



U.S. Department  
of Transportation  
Federal Aviation  
Administration

MAR 14 1994

LOAN COPY

## DOCUMENTATION CONTROL CENTER

U.S. Department of Transportation  
**Federal Aviation Administration**  
**Standard**

### CONFIGURATION MANAGEMENT

(Contractor Requirements)

## DOCUMENT CHANGE NOTICE

1. Originator Name and Address  SEIC Washington, DC		2. <input type="checkbox"/> Proposed  <input checked="" type="checkbox"/> Approved		3. Code Identification N/A		4. Standard No. FAA-STD-021a	
7. System Designation NAS		8. Related ECR/NCP No. see #14		9. Contract No. DTFA01-84-C-00017		6. DCN No. 1	
11. Configuration Item Nomenclature Configuration Management (Contractor Requirements), FAA-STD-021				12. Effectivity N/A			
<p>This notice informs recipients that the standard identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this DCN (being those furnished herewith) carry the same date as the DCN. The page numbers and dates listed below in the summary of changed pages, combined with nonlisted pages of the original issue of the revision shown in block 4, constitute the current version of this specification.</p>							
13. DCN No.	14. Pages changed	S*	A/D*	15. Date			
1	<p>This change notice incorporates the following NCPs: 11290, 12323.</p> <p>NCP 11290, <i>FAA-STD-026, NAS Software Development</i>, was approved on March 31, 1989 and affects the following pages: 2, 3, 8, 10, 11, 14, 21, 58, 59, 95, 98, 101, and 106.</p> <p>NCP 12323, <i>Federal Aviation Administration, Standard, Configuration Management (Contractor Requirements); FAA-STD-021a, Change 1</i>, was approved on March 6, 1990 and affects the following pages: 1, 2, 3, 10, 12, 13, 20, 43-45, 48, 51, 52, 55, 57, 59, 60, 96, and 98.</p> <p>Please replace the following pages with the attached.</p> <p>v-viii</p> <p>1-4</p> <p>7-14</p> <p>19-22</p> <p>43-48</p> <p>51, 52</p> <p>55-64</p> <p>95-98</p> <p>101, 102,</p> <p>105, 106</p> <p><b>NOTE:</b> All change pages carry the date of the DCN (March 6, 1990), although some pages were changed only by NCP 11290, approved on March 31, 1989.</p>	S		03/31/89			
		S		03/06/90			
		S					
		S					
		S					
		S					
		S					
		S					
		S					
		S					

\*S = Indicates Supersedes Earlier Pages    \*A = Indicates Added Page    \*D = Indicates Deleted Page

## FOREWORD

It is the Policy of the Federal Aviation Administration that all resources and services required to operate and maintain the NAS be acquired in an effective and economical manner in order to minimize the aggregate life-cycle cost of the NAS. This standard has been prepared to provide general requirements for a contractor configuration-management program to control the required functional and physical configurations of procured products. The standard is to be tailored to specific programs and implemented by the contract statement of work.

(THIS PAGE INTENTIONALLY LEFT BLANK)

## CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
1.	SCOPE .....	1
1.1	Scope. ....	1
1.2	Purpose. ....	1
1.3	Application. ....	1
1.4	Definitions. ....	1
2.	APPLICABLE DOCUMENTS. ....	3
2.1	Government documents. ....	3
2.2	Precedence. ....	4
3.	GENERAL REQUIREMENTS. ....	5
3.1	Introduction. ....	5
3.2	Configuration management plan. ....	5
3.3	Configuration management elements. ....	5
4.	DETAILED REQUIREMENTS. ....	7
4.1	Baseline management. ....	7
4.2	System engineering and interface control. ....	7
4.2.1	System engineering. ....	7
4.2.2	Interface control. ....	7
4.3	Configuration identification. ....	8
4.3.1	Functional Configuration Identification (FCI). ....	8
4.3.2	Allocated Configuration Identification (ACI). ....	8
4.3.3	Design Configuration Identification (DCI). ....	9
4.3.4	Product Configuration Identification (PCI). ....	9
4.3.4.1	Repairable CIs. ....	9
4.3.4.2	Nonrepairable CIs. ....	9
4.3.4.3	Privately developed CIs. ....	9
4.3.5	Precedence. ....	10
4.3.6	Addendum to configuration identification. ....	10
4.3.7	Inventory item identification. ....	10
4.3.8	Specification authentication. ....	10
4.3.9	Computer Software Configuration Identification. ....	10
4.3.9.1	Requirements specifications. ....	10
4.3.9.2	Design documents and listings. ....	10
4.3.9.3	Product specification. ....	11
4.4	Configuration item identification. ....	11
4.5	Engineering release requirements. ....	11

