELLATION

None.

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P.6 SAFETY

None.

P.7 TRAINING

Training on the contents of this PG is provided by PIMD.

There are many CM training courses currently available via the System for Administration, Training and Educational Resources for NASA (SATERN), including but not limited to:

- Basic Principles of Practical Configuration Management
- Advanced Configuration Management
- Configuration Management
- Configuration Management and Data Management
- Configuration Management, Risks, and Incidents in Software Testing
- Software Configuration Management and Data Management
- Managing for Rapid Change and Uncertainty
- Controlling Changes and Closing a Project (PMBOK Guide Fifth Edition)
- Integrated Project Change Control and Close
- Leading Teams through Change

P.8 RECORDS

The following records are produced by CM activities, and shall be retained by ITCD in accordance with NASA records retention policies:

Record Title	Record Custodian	Retention
Completed Change Request Form(s)	Performing Organization	* NRRS 8/107: for program/project records having operational value to the Agency throughout the program/project life. Temporary. Destroy/delete between 5 and 30 years after program/project termination.
Completed Change Request Log		
Completed Change Impact Analysis Form(s)		
Configuration Management Plan		
Completed Configurable Item Inventory		

* NRRS – NASA Records Retention Schedule ([NPR 1441.1](#))

P.9 MEASUREMENT/VERIFICATION

ITCD organizations, services, activities, programs and projects shall collect the following configuration management metrics:

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- Total number of Configuration Items (CIs)
- Category or Type of Change (i.e., Enhancement, Emergency Bug Fix)
- Number of Configuration Change Requests (CCRs) by Category/Type
- Estimated Schedule Impact of CCRs
- Estimated Cost of CCRs

ITCD's organization, program or project manager, or assigned lead shall track the status of CIs and CCRs throughout the effort's lifecycle.

ITCD's organization, program or project manager, or assigned lead will report status of the effort's CM activities including the number and status of CIs and CCRs, as requested by the Responsible Management Official (RMO), the IT Project Management Office (PMO), or other ITCD leadership or sponsoring organization.

P.10 DOCUMENT STANDARDS

In this document, a requirement is identified by "shall," a good practice by "should," permission by "may" or "can," expectation by "will," and descriptive material by "is."

Additionally, the first use of any CM-specific term or acronym has been identified using the convention of bold and italicized font-face text (i.e., "***Configuration Management***"). The definitions for these terms can be found in [Appendix A: Terms, Definitions & Acronym Lists](#).

In this document the term "*effort*" is used synonymously to reflect ITCD's services, activities, programs and/or projects (the terms "services, activities, and projects" are defined in GPR 2800.2), and the terms "*Organization, Program or Project Manager, or Assigned Lead*" are used to describe the appropriate party that is responsible for the overall success and execution of the ITCD effort.

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PROCEDURES

1 CONFIGURATION MANAGEMENT OVERVIEW

1.1 GOAL OF CONFIGURATION MANAGEMENT

Configuration Management (CM) is a process that establishes and maintains consistency of a product's attributes with the requirements and product configuration information throughout the product's lifecycle and is a management discipline applied over an effort's lifecycle to provide visibility into and to control changes to the performance of functional and physical characteristics of an effort's deliverables.

The primary objectives of a *Configuration Management Plan* (CMP) are to implement and execute against the following disciplines:

- Configuration Management Planning;
- Configuration Item Identification;
- Configuration Change Control;
- Configuration Status Accounting; and,
- Configuration Audit.

ITCD's CM practices documented in this PG comply with NASA's configuration management requirements and are critical to successfully manage the following aspects of ITCD efforts:

- Requirements Management;
- Change Management;
- Release Management;
- Data Management;
- Records Management;
- Document Control; and,
- Library, or Repository, Management.

CM establishes and maintains control of the integrity of requirements, systems, hardware, software, firmware, and documentation items including management plans, technical specifications, drawings that the effort produces or uses. This is accomplished by the use of configuration identification, configuration control, configuration status accounting, and configuration audits.

ITCD's CM practices will ensure that any change to the effort's identified deliverables' configuration is beneficial, that approved changes may be effected without adverse consequences, and that changes are controlled and managed for each ITCD effort.

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1.2 CONFIGURATION MANAGEMENT CONCEPTS

1.2.1 Configuration Management Planning

The purpose of configuration management planning is to define configuration management procedures, roles, responsibilities, and to identify effort-specific *Configuration Items* (CIs) that shall be managed by CM control to avoid errors related to incomplete testing and incompatibilities with other CIs. CIs are a designation applied to the fundamental unit of a configuration management process that has been determined to be subject to CM requirements. Configuration Items (CIs) include, but are not limited to: requirements, hardware, software, systems, networks, documentation, processed materials, services (e.g., transportation or lifting operations), or any discrete portions thereof treated as a single entity in the configuration management process.

The *Configuration Manager* develops the *Configuration Management Plan* (CMP) in parallel with the efforts' other management planning functions (i.e., Lifecycle, Risk, Requirements, and Scheduling management). The role of Configuration Manager is a functional role that may or may not be a separate resource depending on effort's size, complexity, or constraints.

1.2.2 Identification of Configuration Items

Configuration Identification is the systematic process to select the product(s) and/or products' attributes, organizing associated information about the attributes, and stating the attributes.

The primary purpose of configuration identification is to establish a baseline for use in tracking the changes to a *Configuration Item* (CI) throughout its lifecycle. All CIs will be assigned a unique identifier and have a description kept in the *Configuration Items Inventory*.

Configuration identification requires unique identifiers for a product and its technical documentation. Configuration identification includes selecting configuration items, assigning and applying unique identifiers to a product, its components, and associated documents; and maintaining revision relationships to that configuration or *Baseline*.

Baselines are used to establish releases and perform release management, especially in the case of hardware and software deployments. A *Release* is a set of new or changed CIs that are tested and will be implemented into production together. *Release Management* is a process that is aimed at building, testing and delivering the capabilities specified by the approved requirements and design baseline. This process focuses on the protection of the live production environment and its services through the use of formal procedures and controls that are supported by the configuration management process.

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1.2.3 Configuration Change Control

Configuration Change Control is the proposing, justification, evaluation, coordination, disposition and implementation of proposed changes to a controlled configuration item. Changes should only be considered if they add value in one of the following ways:

- Provide new capabilities;
- Enhance support;
- Introduce new technology;
- Effect product development;
- Correct defects;
- Correct problems and prevent recurrence;
- Eliminate safety hazard;
- Implement pre-planned product improvement;
- Reduce cost/increase efficiency; and,
- Prevent schedule slippage.

The objective of Configuration Change Control is to ensure that changes are properly and completely defined and presented to provide the necessary stakeholders a way to consider the schedule and performance impacts of a proposed change, and change implementation.

