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STANDARD FOR CONTRACTOR CONFIGURATION MANAGEMENT FOR MSFC PROGRAMS/PROJECTS

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DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		09/30/2003	Initial Release
Revision	A	01/31/2005	General: updated language utilizing "shall" for requirements (avoiding use of must or will) per Rules Review; 2.0 Changes reflecting new Marshall Program Requirements; 6.1 change acknowledging variance in selection CIs for technology studies; 6.4 change providing greater detail on engineering drawing requirements and content; 6.4.2 Added section for CAD models; 7.1 Add text specifying location of engineering release system; 8.7 New paragraph defining post-deployment software/firmware change process; 8.7 Added information relative to MSFC form 460 in the deviation/waiver process; 9.3.5 Add paragraph describing software status accounting; 10.2 Added requirement for specific planning issued to be addressed during planning; 10.3 Made allowances for Government overview of FCA/PCA, added requirement for Contractor to actually "do" the as-built/as-designed review, and added contractor duties regarding software/firmware, made miscellaneous changes to clarify contractor support; 10.4 Added contractor administrative and technical responsibilities; 11.2 New paragraph describing CM utilization of results of Independent Verification and Validation (IV&V); 11.3 Describes delivery of the software product; 11.4 Adds marking and labeling instructions for software/firmware; Appendix A added specific coverage for software/firmware; Appendix B added for software configuration management plan; Appendix C added sample copy of MSFC form 460; Appendix D added new write-up for Acceptance Data Package expands delivery of ADP to require updated delivery when hardware/software is shipped to a new location and to ; includes separate requirements for hardware different from software/firmware. Added guidance Appendices H - Guidance for Processing Urgent-Emergency Software Changes and Appendix I – Documentation Guidance for FCA/PCA.

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FOREWORD

This standard defines configuration management principles for design, development, integration, operation, and logistical support of Configuration Items and Computer Software Configuration Items managed by MSFC throughout the acquisition life cycle. It incorporates the industry-Government consensus standard ANSI-EIA 649 principles.

The focus of this standard is on performance requirements rather than the details of the design solution. MSFC management of the CM process is based on insight of contractor practice and application of ANSI-EIA 649 principles. These principles are relevant to configuration management practices through the entire life cycle, including "technology" programs where technology is the precursor to product development.

This standard applies only to the extent specified in contracts.

An important function of this standard is to facilitate the use of automation tools by providing standard criteria of the CM process. The predominant media for exchange of information has transitioned from a paper base to a digital one. Information technology concepts and standards for data access, data transfer, and data sharing have increased the opportunity for Government and industry to productively integrate information from distributed sources. This leads to a true virtual enterprise that includes all the Configuration Management information necessary for the life cycle support and maintenance of equipment and software.

Forms cited herein are available at http://starbase.msfc.nasa.gov:8000/forms/forms.taf
Usage of these forms is not mandatory; contractor-equivalent forms may be used as long as the content of information requested is furnished.

STANDARD CONTRACTOR CONFIGURATION MANAGEMENT REQUIREMENTS, MSFC PROGRAMS/PROJECTS

1. SCOPE/PURPOSE

1.1 Scope/Purpose. The purpose of this document is to establish requirements for implementing Configuration Management (CM) on MSFC contracts to design, develop, fabricate, integrate, operate, or provide logistical support to hardware, software, and firmware items. This document also establishes requirements for MSFC contracts providing technology or requirements that are precursors of program design.

1.2 Applicability. This document is applicable to all MSFC contractors performing design, development, fabrication, integration, operations, or logistical products and services for MSFC programs or projects. These standards apply to flight, flight demos, protoflight, and ground support equipment and may be tailored by the individual programs/projects.

2. APPLICABLE AND REFERENCE DOCUMENTS

2.1 Applicable Documents. The following documents of the issue in effect on the date of incorporation of these requirements form a part of this document to the extent specified herein.