CONTENTS (cont)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
4.6	Engineering change proposals, deviations, and waivers. ....	11
4.6.1	Functional, allocated, design or product baseline documentation changes. ....	11
4.6.2	Engineering change proposal (ECP) processing. ....	13
4.6.3	Engineering change proposal (ECP) classification. ....	13
4.6.4	Privately developed item. ....	13
4.6.5	Commercial off-the-shelf equipment (COTS). ....	13
4.6.5.1	Technical manuals. ....	13
4.6.5.2	Proprietary information. ....	13
4.6.5.3	Maintenance level. ....	14
4.6.6	Deviations. ....	14
4.6.7	Waivers. ....	14
4.7	Reporting the accomplishment of updating/retrofit changes. ....	14
4.8	Specification maintenance. ....	14
4.9	System allocation document. ....	14
4.10	Configuration audits. ....	15
4.10.1	Functional Configuration Audit. ....	15
4.10.2	Physical Configuration Audit. ....	15
4.10.3	Relationship of audits to other reviews. ....	16
4.11	Configuration management records, reports, and data. ....	16
4.11.1	Data requirements. ....	17
4.11.2	Electronic data. ....	17
4.12	Quality assurance provisions/qualification requirements. ....	17
10.	Appendix I Configuration Management Plan ....	19
20.	Appendix II Interface Control ....	25
30.	Appendix III Criteria for Selecting Configuration Items ....	31
40.	Appendix IV Addendum to Configuration Item Specification ....	37
50.	Appendix V Inventory Item Specification ....	41
60.	Appendix VI Document and Item Identification, Numbering and Marking ....	43
70.	Appendix VII Engineering Release Records and Correlation of Manufactured Products ....	47

# CONTENTS (cont)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
80.	Appendix VIII Engineering Changes (Equipment) .....	51
90.	Appendix IX Engineering Changes (Computer Software) .....	57
100.	Appendix X Reporting the Accomplishment of Updating/Retrofit Changes .....	63
110.	Appendix XI Specification Change/Maintenance .....	67
120.	Appendix XII Specification and Support Documentation Maintenance, Computer Software .....	75
130.	Appendix XIII System Allocation Document .....	89
140.	Appendix XIV Definitions .....	95
150.	Appendix XV Cm in the Nas Life Cycle .....	105

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1	NAS Subsystem and Representative Key CM Events .....	2
2	Baseline Change Process .....	12
3	Verification Requirements Traceability Matrix (Sample) .....	18
4	Interface Control Documents .....	26
5	Matrix of Interface Control Responsibilities .....	29
6	Example of ICWG Control Sheet .....	30
7	Cover Page - Addendum Specification .....	39
8	Flow Chart for Engineering Change Proposal, Deviations and Waivers .....	56
9	(Sample Form) Installation Completion Notice .....	64
10	Specification Change Notice .....	68
11	Sample Configuration Item Development Record - Part 1 .....	71
12	Sample Configuration Item Development Record - Part 2 .....	73
13	Example of Entries on SCN (CSCI Specification) .....	79
14	Computer Software Configuration Index .....	81
15	Configuration Item Development Record - Section A (CSCI) .....	83
16	Configuration Index: Sample Section I - CSCI Requirements Specification .....	85
17	Change Status Report, Computer Software .....	87
18	Sample A, System Allocation Document .....	90

CONTENTS (concl)

Figure	Title	Page
19	Sample B, Typical System Allocation Document - Part 1 .....	91
20.	Sample C, Typical System Allocation Document - Part 2 .....	92
21.	NAS Life-Cycle Model .....	107