Configuration Change Control includes a governance aspect. A **Configuration Control Board** (CCB) at the effort level (or higher, as appropriate) will be leveraged to address the governance aspects of change control.

A **CCB Charter** establishes the existence of a CCB and defines its scope of authority, identifies its membership and delineates responsibilities of its members. It also describes the procedures by which the CCB will manage configuration changes in the most efficient manner while minimizing the business impact, costs, and risk.

1.2.4 Status Accounting & Audits

Configuration Status Accounting (CSA) is the CM function responsible for verifying the accuracy of configuration information throughout the CI's lifecycle. CSA focuses on capturing and recording the status of requested, approved, or pending changes, configuration baselines, including the outcome of past changes to baselines and configurations.

Configuration Audits are the CM function that review processes and products to ensure compliance with requirements; verifying that products have the required attributes and conform to the released product definition information. Configuration audits are performed to validate and verify the successful implementation and execution of the effort's CMP, and may be divided into separate functional and physical configuration audits. Results of the audit process support the identification of process improvements and lessons learned.

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1.2.5 The CM Lifecycle

CM incorporates two disciplines: the *management* of the configuration items which involves identifying, communicating, and storing configuration details of work products; and the *governance* of how these items change throughout the effort's lifecycle.

The governance discipline involves the execution of CCB meetings/decisions, and the configuration audits that are required to verify CM procedures are being followed and are effectively controlling the effort's CIs.

Configuration management occurs in parallel with the planning, execution, monitor and control, and closure phases of the Project Management Lifecycle.

The CM lifecycle is an iterative process requiring continuous identification, monitoring, and controlling of CM activities throughout the lifecycle of any effort. As depicted in Figure 1 that follows, CM includes five elements:

1. **Configuration Management Planning** – Deciding how to approach and conduct the CM activities, including: scheduling recurring activities, tool selection and set up, roles and responsibilities assignment.
2. **Configuration Identification** – An initial and continuous effort to identify, quantify, document, and baseline Configurable Items.
3. **Configuration Change Control** – Implementing procedures for the evaluation and approval of configuration changes.
4. **Configuration Status Accounting** – Capturing the status of pending changes, configuration baselines, outcome of past changes to baselines and configurations.
5. **Configuration Audits** – The verification of the CMP; identification process improvements and lessons learned.

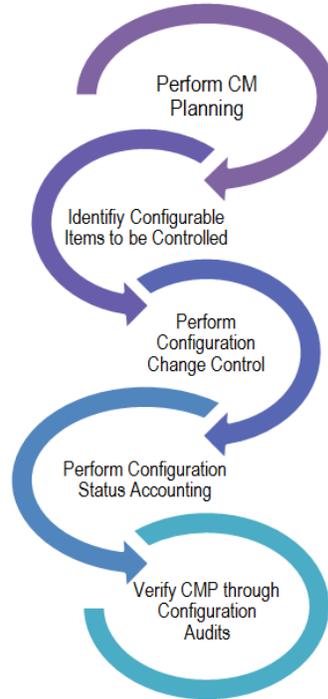


Figure 1: CM Lifecycle

1.2.6 CM Stakeholders, Roles & Responsibilities

Table 1: CM Stakeholders, Roles & Responsibilities

Stakeholder Roles	Responsibilities
<p>Organization, Program or Project Manager, Assigned Lead</p>	<ul style="list-style-type: none"> ✓ Complies with CM PG / documents effort-specific CMP ✓ Establishes the Configurable Items Inventory ✓ Ensures the effort follows CMP and CCB processes ✓ Schedules and manages recurring CCB activities; ensures these activities are reflected in the effort’s schedule ✓ Identifies and analyzes Configurable Items (CIs) ✓ Identifies and documents configuration baselines; manages issues to closure ✓ Assigns ownership of approved Configuration Changes ✓ Monitors execution of approved CCRs ✓ Regularly communicates and reports CCR status to PMO, RMO, Management, Senior Leadership, and other appropriate stakeholders ✓ Escalates Emergency CCRs to RMO and Management/Senior Leadership when appropriate

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Table 1: CM Stakeholders, Roles & Responsibilities

Stakeholder Roles	Responsibilities
Configuration Manager	<ul style="list-style-type: none"> ✓ Assigns CCR Identification numbers ✓ Coordinates CCB agenda with CCB Chairperson ✓ Schedules recurring CCB meetings ✓ Provides copies of CCRs, supporting data, and due dates to CCB members ✓ Responsible for processing CCRs ✓ Ensures all affected requirements are identified ✓ Records, maintains, and reports the information needed for managing the configuration effectively, including a list of approved configuration identification, the status of proposed changes to the configuration, and the implementation of approved changes ✓ Verifies that CM is implemented throughout an effort's lifecycle in accordance with the standards and policies established by the CM PG ✓ Performs Configuration Status Accounting (CSA) ✓ Monitors all tasks involved in the CM function to ensure that the CM procedures are being adhered to and properly implemented
Team Member(s)	<ul style="list-style-type: none"> ✓ Participates in recurring CM activities ✓ Identifies and documents Change Requests ✓ Performs Impact Assessment of CCRs ✓ Identifies and communicates status of approved CCRs ✓ Supports CM approach and helps define intended outcomes of proposed changes to CIs ✓ Regularly communicates and reports CCR status; identifies and documents outcomes of approved CI changes ✓ Escalates CCR classification, when applicable ✓ Reviews the status of all open change requests ✓ Prioritizes approved change requests as necessary ✓ Executes approved changes to CIs ✓ Tables change requests for later discussion by placing in a 'Hold' status ✓ Recommends a release date for those change requests which are considered time critical ✓ Recommends changes to the CCB Charter ✓ Reviews CCB minutes ✓ Monitors progress on action items assigned by the Board

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Table 1: CM Stakeholders, Roles & Responsibilities

Stakeholder Roles	Responsibilities
Project Management Office (PMO)	<ul style="list-style-type: none"> ✓ Offers CM support and guidance via available CM tools, including: CCRs, the Change Impact Analysis Form, CII template, training, and mentoring ✓ Receives and reviews CCR status with PMs or Assigned Leads on a regularly recurring basis, i.e., Project Status Reviews ✓ Integrates and aggregates project configuration information across ITCD for status reporting to Management/Senior Leadership ✓ Confirms compliance to CM PG (or effort-specific CMP) requirements ✓ Validates CM artifacts/work products that are the outcome of executing against the approved CM PG or effort-specific CMP ✓ Reviews, approves (or rejects) CM tailoring or waiver requests ✓ Escalates non-conformance/compliance to Management/Senior Leadership when appropriate
Responsible Management Official (RMO)	<ul style="list-style-type: none"> ✓ Chairs the regularly scheduled, and ad-hoc (or emergency) CCB meetings ✓ Calls emergency meetings ✓ Approves the CCB Agenda (Items brought to a CCB meeting that are not contained in the Agenda may be discussed at the discretion of the Chairperson) ✓ Facilitates the CCB decision process for the disposition of approved changes brought before the Board within the scope of its authority ✓ Coordinates incorporation of approved CCB changes ✓ Ensures that originators of proposed changes are informed of decisions concerning disposition ✓ Approves all actions of the CCB that bear on Agency or Center policy and objectives ✓ Reviews and approves configuration baseline(s) ✓ Advises the CCB of the policy implications of approved CCB actions
Management/Senior Leadership	<ul style="list-style-type: none"> ✓ Reviews and approves configuration change requests; reviews and approves related budget or schedule impacts ✓ Authorizes expenditures of resources for configuration changes ✓ Makes control decisions (analyze, decide, execute) ✓ Coordinates communication with Management, Senior Leadership, Center Leadership, and NASA HQ, as appropriate