2.1.1 Federal Documents.

Cataloging Handbook H4/H8	Commercial and Government Entity (CAGE) Codes
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-961	Defense Specifications
MIL-STD-962	Defense Standards and Handbooks
MPR 8040.1	Configuration Management, MSFC Program/Projects (Appendix Z, CM Audits)
NPD 2190.1	NASA Export Control Program
NPR 2200.2	Requirements for Documentation, Approval, and Dissemination of NASA Scientific and Technical Information
NPR 7150.2	NASA Software Engineering Requirements

2.1.2 Industrial Standards.

ASME Y14.5	Dimensioning and Tolerancing
ASME Y14.24	Types and Applications of Engineering Drawings
ASME Y14.35	Revision of Engineering Drawings and Associated Documents

ASME Y14.41	Digital Product Definition Data Practices
ASME Y14.100	Engineering Drawing Practices
IEEE/EIA 12207	Software Life Cycle Process
IEEE 1042	Guide to Software Configuration Management

2.2 Reference Documents.

ANSI/EIA 649	National Consensus Standard for Configuration Management
OMB Circular A-130	Management of Federal Information Resources
DD Form 250	Material Inspection and Receiving Report
DD Form 1149	Requisition and Invoice/Shipping Document
MSFC Form 460	Discrepancy Record
MSFC Form 847	Deviation/Waiver Approval Request (DAR)
MSFC Form 2348	Engineering Change Proposal
MSFC Form 2490	Installation Notice Card (INC)
MSFC Form 4229	Preliminary/Interface Revision Notice (PIRN/IRN)
MSFC Form 4242	Record Engineering Change Proposal

3. ACRONYMS/DEFINITIONS

For a definition of terms and a list of abbreviations and acronyms used in this document, see Appendix G.

4. GENERAL REQUIREMENTS

The contractor shall establish a CM program covering the appropriate life-cycle phases of the applicable Configuration Items (CIs) and Computer Software Configuration Items (CSCIs). In this document, CI is a broad term that includes CSCI whenever appropriate. The requirements of this document shall be implemented and tailored as stated in the contract Statement of Work (SOW) and consist of the following elements:

a. Configuration Identification

b. Configuration Control

c. Configuration Status Accounting

d. Configuration Verification; Configuration Verification/Validation for Software/Firmware

The contractor shall assure that all appropriate subcontractors comply with the requirements of this CM program.

5. CONFIGURATION MANAGEMENT PLANNING

5.1 General. The contractor shall plan a CM program in accordance with the requirements defined in this standard. The CM program shall be tailored appropriately for the particular CIs, their scope and complexity, and the contracted phase(s) of the life cycle.

5.2 Contractor's CM Plans. The contractor shall develop a CM plan or plans that describe the processes, methods, forms, and procedures to be used for management of the functional and physical characteristics of the CIs. The CM plan, when approved, forms the basis for implementation of CM requirements and shall be maintained by the contractor. The content and format of the CM plan shall be in accordance with Appendix A as tailored by the contract. The software CM plan shall be prepared in accordance with contract direction. The contractor shall submit the CM plan and changes thereto in accordance with the contract Data Procurement Document (DPD).

6. IDENTIFICATION

6.1 Configuration Identification**.** Configuration Identification is the basis from which the configuration of products is defined and verified; products and documents are labeled; changes are managed; and accountability is maintained. The contractor shall implement configuration identification for every CI.

Note: Technology driven programs defy clear definitions of what constitutes a configuration item. Typically government funded studies on technology issues do not result in a designed product requiring configuration management. Prototypes that are scaled down visual models or computer programs that are simply Computer-Off-The-Shelf (COTS) unmodified software or even applications of common desktop programs may be better handled without formal control of design. On the other hand, formal requirements, controlled design over a life cycle, and a formal changes clause in the contract indicate that hardware or software requires formal configuration management to control. The configuration management plan shall identify these items, if not initially, then in a future revision.

Note: The term "configuration item" should not be applied to software products that are employed in the development process of a Program/Project, and considered Computer-Off-The-Shelf (COTS) software. Configuration item would apply to those software products that are the result of specific design requirements generated for the Program/Project, and therefore would be subject to formal configuration management control for the duration of the Program/Project lifecycle. These configuration items shall be identified in the Configuration Management (CM) Plan.