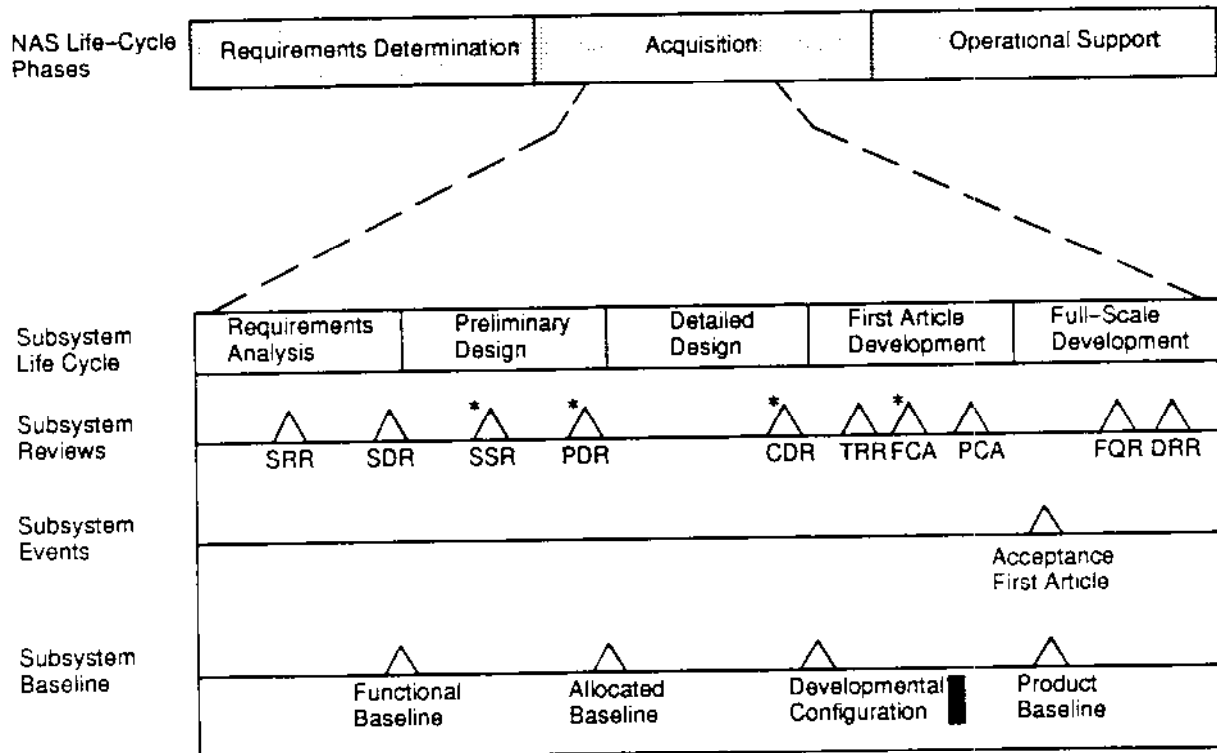
## 1. SCOPE

1.1 Scope. This standard establishes the general requirements and implementing practices for a contractor's configuration management program.

1.2 Purpose. The purpose of this standard is to establish uniform contractor configuration management practices and procedures that can be tailored to all systems and configuration items procured by the Federal Aviation Administration (FAA).

1.3 Application. Configuration management (CM) requirements established by this standard will be initiated at the beginning of the life cycle of a project and continue through all three life cycle phases; requirements determination, acquisition, and operational support. Figure 1 depicts the NAS subsystem and representative key CM events. Appendix XIV defines the events. Contracts invoking this standard will specifically identify in the contract work statement the applicable paragraphs and appendixes or portions thereof depending upon the scope of the program and the complexity of the item being procured. The contractor shall impose the applicable requirements contained herein upon subcontractors, vendors, and suppliers when they are responsible for an item identified by the FAA as a configuration item (CI) as defined in paragraph 140.13.

1.4 Definitions. For definitions used in this standard and not-referenced in Appendix XIV refer to MIL-STD-480, Paragraph 3.



Legend:

- SRR- Subsystem Requirements Review
- SDR- Subsystem Design Review
- SSR- Software Specification Review
- PDR- Preliminary Design Review
- CDR- Critical Design Review
- TRR- Test Readiness Review
- FCA- Functional Configuration Audit
- PCA- Physical Configuration Audit
- FQR- Formal Qualification Review
- DRR- Deployment Readiness Review

\* Can Be Incremental Reviews

*Figure 1. NAS Subsystem and Representative Key CM Events*

GM1599

## 2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard and are applicable to the extent specified herein.

### SPECIFICATIONS

#### FAA

FAA-G-2100	Electronic Equipment, General Requirements
------------	--

### STANDARDS

#### FAA

FAA-STD-002	Facilities Engineering Drawing Preparation
FAA-STD-005	Preparation of Specification Documents
FAA-STD-013	Quality Control Program Requirements
FAA-STD-016	Quality Control System Requirements
FAA-STD-018	Computer Software Quality Program Requirements
FAA-STD-025	Preparation of Interface Control Documentation
FAA-STD-026	NAS Software Development

#### Military

DOD-D-1000	Drawings, Engineering and Associated Lists
DOD-STD-100	Engineering Drawing Practices
MIL-STD-480	Configuration Control - Engineering Changes, Deviations and Waivers
MIL-STD-482	Configuration Status Accounting
MIL-STD-499	Engineering Management
MIL-STD-1521	Technical Reviews and Audits for Systems, Equipments, and Computer Software

### OTHER PUBLICATIONS

FAA Order 1320.33	Equipment Modification and Facility Instruction
Handbook H4/H8	Federal Supply Code for United States and Canadian Manufacturers, Name to Code

Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained as directed by the Contracting Officer.

2.2 Precedence. When conflicts exist between the requirements of the contract and this standard, the contract shall take precedence. Where the requirements of non-FAA documents conflict with the requirements specified herein or in any other applicable FAA documents, requirements of this standard and the other FAA documents shall apply. The contractor shall notify the Contracting Officer of each instance of conflict of or apparent conflict of requirements.

### 3. GENERAL REQUIREMENTS.

3.1 Introduction. Configuration management is a discipline applying technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a Federal Aviation Administration hardware or software configuration item that satisfies an end use function, to control changes to those characteristics, and to record and report change processing and implementation status. It is used to establish and maintain a formal set of procedures by which a uniform system of change identification, coordination, approval, status accounting, and audits is accomplished. It applies to the development, acquisition, implementation, modification, operation, and training of specific systems, subsystems, facilities, equipment, computer software, and documentation (specifications, plans, drawings, manuals, etc.). Appendix XV explains CM in the NAS life cycle.