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Table 1: CM Stakeholders, Roles & Responsibilities

Stakeholder Roles	Responsibilities
Customer(s) and Affected Stakeholders	<ul style="list-style-type: none">✓ Identifies and communicates configuration information✓ Is informed or consulted about configuration baselines✓ Is informed or consulted (and provides approval, when appropriate) in configuration management planning

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2 CM PROCESSES

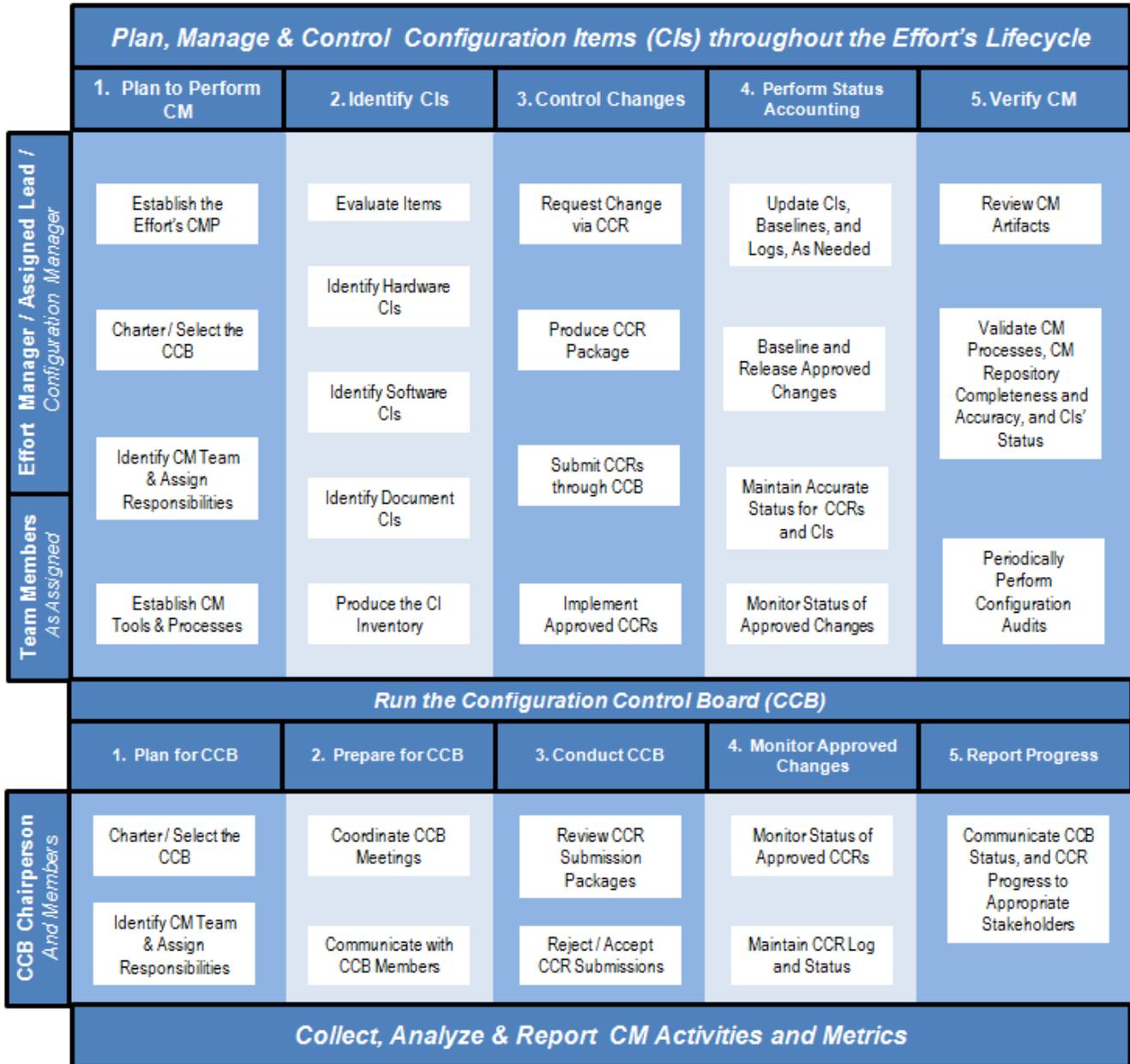


Figure 2: CM & CCB Processes Overview

CM is a full lifecycle activity performed for ITCD's organizations', activities', services', programs' and/or projects' components including: requirements, hardware, software, systems, networks, and documentation identified as configuration items.

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The following five disciplines of configuration management shall be applied across all ITCD efforts:

- Configuration Management Planning;
- Configuration Item Identification;
- Configuration Change Control;
- Configuration Status Accounting; and,
- Configuration Auditing.

Efforts related to hardware or software deployments shall use CM controls and release management processes to manage verification and implementation of approved changes into the target production environment.

Hardware and software deployment efforts in ITCD shall document their release management and delivery process within their CMP, Project Plan, or other applicable management plan (i.e., Software Development Plan).

2.1 PLAN TO PERFORM CONFIGURATION MANAGEMENT

Configuration Management Planning shall occur during the planning and preparation of an ITCD effort.

ITCD organizations, program or project manager, or assigned lead shall ensure that their effort's deliverables are known and are reflected in the effort's plan (i.e., project plan).