6.1.1 Configuration Identification Baselines. The contractor shall accomplish configuration identification through formal documentation that defines the baseline being established and provides for the control and accounting of future changes to that baseline. The design of each

CI progresses through baseline evolution from basic requirements into a final verified and built product. The baselines are defined as the *Functional Baseline, Allocated Baseline, Development Baseline, and Product Baseline.* A baseline identifies an agreed-to description of attributes of a CI at a point in time and provides a known configuration to which changes are addressed. Baselines are established by agreeing to (and documenting) the stated definition of a CIs attributes. The approved "current" baseline defines the basis of the subsequent change.

a. Functional Baseline. The Functional Baseline is the approved configuration documentation that describes a system's or top-level CIs performance requirements (functional, interoperability, and interface characteristics) and the verification required to demonstrate the achievement of those specified characteristics. The Functional Baseline is controlled by the Government.

b. Allocated Baseline – The Allocated Baseline is the approved performance-oriented configuration documentation for a CI to be developed that describes the functional and interface characteristics that are allocated from a higher level requirements document or a CI and the verification required to demonstrate achievement of those specified characteristics. The allocated baseline extends the top-level performance requirements of the functional baseline to sufficient detail for initiating manufacturing or coding of a CI. The Allocated Baseline is controlled by the Government.

c. Development Baseline. The Development Baseline is the contractor's design and associated technical documentation that defines the contractor’s evolving design solution during development of a CI. The developmental configuration for a CI consists of contractor internally-released technical documentation for hardware and software design that is under the developing contractor's configuration control.

d. Product Baseline - The Product Baseline is the approved technical documentation that describes the configuration of a CI during the production, fielding/deployment and operational support phases of its life cycle. It is not established until successful certification following a Functional Configuration Audit and a Physical Configuration Audit. The product baseline describes:

— Detailed physical or form, fit, and function characteristics of a CI

— The selected functional characteristics designated for production acceptance testing

— The production acceptance test requirements.

Once the Product Baseline is established, the Government determines how it shall be controlled.

6.1.2 Functional and Allocated Baseline Relationships. Interface control documents are considered part of the functional and/or allocated baselines to the extent that they are referenced in and supplement the performance specifications that constitute the applicable baselines. Contractor implementation of the Functional and Allocated Baseline Requirements involves the creation and release of engineering documentation that incrementally defines the configuration of the specific product. The function and allocated baseline represents the contractor’s detailed design solution and is controlled by the Government. It may or may not include a detail specification for the product. The contractor is responsible for the configuration

control of the developmental configuration and may iteratively design, release, prototype, and test until the functional and allocated requirements are satisfied. The developmental configuration ultimately includes the complete set of released and approved engineering design documents, such as the engineering drawings and associated lists for hardware, software, and interface and database design documents for software. By reference within this documentation, it also includes test and verification documents.

6.1.3 Product Baseline Requirements. The product baseline is the approved documentation that completely describes the functional and physical characteristics of the CI, and any required joint and combined operation's interoperability characteristics of a CI (including a comprehensive summary of the other environment(s) and allied interfacing CIs or systems and equipment). It consists of the Product Configuration Identification which defines the configuration of a CI during production, operation, maintenance and logistic support phases of its life cycle and which prescribes the requirements for 1) fit and function characteristics of a CI, 2) the functional characteristics selected for production acceptance testing, and 3) the production acceptance tests.

The Product Configuration Identification includes the complete set of released and approved engineering design documents such as engineering models, engineering drawings and associated lists for hardware, software, interfaces, operations documentation, and database design documents for software. (These are the configurations of the documents that were considered the developmental configuration.) The product baseline may include the 2-D drawings or a 3-D engineering model of a hardware product, and for software a representation of the CSCI source code. It also includes by reference the material and process specifications invoked by the engineering documentation.

6.2 Specifications. Each CI shall be documented in a performance specification as defined in MIL-STD-961. At the system or program level, *Systems Specifications or a System Requirements* document may be required to establish comprehensive and definitive set of system performance requirements. These shall follow the same content requirements as exist for CI specifications. (Exceptions shall be documented in the Configuration Management Plan.)

Note: MIL-STD-961 describes different types of specifications, including performance specifications, detail specifications, and program-unique specifications. A program-unique specification is prepared when there is little likelihood that the requirements will extend beyond a single program. A program-unique specification can be prepared as a performance specification or a detailed specification. A performance specification defines requirements in terms of results required and criteria for verifying compliance. A detailed specification goes beyond describing functions and defines in detail the methodology to build the product. Specifications are also categorized as to type-like system specification, Configuration Item (CI) specification, material specification, software specification, or process specification.

6.2.1 Specification Requirements. The contractor shall prepare a *performance specification* as a program-unique document for each identified CI in accordance with MIL-STD-961. For software specifications and requirements, the contractor shall prepare documentation in accordance with IEEE 12207 and IEEE 1042.