3.2 Configuration management plan. The contractor shall establish within his organization, responsibility for implementing the requirements of configuration management invoked by the contract. The responsibilities and procedures shall be documented in a configuration management plan which is subject to approval by the procuring activity. For Hardware Configuration Items (HWCI) and Computer Software Configuration Items (CSCI) the plan shall be in accordance with the requirements set forth in Appendix I. The intended approach and an outline of the controls to be implemented will be required as a part of the contractor's proposal in response to, the Request for Technical Proposal (RFTP) or a fully described configuration management plan submitted to the Federal Aviation Administration for review and approval within a specified time after contract award.

3.3 Configuration management elements. The major elements of configuration management are:

- (a) Baseline establishment and maintenance
- (b) System engineering and interface control
- (c) Configuration identification
- (d) Engineering release requirements
- (e) Engineering change criteria and change control procedures
- (f) Specification and interface control documentation maintenance
- (g) Configuration audits, design reviews and verification records
- (h) Records, reports and status accounting data.

(THIS PAGE INTENTIONALLY LEFT BLANK)

#### 4. DETAILED REQUIREMENTS

4.1 Baseline management. A baseline is the documentation or listing of configuration items at the time when the documentation represents a meaningful statement of the performance requirements and is subject to configuration management. Baselines must be established anytime in a program when a formal departure point must be defined for control of future changes in performance and design. There are normally three program baselines; functional, allocated, and product. Equipment management may employ all three baselines or employ only the functional and product baselines depending upon program complexity and requirements. Computer software management normally employs a design baseline in addition to the previously named three baselines. The baselines shall be documented by approved configuration identifications which are the basis for control. All descriptions of baselines (functional, allocated, design, and product) of a system, or other configuration items, used as common reference by industry and the Government must be contained in specifications. However, description of the contractor's internally controlled development configuration of a CSCI, used to describe the evolving configuration of the software design during software development are contained in design documents (not specifications) and software listings. FAA-STD-005 establishes criteria for a uniform specification program for all contractor-prepared documents.

4.2 System engineering and interface control. Two closely related tasks which must be accomplished in the design and development of configuration items, and in the development of the specification requirements for the configuration items, are system engineering and interface control.

4.2.1 System engineering. System engineering responsibility for the total system or a functional area is normally vested in a single contractor or procuring activity. System engineering, as it relates to configuration management, is the application of scientific and engineering efforts to transform an operational need into a description of system performance parameters. A system configuration must ultimately be called out in the product specifications. In this way, the system engineering agency or contractor generates requirements for configurations which will satisfy the operational need, constrained technically only by the content of the product specification. The system engineering agency or contractor is responsible for assessing the impact of changes to the product specification. This includes modifications to operational systems. (See FAA Order 1320.33 and MIL-STD-499.)

4.2.2 Interface control. Interface control is the coordinated activity required to assure that the functional and physical characteristics of systems and equipments are compatible. The interface

control officer/contractor is a coordinator with responsibility to assure that configuration item identification conforms to the functional interfaces established by system engineering, and that the configuration items, including computer software as finally designed, are physically and logically compatible, will assemble together, and can be operated and maintained as intended. The interface control officer or contractor is responsible for control of space allocation where necessary to assure that equipment under configuration control can be installed in a facility or existing system, and is responsible for management control of interface control drawings. The interface control contractor shall be responsible for the preparation of interface control documentation, including installation control drawings. The interface control contractor shall assess the impact of changes which affect interfaces. Appendix II shall be used to establish the requirements for interface control of a system with other systems, and between configuration items within a system; including computer software, when configuration items are being procured from several contractors.

4.3 Configuration identification. Selection of configuration items (CIs) shall be in accordance with the guidance contained in Appendix III. For every CI, configuration identification shall be established in the form of technical documentation. Initially, functional configuration identification is used to establish performance-oriented requirements for the design and development of the higher level CIs. These requirements may be translated into allocated configuration identification for selected CIs that are part of a higher level CI. Identification of developmental CSCIs is used to describe each CSCI's design documentation and software listings as the CSCI is undergoing development. (These documents and listings become the product configuration identification for software.) Finally, for developed CIs (Government or private), product configuration identification shall be used to prescribe "build-to" or form, fit, and function requirements, and acceptance test appropriate to these requirements.

4.3.1 Functional Configuration Identification (FCI). FCI is required for all systems and all CIs specified in the contract which are allocated from a system requirement, except privately developed items. Whenever possible, the initial FCI (i.e., the functional baseline or changed functional baseline of a system required to be modified) will be established concurrently with approval to initiate engineering or operational systems development. The establishment of the functional baseline will occur no later than System Design Review (SDR). The FCI shall be documented by a Type A specification prepared in accordance with FAA-STD-005.

4.3.2 Allocated Configuration Identification (ACI). ACI shall be used to govern the development of selected CIs that are allocated from system requirements or are part of a higher level CI, including those that will become a part through modification of a higher level CI. The allocated baseline will be formally established with the award of engineering or operational systems development contract(s) whenever possible. For CIs, the timing of the establishment of the allocated baseline will be as agreed between the contractor and the procuring activity, but not later than Critical Design Review (CDR). For CSCIs, the allocated baseline may be established upon completion of the Software Specification Review (SSR). The ACI shall be documented by Type B specifications, Software and Interface Requirements Specifications, and other documents prepared in accordance with FAA-STD-005.