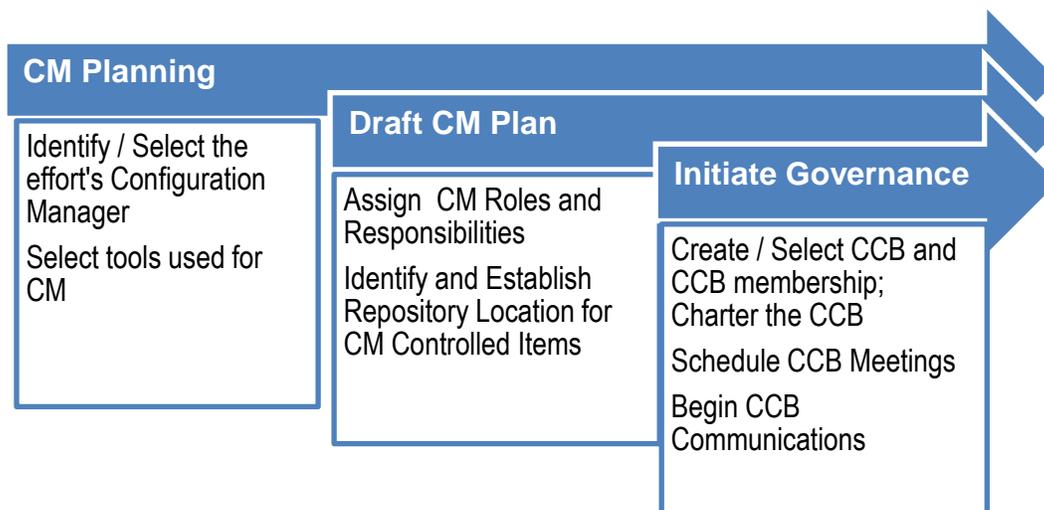


Figure 3: CM Planning

As depicted in Figure 3, the CM Planning process consists of the following steps:

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- Identification, selection of a Configuration Manager for the effort (or assignment of Configuration Manager responsibilities to a resource as an alternate or additional role);
- Selection of the tools, templates, standards, etc. that will be used to perform CM for the effort;
- Documentation of the CM Plan for the effort;
- Identification and setup of a repository for the retention and control of the effort's configuration items;
- Creation of (or selection of an existing) *Configuration Control Board* (CCB) and identification of required participants
- Coordination and scheduling of CCB Meetings and ongoing communication and reporting of CCB status

ITCD efforts shall have a CMP that describes the tracking, controlling, status reporting and auditing of items within the scope of the effort.

There are a number of CCBs operating within ITCD; therefore each ITCD effort will select or establish a CCB that will perform CM functions throughout its lifecycle.

2.2 CONDUCT CONFIGURATION ITEM IDENTIFICATION

Configuration Item (CI) Identification is the process of separating the elements of a system into individually identified subsets for managing their development. They are selected based upon the need to control the item's inherent characteristics, including interface with other items.

CIs are treated as a single entity in the configuration management process, even if a CI is comprised of multiple artifacts. Documents that define project schedules, project requirements, project scope, design, build/production, validation, and interfaces of products shall be placed under CCB control.

All CIs including documentation shall be identified in the effort's *Configuration Item Inventory (CII)*. The term Configuration Management Database (CMDB) may be used interchangeably with CII. An approved CII template has been established for use on IT projects and is available for ITCD's use and tailoring.

Examples of project products and deliverables that shall be identified as CIs include, but are not limited to: IT systems, hardware, and software including Commercial Off The Shelf (COTS), Government Off The Shelf (GOTS), or in-house developed software produced at Goddard; technical specifications, requirements, and related documentation including drawings; inventories of items used for project purposes; and environments developed and maintained for IT project purposes.

Other project deliverables, including products and documents, may be placed under CCB control as warranted.

ITCD efforts shall identify effort-specific CIs and shall establish and maintain the integrity of these items throughout the effort's full lifecycle.

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The organization, program or project manager, or assigned lead shall be responsible for the selection/identification and verification of all CIs for the duration of the effort’s lifecycle.

Steps to collaboratively perform configuration identification for any ITCD effort are depicted in Figure 4.

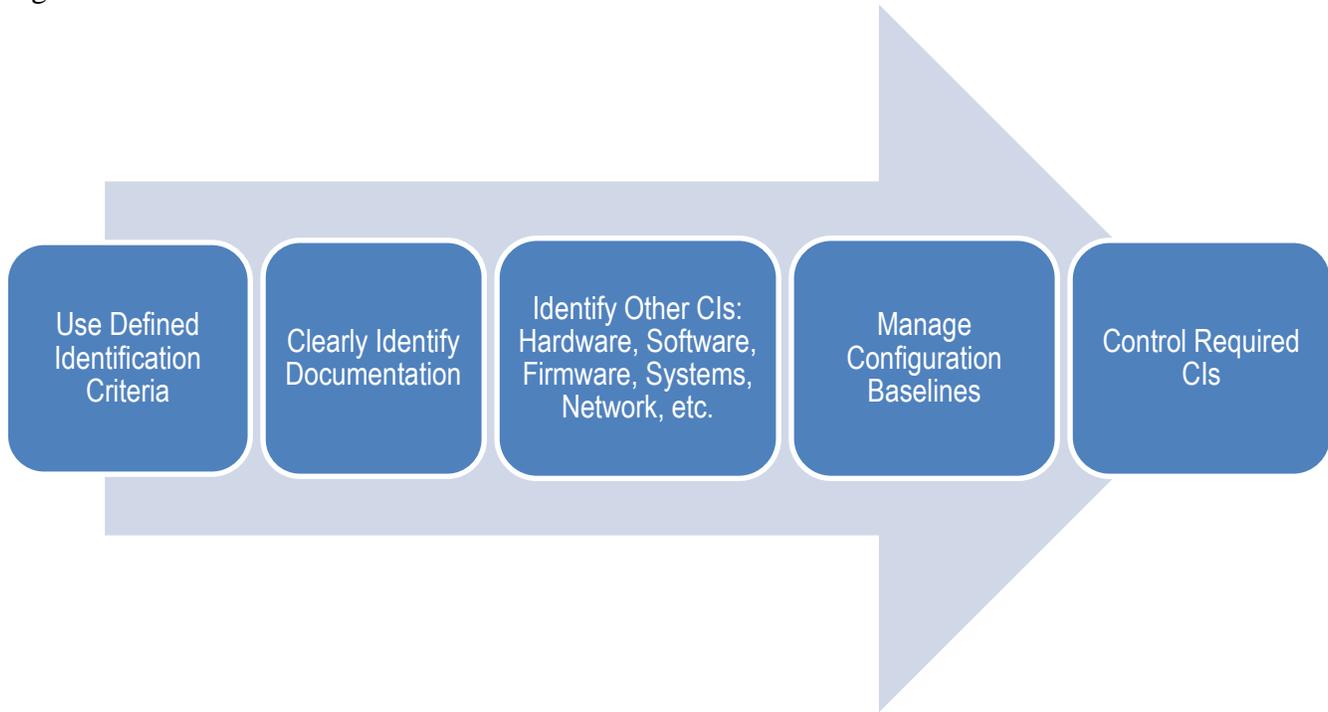


Figure 4: Configuration Identification

2.2.1 Use Defined Identification Criteria

As products are developed, new CIs will be identified and included as appropriate into the effort’s configuration baseline. CIs may include, but are not limited to: requirements, software, hardware, system, network, technical and management documentation, plans, specifications, drawings, and commitments or agreements; refer to Section 2.2.5 Maintain Required CIs for additional examples.