6.2.2 Requirements When Submitting Specification Changes. The contractor shall provide detailed change information when proposing changes to baselined specifications and shall maintain traceability of changes to other baselines for each specification.

6.2.2.1 Specification Changes. When a change to a specification is proposed, the proposed revision shall be described verbatim with a "From/To" language or graphics, if the change is less than 25 percent of the specification. If the change is greater than 25 percent, a general description of the changes shall identify individual sections and/or paragraphs being changed with a brief explanation. Information regarding application of the change that is described in Appendix C shall be apparent either by referencing an ECP or as header information describing the change. There is no prescribed format.

Note: The editing tool of common word processors may be used as a means of submitting from/to language.

6.2.2.2 Specification History Log. All approved changes shall be prepared as a revision and each specification shall contain a Specification History Log in the front of each document. (Specification change pages in lieu of a revision may be used only as an exception and with prior authorization in the Configuration Management Plan.) The history log records all changes (approved, disapproved, or pending) issued against the specification. The log shall also provide a chronological listing of all changes to the specification. Appendix C shows content. There is no prescribed format.

6.2.2.3 Distribution Restrictions. The contractor shall identify notices of availability and limitation statements as required in accordance with public law, federal regulations, and contractual requirements. The contractor shall assess each document and provide a determination on distribution restrictions. Generic or general statements like “may contain export control data” are not acceptable. Areas of limitation include: International Traffic in Arms Regulations (ITAR) Notice; Export Administration Act (EAR) Notice; Trade Secrets or Confidential Commercial Information; Copyright; Small Business Innovative Research (SBIR) Data; and Publicly Available Documents. (Reference NPD 2190.1.)

6.3 Interface Identification. The contractor shall comply with the imposed interface requirements and shall establish interface identification documentation as required by contract provisions and systems integration considerations. These interface identifications shall become a portion of the Functional and Allocated Baseline definitions. Interface documentation consists of Interface Control Documents (ICDs) and/or Interface Requirements Documents (IRDs).

6.3.1 Interface Requirements Documents. The contractor shall comply with and/or develop IRDs as required by the contract Statement of Work requirements. The IRD defines interface requirements to be controlled between programs, projects, systems, or CIs. The specifications for the interfacing elements shall reference and identify the current and applicable IRDs.

6.3.2 Interface Control Documents. ICDs are the design solutions to the IRDs. The contractor shall prepare or support preparation of ICDs to identify the physical, functional, and/or procedural parameters that are to be controlled between interfacing elements.

6.3.3 Interface Change Control. Following IRD/ICD baseline establishment, any changes affecting the IRD/ICD approved baselines shall be a Class I change. (See paragraph 8.3.3 for definition of Class I change.)

6.3.3.1 IRD/ICD Revision. Interface document revision involves the total reissuance of the document and shall be accomplished only to incorporate approved Interface Revision Notices (IRNs). Revisions to IRDs/ICDs are made concurrently with IRN approval or periodically to incorporate multiple approved IRNs. The contractor's Configuration Management Plan shall tailor the policy to program/projects requirements. The revised document shall be submitted for approval in the same manner prescribed for the initial submission.

6.3.3.2 IRN Process. When a contractor desires, or is directed by MSFC to make a change to an interface document, the proposed change shall be documented as a Preliminary Interface Revision Notice (PIRN). All changes to interfaces are initiated with a PIRN which permits coordination of the technical interfaces among the different organizations. The PIRN shall be coordinated among all parties of the affected interface before it is submitted for approval. The PIRN shall be submitted by an Engineering Change Proposal (ECP) in accordance with implementing instructions for processing changes. (See paragraph 8 for processing ECPs.) Changes to specifications that may be associated with the change to the interface shall also be submitted as part of the ECP. Note that a PIRN utilizes the same format as the IRN. Until approved, the input is designated with the word "preliminary" (PIRN). If the contractor cannot agree to the PIRN during review and evaluation, the contractor shall submit an alternate PIRN by ECP to MSFC for consideration and disposition. The PIRN requires approval from all parties affected by the interface. Appendix D shows an example of the PIRN/IRN format.

Proposed interface document changes initiated by other activities and submitted for the contractor review and evaluation shall require coordination and response in accordance with implementing instructions for processing changes. When a change to an IRD/ICD is proposed by another entity, the contractor shall acknowledge receipt and release of the change into its baseline. If the change is to be incorporated without affecting the cost, schedule, or other principal articles of the contract, the contractor shall agree to acceptance of the change with a "Record" ECP (RECP). (See paragraph 8.5.)