4.3.3 Design Configuration Identification (DCI). The DCI shall be applied to software development programs. It consists principally of the Software Requirements Specification and Interface Requirements Specification updated after critical design review (CDR). These specifications will be retained under configuration control throughout the life cycle of the product, thus, permitting controlled development of test plans and procedures, training, and manuals.

4.3.4 Product Configuration Identification (PCI). PCI shall be used to prescribe necessary "build-to", or form, fit, and function requirements and the acceptance tests for those requirements. The kind and level of detail to be contained in the PCI shall be determined in consideration of requirements for the anticipated method of reprourement and for logistic support of potentially repairable items which are part of a CI. The contractor shall establish and implement a developmental configuration for each CSCI to maintain configuration management during the full scale development phase or software development. Computer software and software design documentation shall be developed, reviewed, and entered into the contractor's design baseline. After the software and documentation for the CSCI are approved at the functional and physical configuration audits, the contractor's design baseline shall become part of the procuring activity's product baseline. In addition to other contractual requirements such as DOD-STD-100 and FAA-STD-005, documentation for the PCI shall be prepared in accordance with the following:

4.3.4.1 Repairable CIs. On repairable CIs developed at Government expense, as identified and required by the procuring activity, design disclosure documentation to the level of nonrepairability shall be developed. On those repairable items tested by automatic or semiautomatic test equipment, the maintenance of the configuration of the item will be at the lowest level tested automatically or semi-automatically. The maintenance documentation shall consist of product specifications, drawings, and associated lists, including the detail design of all interfaces.

4.3.4.2 Nonrepairable CIs. On nonrepairable CIs developed at Government expense, form, fit, and function documentation shall be used. This documentation describes the physical and functional characteristics of the item as an entity, but does not describe characteristics of the elements that make up the item. For those nonrepairable items that are also expendable, the PCI may consist of a detail design specification (as in the case of clothing and subsistence), or of a detail design specification incorporating performance requirements and certain drawings, where interchangeability or other functional considerations prevail.

4.3.4.3 Privately developed CIs. On privately developed CIs (repairable and nonrepairable), form, fit, and function documentation (equivalent to function type specification per FAA-STD-005) shall be used. On all configuration items planned for test on automatic or semiautomatic test equipment, the criteria for configuration identification shall be form, fit, function, and testability.

4.3.5 Precedence. Functional, allocated, design and product configuration identification shall be mutually consistent and compatible. Should conflicts arise between such identification, the order of precedence shall be (a) functional, (b) allocated, (c) design, and (d) product, unless otherwise specified by the procuring activity.

4.3.6 Addendum to configuration identification. When an existing configuration item can be changed for a new application and it is required that the original configuration identification document be retained, the change can be described by means of an addendum to the configuration item specification. Use ' and format for preparation of an addendum to a CI specification shall be accordance with Appendix IV.

4.3.7 Inventory item identification. Configuration items previously procured and entered into the Government inventory and which are suitable for use as a part of the configuration baseline of the system or configuration item, shall be identified in an inventory item specification in accordance with FAA-STD-005. Appendix V provides supplementary information to be followed in the preparation of the inventory item specification.

4.3.8 Specification authentication. The Government will authenticate specifications developed by the contractor which are the contractual requirements through approval signatures. Government authentication of such documents through a configuration control decision, shall formally establish the respective baseline which that document represents as defined in paragraph 4. Changes to the specification subsequent to authentication by the procuring activity and its contractual incorporation shall be accomplished in accordance with formal change procedures e.g., as set forth in MIL-STD-480, FAA-STD-005 and this standard.

4.3.9 Computer Software Configuration Identification. Computer Software Configuration Item (CSCI) specifications, design documents, and listings, shall define software requirements and design details for a single CSCI. The subparagraphs below identify the specifications and design documents of the CSCI.

4.3.9.1 Requirements specifications. The Software Requirements Specification (SRS) and if applicable, Interface Requirements Specification (IRS) shall define system performance requirements allocated to a specific CSCI, as well as identify the major functional and interface requirements of the CSCI. Interface requirements shall include the interfaces between the CSCI and any other CSCI and any other CSCIs or HWCIs. The SRS, and if applicable IRS, shall be authenticated at the Software Specification Review and establish the allocated baseline for the CSCI.

4.3.9.2 Design documents and listings. The Software Design Document (SDD) shall define the design of the CSCI. Upon successful review of the SDD at the Preliminary Design Review, the contractor shall establish the Developmental Configuration for the CSCI. The contractor shall update the SDD and prepare the Interface Design Document(s) (IDD(s)) to define the detailed design of the CSCI. Upon successful review of the SDD and IDD(s), at Critical Design Review

the contractor shall enter these documents into the Developmental Configuration. The contractor shall then code and test software units, and enter the source and object code, and associated listings of each successfully tested unit into the Developmental Configuration.