ITCD shall use one or more of the following criteria for identification of an item as a CI:

- May be used, operated, or maintained by multiple entities;
- May change over time due to changes in scope, requirements, corrections, enhancements, etc. and require traceability to a prior baseline (to support roll-back, back-up, or restore capabilities), as a result;

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- May possess attributes defined by policy, law, or other authority that require it be traceable, for example: items sensitive to safety, security, or accessibility or are critical to overall system performance;
- Be acquirable in the assembled condition as a subsystem or system-level spare;
- Be capable of separate qualification and/or acceptance testing; and,
- Be a commitment or agreement.

2.2.2 Clearly Identify Documentation

All controlled documents shall have clear document identification.

The first page (cover page) of all controlled documents shall contain, as a minimum, the following data:

- Unique document number
- Revision level
- Document title
- Name and organizational code of responsible organization
- Security classification, if applicable (e.g., Sensitive But Unclassified – SBU, etc.)
- Footer to indicate where to confirm the proper revision or approval status; for example:

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All controlled documents shall capture and reflect a history of approved changes made and shall contain version description, version date, affected content, authorizing CCR number(s) and CCR approved date. A Configuration Change Request (CCR) is any formal request to make a change to an item under change control.

NASA complies with the *International Traffic in Arms Regulations* (ITAR) that stipulates the need to control access to certain documentation. If an ITCD effort meets ITAR criteria, that effort shall clearly identify the document as an ITAR sensitive artifact. No foreign partners will be included in the distribution of ITAR sensitive documentation. The following U.S. Citizens & Permanent Resident ITAR statement shall be included on the cover of all ITAR sensitive documentation, as depicted in Figure 5.

ITAR RESTRICTED DATA

U.S. Citizens / US Permanent Residents (Green Card Holders) Only

The unclassified technical information included herein is controlled under the ITAR, 22 CFR 120- 130, by the U.S. Department of State. Transfer of this information to a foreign person or entity requires an export license issued by the U.S. Department of State or an ITAR exemption to the license requirement prior to the export or transfer.

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Figure 5: Change Control Process Flow

2.2.3 Identify Other CIs: Hardware, Software

For non-documentation CIs, such as hardware, software, firmware, systems, or network CIs, configuration identification shall be established in the form of unique numbering.

All hardware/software CI parts, components, and assemblies shall be marked with a unique identifier (i.e., part number, asset tag, license key, or serial number).

Part numbers shall be documented within the technical documentation or specification.

All certifications shall use the assigned part numbers and serial numbers to ensure traceability.

2.2.4 Manage Configuration Baselines

A configuration baseline shall be used to identify an approved description of the attributes of a CI (product, deliverable, or other designated item) at a point in time, and provides a known configuration to which requested and approved changes are addressed.

A baseline shall be established when the software, hardware, or documentation is approved by the appropriate configuration control authority and released for use.

Baselines shall be documented by approved configuration identification documents, and CCRs that are the basis for control of changes to the CIs. Once a configuration baseline is established, changes must be documented via a CCR form submission. CCR forms are reviewed and approved by the CCB.

2.2.5 Control Required CIs

ITCD efforts shall maintain the following standard project management CIs, at a minimum:

- Formulation Authorization Document (FAD)
- Project Plan
- Scope Document
- Schedule
- System Requirements Document (SRD)
- System Requirements Review (SRR) presentation materials, meeting minutes, and related actions assigned as outcomes of this formal requirements review
- Functional Design Document (FDD)
- Configuration Change Requests (CCRs)
- Preliminary Design Review (PDR) and Critical Design Review (CDR) presentation materials, meeting minutes, and related actions assigned as outcomes of these formal design review
- Technical Architecture Document(s)

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- Interface Control Documentation (ICDs)
- Other formal reviews presentation materials, meeting minutes, and related actions assigned as outcomes of the review, including, but not limited to: Non-Advocate Review (NAR), Test Readiness Review (TRR), or Operational Readiness Review (ORR)
- Other supporting management plans produced for the effort, including, but not limited to: schedule management plan, risk management plan, configuration management plan, test plans)

Other required CIs applicable to the specific ITCD effort as dictated by NPR 7120.7; including technical documentation, drawings, specifications, hardware, software shall be identified and managed using approved configuration management processes.

2.3 CONTROL CONFIGURATION CHANGES

Initiators of documents and document revisions, or other requests for changes to approved CIs shall submit CCRs to the appropriate CCB for consideration.

The ITCD effort's Configuration Manager shall assign a CCR identification number, determine review requirements in coordination with the CCB Chairperson, and schedule the CCB meeting. The CCB should normally meet within two weeks of receipt of the CCR.

The Configuration Manager shall provide copies of CCRs, supporting data, and a due date to CCB members.

The Configuration Manager shall be responsible for processing CCRs and checking to ensure all affected requirements are identified.

The Configuration Manager will assess CCRs for completeness and accuracy, and verify the integrity of each baseline and revision thereafter.

The Configuration Manager, in conjunction with the CCR originator, shall recommend a priority classification to each proposed or requested change.

The organization, program or project manager, or assigned lead shall determine the final priority classification.

Figure 6 details the priority classifications and the review and approval parameters for each classification.

Change Classification	Classification Definition	CCB Action Required
Normal	A non-routine change requested within the normal lead time for review, communication, and approval	Approval
Urgent	A non-routine change with a reduced time to	Approval

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Change Classification	Classification Definition	CCB Action Required
	implement based on a critical business need	
Emergency	A change that resolves an incident or problem deemed critical to business continuity and for which a work-around is not sufficient	Approval

Figure 6: Change Classifications

Normal, *Urgent*, and *Emergency changes* must be approved by the CCB before being allowed to affect the production environment. If a consensus of voting CCB members cannot be obtained within a reasonable time period, the Chairperson will have the authority to approve Emergency changes.

The Configuration Manager is responsible for compiling a complete master CCB package that will be maintained by the CCB as a case file for historical purposes.

A CCB package shall include, at a minimum, the following items:

- CCR Form
- CCR Review Comments
- Contractor Correspondence (if applicable)
- Effort Correspondence (if applicable)
- CCB Agenda
- CCB Minutes
- Signature Page
- Action Items (for verification)

CCB members shall review the information and provide their recommendations for dispensing the requested change, (i.e., acceptance/rejection status) to include: change approval, approval with requested change(s), disapproval, withdraw/cancel, or place on hold.

To adequately evaluate any proposed change, all requested changes shall be fully documented within the CCR and the CCR Impact Analysis (CCRIA) Form; refer to Section 3 for more information on these and other CM forms.

This documentation shall include: description of the change and anticipated impacts (i.e., to resources, cost, and schedule), risks, effectiveness, value, timeline, and intended outcome.