When not designated as interface document custodian, the contractor shall review proposed IRDs/ICDs from other interfacing contractors and/or agencies. Upon receipt of proposed IRDs/ICDs, the contractor shall assess impact, coordinate as necessary, and take one of the following actions:

a. Submit an RECP.

b. If the interface document is not a contractual requirement, but is compatible with the contractor's detailed design, submit an ECP with specification changes incorporating the IRD/ICD in the development specification CI documentation.

c. If the interface document is incompatible with the contractor's detailed design, submit an ECP identifying required changes in accordance with implementing instructions for processing changes, including specification changes as required.

6.3.4 Contractor Developed and Maintained Interface Documents. When designated as an interface document custodian, the contractor shall be responsible for initial preparation of Interface Requirements Documents/Interface Control Drawings (IRDs/ICDs). IRDs shall comply with the format for Interface Standards as defined in MIL-STD-962 and shall specify basic performance requirements that are defined for visibility and control. ICDs shall comply with the requirements for interface control drawings/documents specified in industry standard ASME Y14.24 (drawings) or MIL-STD-962 (documents). ICDs shall record quantified design interfaces between participating contractors and/or Government agencies.

The contractor shall be responsible for technical coordination with other parties involved with the interface. The contractor shall provide periodic status of this coordination activity and shall advise MSFC of any design, operational, or procedural differences, including recommended resolution, between interfacing parties.

The proposed initial interface document baseline shall be submitted by an Engineering Change Proposal (ECP). MSFC approval of the ECP provides authority for release and distribution of the interface documents.

6.3.5 Interface Designation on Associated Documentation/Drawings. Documentation/drawings affecting any interface require interface control management coordination and action. The following statement shall be entered on the first sheet of the document/drawing immediately above the title block:

"This drawing/document contains information controlled by an IRD/ICD. No changes shall be made to information controlled by an IRD/ICD prior to interface control management authorization."

6.4 Drawing and Models

6.4.1 Drawings. A drawing discloses by means of graphical or textual presentation or a combination of both the physical and functional definition of a product. The drawing along with associated lists and notes define the detailed design, the attributes of which are verified through testing. Drawings reflect the end-product and provide information for manufacturing, testing, quality, training, and operations. Released drawings reflect the status of design at an exact point in time. Drawings provide data regarding sources of supply when a part is built by an outside vendor.

6.4.1.1 Each drawing shall be designated with a drawing number and each drawing shall reflect the next higher assembly until a top assembly is defined. The sum of all drawings represents the complete design of the product.

6.4.1.2 The contractor shall prepare drawings in accordance with ASME Y14.100. Part I drawings shall define the following:

a. Reflect the end-product at its current level of design maturing

b. Provide the engineering data for logistics support products

c. Provide the necessary data to permit manufacture and/or acquisition of items identical to the original item

d. Document directly or by reference the following

(1) Details of unique processes (i.e. not published or generally available to industry) when essential to design and manufacture
(2) Performance ratings
(3) Critical manufacturing processes and assembly sequences, and rigging procedures
(4) Diagrams
(5) Mechanical and electrical connections
(6) Physical character tics, including form and finish
(7) Details of material identification, including heat treatment and protective coating
(8) Inspection, test, and evaluation criteria
(9) Equipment calibration requirements
(10) Quality assurance requirements
(11) Hardware marking requirements
(12) Requirements for reliability, maintainability, environmental conditions, shock and vibration testing and other operation or functional tests

Part II Cable interconnect diagrams (CIDs) electrical system schematics, wiring lists, and fluid system schematics shall include the following:

a. Cable interconnect diagrams shall show graphically the arrangement of external electrical cabling which interconnects electrical assemblies and/or equipment. The CID shall show all cable runs and terminations; each cable shall be identified by reference designation number. The connector short sign shall be identified.

b. Electrical system schematics shall illustrate and describe circuit items with symbols placed such that a circuit may be traced from item to item in the sequence of its function. The placement and arrangement of these circuits shall follow a logical sequence of presentation to provide a clear description of distribution.

c. Schematics and/or wiring list for components, including interconnection cable harnesses shall be provided.