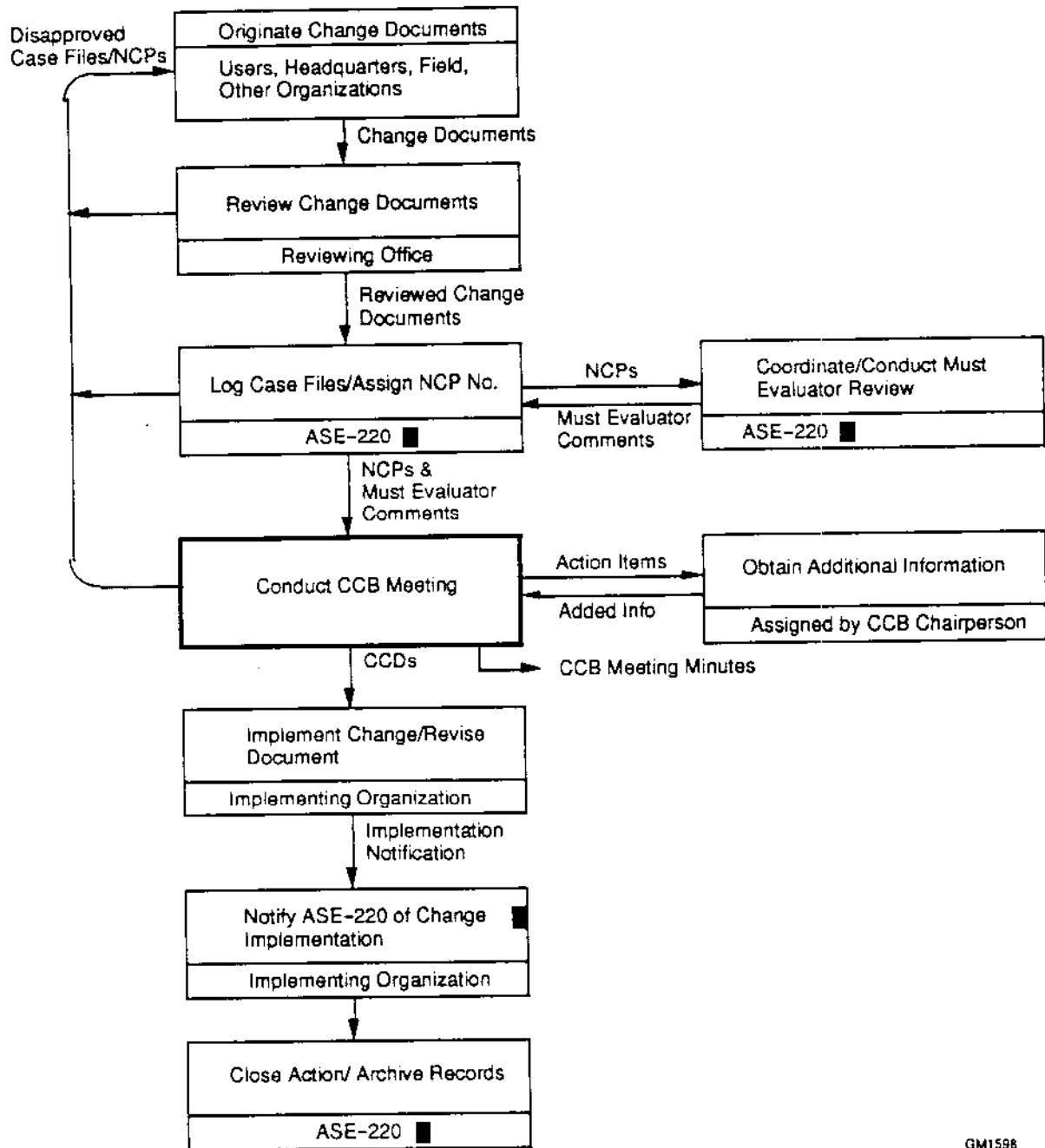
4.3.9.3 Product specification. At the completion of formal testing of the CSCI, the contractor shall combine the updated design documents and software listings contained in the design baseline or developmental configuration to comprise a Software Product Specification (SPS) for the CSCI. The integrity of the SPS is established by the Physical Configuration Audit and dependent upon the accuracy with which the SPS describes the detailed configuration of the qualified (or to be qualified) CSCI. Upon authentication of the SPS following the Physical Configuration Audit, the SPS will be entered into the procuring activity's product baseline.

4.4 Configuration item identification. Identification numbering and marking requirements for configuration items and the associated configuration identification documentation shall be as contained in Appendix VI as supplemented by FAA-G-2100.

4.5 Engineering release requirements. The contractor shall maintain a current engineering release record of all specifications and drawings for configuration items accepted, or to be accepted, by FAA. The engineering release records shall interrelate with the contractor's internal system of controls to assure that all approved engineering changes have been incorporated in production items, as-specified. Minimum criteria and capabilities to be provided by the contractor's engineering release system and his control system for verifying that manufactured products correlate with the released engineering data shall be in accordance with Appendix VII.