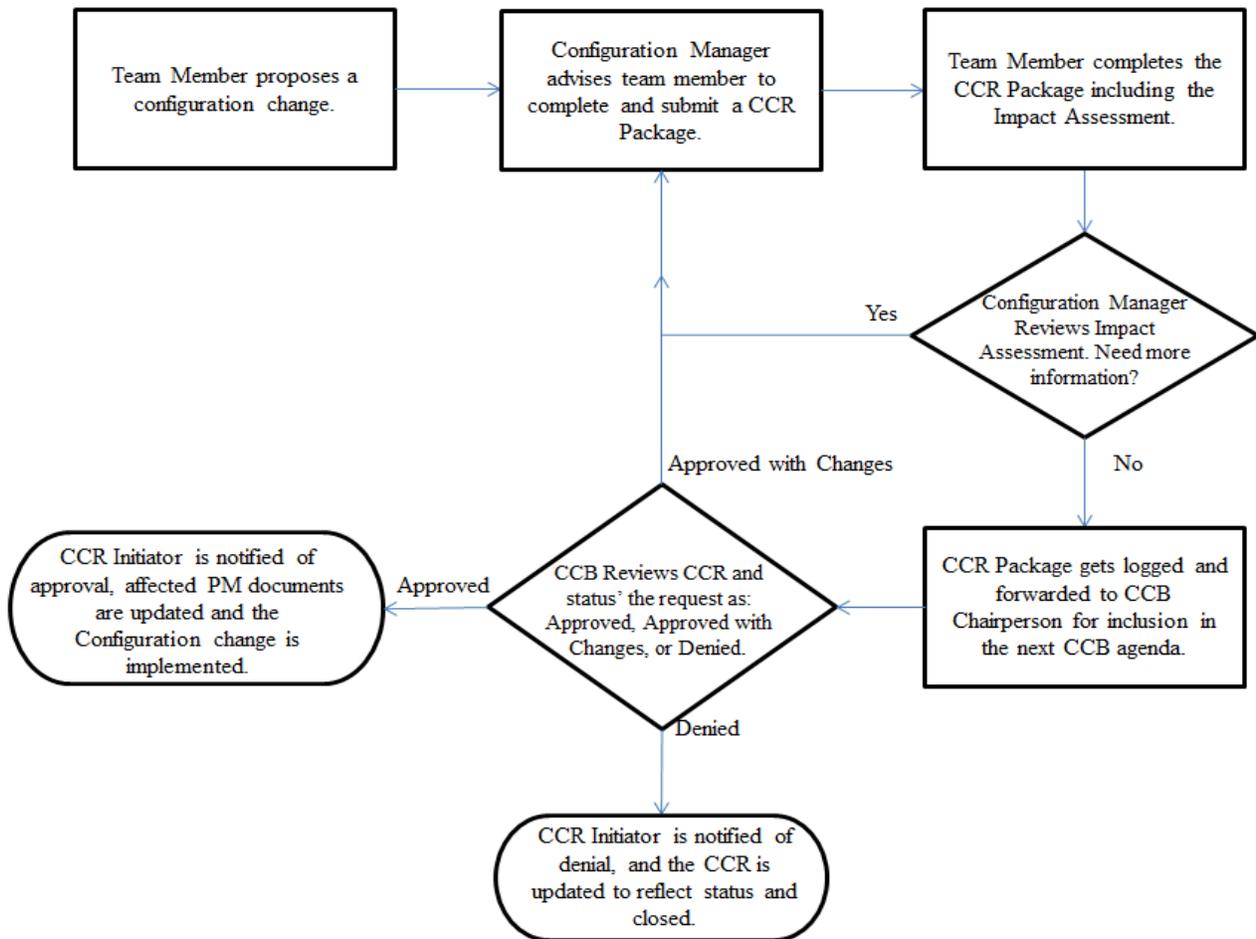


Figure 7: Change Control Process Flow

ITCD templates for both CCRs and CCR Impact Assessment forms have been established for use on IT projects and are available for ITCD’s use and tailoring.

2.4 PERFORM CONFIGURATION STATUS ACCOUNTING (CSA)

CSA is the recording and reporting of approved documentation that identifies established baselines and the proposed and approved changes to these baselines. A CSA correlates, stores, maintains, and provides readily available views of this organized collection of configuration information.

ITCD efforts shall perform CSA and shall be able to provide access to accurate, timely information about a product and its configuration information throughout the effort’s lifecycle.

Information elements stored and maintained shall include:

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- Product Information – Including Configuration
- Proposed Configuration Changes
- Status of Proposed Changes
- Associated Action Items
- Status of Associated Action Items
- Approved Changes Awaiting Implementation
- Current and accurate records of changes from initiation through final implementation.
- Verified (results of completed configuration audits) and closed changes

The ITCD effort’s Configuration Manager shall be responsible for recording, maintaining, and reporting the information needed for managing the configuration effectively, including a list of approved configuration items, the status of proposed changes to the configuration, and the implementation of approved changes.

A change log will be maintained for each controlled document identifying the current change status and describing the document’s change history.

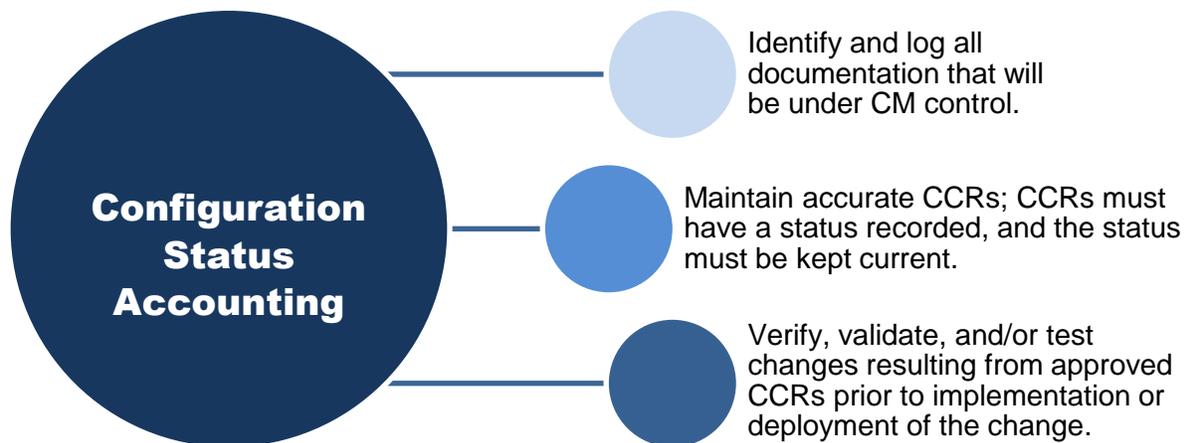


Figure 8: Configuration Status Accounting

2.5 CONFIGURATION MANAGEMENT AUDIT

The Configuration Manager shall be responsible for ensuring that the CM discipline in this procedure is implemented throughout an effort’s lifecycle in accordance with the standards and policies established by this procedure.