d. The grounding schematics shall show the details of all grounds and power returns from source to loads. All connections shall be shown in overall grounding documentation. The schematics shall also show details of all electrical ground support equipment interconnections to facility and show all safety grounds.

e. The fluid system schematics shall illustrate and describe all components with systems and flow designators such that the fluid system maybe be traced from component to components (such as pumps, valves, meters, regulators, and filters). The schematic shall document the range requirements (flow, temperature, and pressure) for all component external interfaces and line sizes. The placement and arrangement of these components shall follow a logical sequence or presentation to provide a clear description of the flow of fluids in the system. The schematics shall reference engineering drawings and associated lists for configuration details.

f. General drawing practices, drawing titles, and markings on drawing shall follow ASME Y14.100.

g. The contractor shall revise engineering drawings and associated documents in accordance with ASME Y14.35M.

6.4.1.3 Geometric dimensioning and tolerancing for drawings and models shall be applied as described in ANSI Y14.5. GDT shall be used between all external and major internal interfaces.

6.4.1.4 Proprietary restrictions, such as limited rights and licensing, shall be marked on the applicable drawing sheets with the appropriate approved legend within the field of the drawing. Drawings otherwise restricted, such as export control, shall also be marked within the field of the drawing.

6.4.2 Models. Computer Aided Design (CAD) models assist designers in preparing drawings, specifications, parts lists, and other design-related elements using special graphics and calculation-intensive computer programs. Its output is a three-dimensional model that defines geometry (point, surface, curve, solid); topography (connectivity and order of relationships of vertex, edge, face, object); and domain or structure (product position and attributes). The CAD model greatly enhances the design process and detects errors before the manufacturing process begins.

6.4.2.1 The contractor shall prepare digital data on a CAD in accordance with ASME Y14.41. The contractor shall be capable of providing two dimensional drawings to the government for design reviews, audits, or for other purposes.

6.4.2.2 The contractor shall use CAD as a means of developing design, using a neutral format that shall be agreed to between the Government and the Contractor. The neutral format serves as means of data transfer between dissimilar systems. Translators, developed to the neutral standard, are used to export a design between the system of original and the destination system. The model may be delivered to the Government by CD, DVD, or direct electronic transfer. The CAD model vendor utilized by the contractor and the means of transfer shall be negotiated between the contractor and the Government.

Note: MSFC design organizations use the following CAD vendor products: Ideas, Mentor Graphics Expedition series, ProEngineer, Solid Edge, and Unigraphics.

6.5 Identification Numbering.

6.5.1 General. The contractor shall apply an identification numbering system that provides a unique identification number for items and supporting documentation. Individual units of a product shall be assigned a unique product unit identifier (serial/lot number) when there is a need to distinguish one unit of the product from another unit of the product, each of which are the same configuration. The product composition, (i.e. relationship and quantity of parts that compose the product) is determinable from its configuration documentation. That is, there is a hierarchical relationship of all parts composing the product. Assignment and use of numbers and other identifiers shall be used for configuration identification, control, and accounting of all (hardware, software, firmware) CIs, related equipment, and associated documentation. The types of identification numbers include:

a. Document identification numbers

b. CI, system, subsystem, and part Identification

c. Software identifiers

d. Serial and lot numbers

e. Design activity (Commercial and Government Entity) CAGE Code

6.5.2 Identifiers Assigned by Other Design Activities**.** Where the CI incorporates the design of a Government agency or of another contractor, subcontractor, vendor or supplier, the contractor shall use identifiers assigned by these design activities without reidentification, except as authorized by MSFC. An exception is noted to allow a new number when a part is procured under a source control drawing.

6.5.3 Specification Identification. The contractor shall assign each specification an identification number. Once a specification is identified, it shall maintain that identification throughout the life of the program. The contractor shall uniquely identify specifications, specification revisions, and specification changes. These numbers shall uniquely identify all specifications required to control the design, fabrication, and test of hardware and computer software items under MSFC contracts. The numbering system shall be identified in the contractor's Configuration Management plan.

6.5.3.1 Government or Industry Specification Numbers. The contractor shall not apply further identification to Government or industry specifications or standards unless the specifications or standards are altered.

6.5.3.2 Specification Identification Number Records. The contractor shall develop and maintain a record of all contractor-prepared specifications, including the revision level and specification change status.

6.5.4 Interface Requirements/Control Documents. Consistent and accurate use of identification numbers is required. If the contractor is responsible for development and maintenance of an ICD/IRD, the numbering scheme shall be identified in the Configuration Management Plan.