4.6 Engineering change proposals, deviations, and waivers. This procedure is used by prime contractors and Government activities for proposing, or requesting changes to or deviating from, a configuration identification for items which are developed, designed, or modified for the Federal Aviation Administration. (See Figure 2.) Also, it is to be used when the prime contractor requests delivery to the Government of an item, which during production or after having been submitted for inspection, is found to depart from specified requirements of the configuration identification. The contractor shall not incorporate any engineering change, deviation, or waiver in an item as described in the configuration identification prescribed by the contract, without the approval of contractual authorization. Contractual authorization will be required prior to the incorporation of an engineering change proposal (ECP) which affects contract cost, fee, schedule, or technical requirements specified either in the contract, or in the configuration identification prescribed directly by its identifying number in the contract.

4.6.1 Functional, allocated, or product baseline documentation changes. Changes to functional or allocated documentation shall be formally documented by the contractor. After these baselines become a contractual requirement, changes require formal approval by the procuring activity. After



GM1598

Figure 2 Baseline Change Process

the product baseline is established contractually, changes to the product documentation require formal approval by the procuring activity. This procedure is also to be used to control the form, fit, and function of privately developed/proprietary products used in configuration items. Appendix VIII provides criteria supplementary to MIL-STD-480 on engineering changes. Appendix IX provides procedures for implementing changes to computer software and its documentation.

4.6.2 Engineering change proposal (ECP) processing. After determining the need for a change, the processing consists of:

- a. Describing the reason for change
- b. Classifying the engineering change as Class I or Class II
- c. Preparing the ECP form and submitting it to the FAA for further processing
- d. Review by FAA
- e. FAA approval/disapproval, or concurrence/nonconcurrence in classification
- f. Incorporation of approved engineering change in the configuration item and in the data at the specified effective point.

4.6.3 Engineering change proposal (ECP) classification. The classification of engineering change proposals (ECP) shall be assigned by the originator, as Class I or Class II. The preparation of Class I and Class II ECPs is described in Appendix VIII.

4.6.4 Privately developed item. An engineering change to a privately developed item shall be classified Class I when it meets the criteria described in paragraph 80.4.1 of Appendix VIII.

4.6.5 Commercial off-the-shelf equipment (COTS). Configuration management performed on off-the-shelf equipment includes monitoring of supplied manuals, tracking of serial numbers and equipment location matrix, and tracking of installation space. Operational phase activities include monitoring of technical manuals and tracking of spares.

4.6.5.1 Technical manuals. COTS technical manuals are key instruments in any COTS procurement. The manuals should provide established CIs, serial numbers, a hierarchy, and maintenance information. The contractor shall ensure that the manuals are procured and include all the information necessary to identify the specific piece of equipment under procurement.

4.6.5.2 Proprietary information. The contractor shall develop an accountability system to ensure that vendor proprietary information is protected.

4.6.5.3 Maintenance level. Maintenance levels are to be identified in accordance with level of support identified in the contract work statement. For example, full support down to piece part, or medium support down to module.

4.6.6 Deviations. Prior to manufacture of an item, if a contractor considers it necessary to depart temporarily from the mandatory requirements of the configuration identification, he may request that a deviation be authorized. As an example, a deviation relating to an alternative material or process may be requested when the contractor can show that the delivery schedule cannot be met unless the deviation is granted. Items shall not be delivered incorporating a known departure from the specified configuration identification unless a request for a deviation has been approved in accordance with the requirements of this standard, or unless otherwise permitted by contractually authorized procedure. The processing of a request for deviation is discussed in Appendix VIII.

4.6.7 Waivers. Items or services which do not conform in all respects to the contract requirements shall be rejected. An item which through error during manufacture does not conform to the contractual configuration identification, but is considered suitable "as is", or can be made suitable to FAA after rework by an approved method shall not be delivered unless a waiver has been processed and granted in accordance with this standard or conditions outlined in the contract. The processing of a waiver request is discussed in Appendix VIII.

4.7 Reporting the accomplishment of updating/retrofit changes. The accomplishment of updating/retrofit changes is required to be reported in order to maintain status on all configuration items in the custody of a contractor, unless otherwise directed by the contract. Appendix X delineates the detailed procedures for reporting accomplishment of updating/retrofit changes by the contractor during test, and installation and checkout phases of the program. These procedures are intended for use only by contractor's test and field organizations to report Engineering Change Proposal (ECP) accomplishments to his home plant and other activities as directed by the procuring activity.

4.8 Specification maintenance. After initial release of a specification defining any of the three baselines as applicable to a specific contract, changes to each specification shall be formally approved, documented, and made part of the specification. Appendix XI delineates the detail requirements for specification change and maintenance for equipment specifications and related data. Appendix XII sets forth procedures which are applicable to maintenance of specifications and related data for computer software.

4.9 System allocation document. A system allocation document shall be prepared to identify the group of configuration items which are the basis for system design and integration. The system allocation document shall be maintained until completion of all system testing required to complete the system design and development program. The system allocation document shall be in accordance with appendix XIII.

4.10 Configuration audits. Configuration audits shall consist of a functional and a physical audit of items for compliance with the configuration identification. The purpose is to validate and document that the development of the configuration item and its configuration identification are accurate, complete, and have met functional and physical requirements; the actual performance of the configuration item meets with contract requirements; the development of the configuration item has been completed and it is ready for production and development; all engineering change proposals, and requests for deviations and waivers have been incorporated, verified, and documented; appropriate tests, analysis and acceptance requirements have been conducted, met, and documented; and all deficiencies are documented and resolved.