Audits of CM activities within program organizations may be planned, conducted, and recorded to ensure implementation of this procedure as directed by the organization, program or project manager, or assigned lead. The Configuration Manager may be precluded from participating in, or leading the audit, depending on the risk for a conflict of interest. The purpose of configuration audits is to prove that the actual configuration of CIs conforms to the intended configuration. Configuration audits validate the

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accomplishment of development requirements and achievement of a production configuration through comparison with the CI's technical documentation.

The Configuration Manager shall continually monitor all tasks involved in the CM function to ensure that the CM procedures are being adhered to and properly implemented. Periodic audits will include evaluating all document operations (CCRs, Impact Assessments), reviewing all CCRs for completeness, reviewing contract modifications, and technical directions to ensure the CCB is not being bypassed. Additionally the Configuration Manager and or the organization, program/project manager, or assigned lead may have external (to the effort) resources conduct configuration audits for an independent verification of CM procedural compliance. Items to be covered during this type of audit are as follows:

- Configuration Management Responsibilities;
- Configuration Identification;
- CCB activities and responsibilities;
- CCR classification procedures;
- Subcontractor/Vendor control procedures;
- Change Review procedures;
- Document change process;
- Document release procedures;
- Interface Control procedures (if applicable);
- Change Verification; and
- Records.

ITCD efforts shall periodically conduct CM audits to ensure quality, conformance, and compliance with CM practices.

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Figure 9: Configuration Management Audit

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3 CONFIGURATION MANAGEMENT TOOLS

3.1 CONFIGURATION CHANGE REQUEST FORM (CCR FORM)

ITCD efforts shall select the form that best suits the needs of the effort, program, and/or project that requires them.

GSFC Configuration Change/Approval Request

1a. Initiator Name and Code:		1b. Telephone:	
1c. Email Address:		1d. Date Submitted:	
2. Responsible Organization/Individual:			
3. Configured Item: (select one)	<input type="checkbox"/> GDMS <input type="checkbox"/> CCMS <input type="checkbox"/> NCR/CA <input type="checkbox"/> AUDIT SYSTEM <input type="checkbox"/> Product Description: _____ <input type="checkbox"/> Document		
4. Action Requested:	<input type="checkbox"/> New Document <input type="checkbox"/> Revised Document <input type="checkbox"/> Other		
5. Reason:			
6. Other Documents Affected:			
-- Reserved for use by Responsible Organization --			
7. Priority:	<input type="checkbox"/> High <input type="checkbox"/> Normal <input type="checkbox"/> Low		
8. Disposition:			
9. Signature/Code of Authorized Individual:		9a. Date:	

Figure 10: GSFC Form 4-35

GSFC Form 4-35 (CCR Form) is available for use on ITCD efforts for requesting and managing changes to controlled items.

3.2 CONFIGURATION CHANGE REQUEST LOG (CCR LOG)

A CCR Log shall be used to account for all CCRs utilized by an effort.

ITCD CCR Logs shall contain the following data elements, at a minimum:

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- Date of Submittal
- CCR ID Number
- CCR Initiator
- Priority Classification
- Responsible Management Official (RMO)
- Status (Approved, Denied)

A template for a CCR Log has been established for use on IT projects and is available for ITCD's use and tailoring.

3.3 CCR IMPACT ANALYSIS (CCRIA) FORM

ITCD efforts shall assess and document the following data when evaluating potential impact of a requested change for a submitted CCR:

- Effort Impact
- Documentation Impact
- Financial Impact
- Performance Impact
- Schedule Impact
- Hardware Impact
- Software Impact
- Other Impact

3.4 CONFIGURATION ITEM INVENTORY (CII)

ITCD efforts' CII, or CMDB, shall contain, at a minimum, the following information:

- CI Identifier
- CI Class
- CI Type
- CI Name/Description
- CI Location
- Owning Organization
- CCB Identification
- Version
- Effective Date

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APPENDIX A – TERMS, DEFINITIONS & ACRONYM LISTS

Terms & Definitions

- A.1 Baseline** – See “*Configuration Baseline.*”
- A.2 Configuration** – The product attributes of an existing or planned product, or a combination of products. Also can be one of a series of sequentially created variations of a product.
- A.3 Configuration Audit** – The CM Function that reviews processes and products to validate compliance with requirements and verifies that products have achieved the required attributes and conform to released product definition information.
- A.4 Configuration Baseline** – The configuration of a product or service, formally established at a specific point in time, which serves as a reference for further activities.
- A.5 Configuration Change** – An alteration of a product or its product configuration information or both.
- A.6 Configuration Change Request (CCR)** – Documented requests to issue, change, or delete a controlled item. A generic CCR form (GSFC 4-35) meeting minimum requirements is available on the Goddard Directives Management System (GDMS).
- A.7 Configuration Change Request Impact Analysis (CCRIA)** – Documented analysis that estimates the impact of a requested change to a configuration item, including but not limited to the anticipated impacts to resources, schedule, and documentation.
- A.8 Configuration Control** – The element of Configuration Management concerning the systematic proposal, justification, evaluation, coordination, and disposition of approved baselines and changes, and the implementation of approved changes to base-lined documentation and products (Configuration Items).
- A.9 Configuration Control Board (CCB)** – A board composed of designated individuals who review and evaluate configuration changes proposed against products. While maintaining formal records, issuing recommendations for approval or disapproval of proposed baseline Configuration Items and changes, revisions, or cancellations.
- A.10 Configuration Documents** – The technical documentation that identifies and defines the items functional and physical characteristics. Documents that define requirements, design, build/production, validation, and interfaces of products that are designated as configuration items.
- A.11 Configuration Identification** – The CM function that:
- Establishes a structure for products and product configuration information.
 - Selects, defines, documents, and baselines product attributes.
 - Assigns unique identifiers to each product and product configuration information.