4.10.1 Functional Configuration Audit. The objective of the Functional Configuration Audit (FCA) shall be to validate that the HWCI's/CSCI's actual performance complies with its Hardware Development or Software Requirements and Interface Requirements Specifications. Test data shall be reviewed to validate that the hardware item or computer software performs as required by its functional/allocated configuration identification. For HWCI's/CSCI's developed at Government expense, a FCA shall be a prerequisite to acceptance of the HWCI/CSCI.

4.10.2 Physical Configuration Audit. The Physical Configuration Audit (PCA) shall be the formal examination of the as-built version of a configuration item against its technical documentation in order to establish the product baseline. After successful completion of the audit, all subsequent changes are processed by engineering change action. The PCA also determines that the acceptance testing requirements prescribed by the documentation is adequate for acceptance of production units of a CI by quality assurance activities. The PCA includes a detailed audit of engineering drawings, specifications, technical data and tests utilized in production of HWCI's and a detailed audit of design documentation, listings, and manuals/handbooks for CSCI's. The review shall include an audit of the released engineering documentation and quality control records to make sure the as-built or as-coded configuration is reflected this documentation.

- a. When the developing contractor is also the contractor for producing production articles, the following shall apply:
  - (1) Achievement of the key functional characteristics of the configuration item shall have been demonstrated in those cases where production/release is authorized prior to completion of the FCA.
  - (2) The contractor shall identify any differences between the physical configuration of the selected configuration item and the development configuration item used for the FCA, and shall certify or demonstrate to the Government that these differences do not degrade the functional characteristics of the selected configuration item.

- (3) If the FCA has not been completed prior to accomplishment of the PCA, the Government may conditionally approve hardware production units until the FCA is completed, provided that other acceptance requirements for the hardware units have been met.
- b. Where the developing contractor is not preselected to be the production contractor, the following shall apply for the developing contractor:
  - (1) The most complete development hardware unit of the HWCI will be selected for the PCA.
  - (2) The FCA must have been accomplished prior to completion of the PCA.
  - (3) The contractor shall identify any differences between the physical configuration of the selected configuration item and other development configuration item used for the FCA, and shall certify or demonstrate to the Government that these differences do not degrade the functional characteristics of the selected configuration item.

4.10.3 Relationship of audits to other reviews. Wherever practicable and appropriate, configuration audits shall be accomplished in conjunction with other audits and reviews. MIL-STD-1521 establishes procedures, tasks, and responsibilities for conducting configuration audits. All reviews and audits will be done in accordance to the Statement of Work.

4.11 Configuration management records, reports, and data. Configuration management records and reports shall insure that:

- a. There will be a configuration record documenting all approved changes to all configuration items.
- b. Configuration status accounting reporting of a configuration item shall be implemented at the time the product configuration identification is approved/accepted. The contractor shall insure that configuration status accounting is maintained until the last unit is delivered. The documentation shall be as established by the contract and as a minimum shall include identification of:
  - (1) Technical documentation comprising the configuration identification
  - (2) Essential configuration item data elements
  - (3) Contractual information required to be included in the records/reports for each configuration item, including contractor identification code



- (4) Proposed Class I changes to configuration and the status of such changes.
  - (5) Approved changes to configuration, including the specific number and kind of configuration items to which these changes apply, the implementation status of such changes, and the activity responsible for implementation.
- c. The contract will specify the specific data base supplied configuration management reports required for the program. Format, content and timing will be as agreed between the contractor and the procuring activity.

4.11.1 Data requirements. The deliverable configuration management data requirements will be specified in the Contract Data Requirements List (CDRL) (DD Form 1423), attached to the request for proposal, invitation for bids, or the contract, as appropriate.

4.11.2 Electronic data. The CM data base shall be delivered in an electronic format compatible to the FAA to provide an electronic means for traceability as specified in the contract work statement. This avoids the necessity of performing a format conversion. It also enhances time, cost and problem solving for both the contractor and the procuring activity, and facilitates the transitioning and hand-off of CM responsibility to the FAA user organizations.

4.12 Quality assurance provisions/qualification requirements. A verification matrix shall be included in any of the hardware specifications prepared per the appendixes of this standard. This matrix provides for the correlation of Section 3 performance requirements with Section 4 verification requirements. Figure 3 is a sample verification requirements traceability matrix. Software specifications shall be prepared in accordance with the applicable Data Item Descriptions.

D = Demonstration      I = Inspection      T = Test      X = Not Applicable

Section 3 Requirements Paragraph Reference	Verification Phase and Method			Remarks
	Subsys Level	Integration Level	Site Level	
3.2.7	X	D	D	
3.2.8	I	I-D	I	
3.2.8.1	I	I	I	
3.2.8.1.1	I	I	I	
3.2.8.1.2	I	I	I	
3.2.8.1.3	X	D	D	
3.2.8.2	I	I	I	
3.2.8.3				
3.3				

*Figure 3. Verification Requirements Traceability Matrix (Sample)*