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- A.12 Configuration Item** – A designation applied to the fundamental unit of a configuration management process that has been determined to be subject to CM requirements. Configuration Items (CIs) include, but are not limited to: requirements, hardware, software, systems, networks, documentation, processed materials, services (e.g., transportation or lifting operations), or any discrete portions thereof treated as a single entity in the configuration management process.
- A.13 Configuration Management** – A system for controlling and documenting changes to selected baseline documents, hardware and software. Configuration management systems contain the following elements:
- (1) Configuration Management
 - (2) Identification of controlled documents and configuration items
 - (3) Configuration control
 - (4) Configuration status accounting
 - (5) Configuration verification
- A.14 Configuration Status Accounting** – The CM function managing the capture and maintenance of product configuration information necessary to account for the configuration of a product throughout its lifecycle.
- A.15 Controlled Document** – A document that affects the quality of an organization’s product. Controlled documents are those designated as requiring formal document control (see P.10.p) before they may be changed or released.
- A.16 Data** – Recorded information, regardless of medium or characteristics, of any nature including administrative, managerial, and technical.
- A.17 Directive** – A policy, procedure and guideline, or instruction that has been approved and published by the appropriate authority
- A.18 Document Owner** – An individual designated to be responsible for the content, changes, and records associated with a controlled document.
- A.19 Effective Date** – The date the final approving authority signs/approves a document.
- A.20 External Document** – A document, such as a plan, specification, or standard, that comes from an external source and is implemented by an organization as part of the management system or effort. Examples may include military specifications and industry standards.
- A.21 Formal Document Control** – A process whereby changes to an approved document are properly identified, recorded, evaluated, approved or disapproved, incorporated, and verified as appropriate and necessary. A subset of this process is used for the initial release of the document.
- A.22 Organization Head** – The head of any organization needing to establish configuration management or document control procedures as described herein. Examples include project managers, project scientists, branch heads, Directors.

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- A.23 Product** – Systems, hardware, software, data, documentation, services, and/or processed material resulting from work activities at GSFC that have been defined to be in-scope to the management system or effort.
- A.24 Release** – A set of new or changed CIs that are tested and will be implemented into production together.
- A.25 Release Management** – A process that is aimed at building, testing and delivering the capabilities specified by the approved requirements and design baseline. This process focuses on the protection of the live production environment and its services through the use of formal procedures and controls that are supported by the configuration management process.
- A.26 Responsible Management Official** – The official, and therefore organization, responsible for maintaining the accuracy and currency of the document/data from baseline release through all follow-on actions.
- A.27 Specification** – Information that explicitly states the requirements for product attributes.
- A.28 Validation** – Authentication that the requirements for a specific application fulfilled the intended need.
- A.29 Verification** – Confirmation that a specific requirement has been met by the product.
- A.30 Version** – A specific configuration of a product which varies from other configurations of the product.

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Acronym List

AA	Alternatives Analysis
CCB	Configuration Control Board
CCR	Configuration Change Request (Form)
CCRIA	Configuration Change Request Impact Analysis (Form)
CI	Configuration Item
CII	Configuration Item Inventory
CM	Configuration Management
CMDB	Configuration Management Database
CMMI	Capability Maturity Model – Integrated
CMP	Configuration Management Plan
CMS	Configuration Management System
CSA	Configuration Status Accounting
GDMS	Goddard’s Directive Management System
GPD	Goddard Policy Directive
GPR	Goddard Procedural Requirement
GSFC	Goddard Space Flight Center
HPP	High Priority Practice
IOC	Initial Operating Capability
IT	Information Technology
ITCD	Information Technology and Communications Directorate (Code 700)
ITIL	IT Infrastructure Library
LOE	Level of Effort

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MIS	Management Information System (Goddard in-house tool)
NASA	National Aeronautics and Space Administration
NODIS	NASA Online Directives Information System
NPR	NASA Procedural Requirement
PG	Procedures and Guidelines
PIMD	Program Integration & Management Division (Code 740)
PM	Project Manager
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PMO	Project Management Office
RMO	Responsible Management Official
SATERN	System for Administration, Training and Educational Resources for NASA
SEI	Software Engineering Institute (Carnegie Mellon)
SME	Subject Matter Expert
WI	Work Instructions

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APPENDIX B – CM TOOLS & TEMPLATES

The following approved tools and templates have been established and are available for ITCD efforts' use and tailoring:

- Configuration Management Plan (CMP) Template
- Configuration Change Control Board (CCB) Charter Template
- Configuration Change Request (CCR) Form Template (GSFC Form 4-35)
- CCR Impact Analysis (CCRIA) Form
- CCR Log Template
- Configuration Items Inventory (CII) Template

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APPENDIX C – DOCUMENTATION IDENTIFICATION GUIDANCE**Document Types**

Document types are assigned by authorized configuration management personnel only and are required for quick identification of controlled documentation. Some typical document categories and associated abbreviations for document types include, but are not limited to:

Document Identifier	Description
BCAR	Business Case Analysis Report
CDR	Critical Design Review
DDD	Detailed Design Document
DP	Decommissioning Plan
DR	Decommissioning Review
IMP	Implementation Plan
OCD	Operations Concept Document
OH	Operations Handbook
ORR	Operational Readiness Review
PCR	Project Completion Review
PDR	Preliminary Design Review
PMP	Project Management Plan
PTP	Project/Task Plan
RQD	Requirements Document
SCP	Scope Document
SCR	System Concept Review
SRR	System Requirements Review
TBD	Preliminary Design Document
TEM	Template
TM	Training Materials
TP	Test Plan
TRP	Transition Plan
TRR	Transitional Readiness Review

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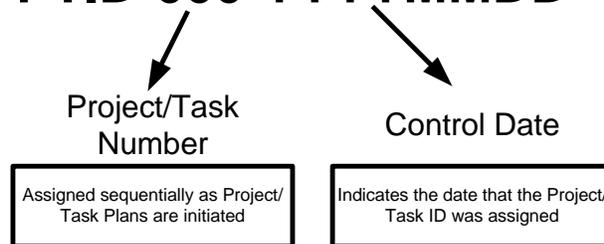
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Project/Task Identification Numbers

Project/Task numbers are assigned by the RMO and are used for indexing and cross-reference purposes in the maintenance of documentation. These Numbers also support the ability to search the document repository for multiple documents associated with a specific activity. Project/Task ID numbers are assigned when an effort is initiated.

Project/Task Identification Number Schema

Code760-PTID-000-YYYYMMDD

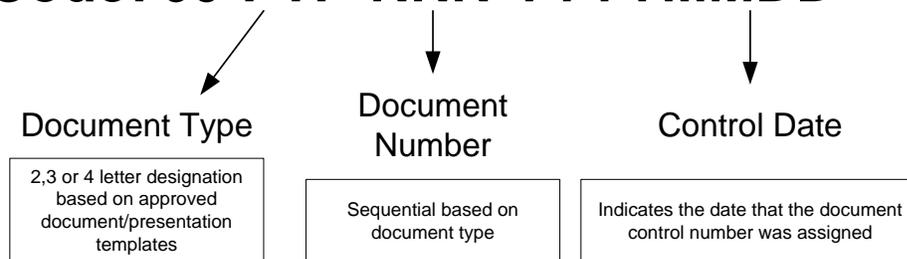


Document Control Numbers

Document Numbers are assigned by authorized configuration management personnel only and are required for all controlled documentation and presentations. Document numbers are assigned at the beginning of the formal review process.

Document Control Numbering Schema

Code760-PTP-NNN-YYYYMMDD



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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	11/20/2013	Initial Release

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