6.5.5 Drawing and Part Numbering. The contractor shall assign drawing and part identification numbers in accordance with principles described in ASME Y14.100.

6.5.6 CI Selection and Numbering. The contractor shall assign unique identification numbers to all CIs. These numbers are used by MSFC upon delivery and shall be maintained throughout the life of the CI. The contractor shall select and recommend potential CIs to the Government. Any item requiring logistics support or designated for separate procurement is a CI. The contractor may designate CIs at any time during the life cycle of the program. Computer hardware shall be treated as CIs. CI selection involves the grouping of software into manageable entities based on coherence of design, implementation, and test. Other considerations in the selection of CIs are risk, safety, complexity of interfaces, user interface, and functionality. The final CI selection is made by the Government.

6.5.7 Changing Drawing and Part Numbers. Before the Product Baseline or initiation of manufacturing, release of a part drawing into the contractor's Development Baseline is accomplished by drawing change letter control. Thereafter, drawing change letter control shall continue and part numbers shall be controlled and changed in accordance with the requirements of ASME Y14.100 as follows:

a. When performance or durability is affected to such an extent that the previous versions are required to be discarded or modified for reasons of safety or malfunction. A Part Identification Number (PIN) shall also be assigned to all subsequent higher assemblies up to the level at which interchangeability is reestablished.

b. When the new version of an item is not interchangeable with the previous version.

c. When a repair part within an item is changed so that it is no longer interchangeable with its previous version. (A new PIN shall also be assigned to all subsequent higher assemblies up to the level at which interchangeability is reestablished. (Either the original or the new item may be used in all units of all next higher assemblies.))

d. When the previous version of an item is limited to use in specific articles or models of articles, and its new version is not so limited. (A new PIN shall also be assigned to all subsequent higher assemblies up to the level at which interchangeability is reestablished.)

e. When a part used on multiple articles is changed so that it has limited effectivities.

f. When an item is changed in such a way that it necessitates a change to an operational test, self-test, or maintenance test computer program. A new PIN shall be assigned to all subsequent higher assemblies up to the level at which computer programs are no longer affected.

g. When the design of the item is controlled by the contractor, the item may be identified by a standard specification identification number when all the following criteria apply:

(1) It has a multiple usage and is expected to have a design application in more than one CI.

(2) It is non-repairable (throw away) and is not to be provisioned under the contract below the level identified by the standard specification identification number.

(3) It is completely specified in a specification document or source control drawing with respect to performance, durability, reliability, form, fit, qualification, and inspection requirements.

(4) Unless otherwise concurred in by MSFC, one or more alternate sources are approved and qualified to supply the item.

6.6 Lot and Serial Numbering. The contractor shall utilize lot and serial numbering for proper identification and control of components, parts, and CIs. Lot and serial numbers allow

one product to be distinguishable from another; identify the source of a product; and allow the correct product information to be identified and retrieved.

6.6.1 Serial Numbers.

6.6.1.1 General. The contractor shall assign serial numbers to all complete units of a CI and to critical parts and components when traceability is necessary. The contractor shall record and maintain serial numbers assigned by subcontractors and suppliers/vendors.

6.6.1.2 CI Serial Numbers. Serial numbers shall be used for unit identification and engineering effectivity. The contractor shall record serial numbers on all applicable manufacturing records and configuration accounting records for each item.

6.6.1.3 Critical Parts and Components (Items) Serial Numbers. When serialization is required, serial numbers shall be permanently assigned in numerical sequence for a particular part number and shall not be changed even though the component, assembly, or part has been identified by a new part number. The serial number shall be applied to the part in accordance with MIL-STD-130 and shall be recorded on all manufacturing records and configuration accounting records.

6.6.2 Lot Numbers.

6.6.2.1 General. A lot number is a unique number assigned to items that have been fabricated from a particular batch of material, have undergone a particular process, or have been manufactured/tested in a group with each item in the group having an identical history. For items meeting the above criteria and which are not serialized, the contractor shall assign lot numbers to contractor-developed and fabricated items and shall maintain lot numbers assigned by suppliers.

6.6.2.2 Recording of Lot Numbers. The contractor shall record lot numbers on all manufacturing records and configuration accounting records. In addition, the contractor shall develop and maintain a utilization list that cross-references the item, component, or part lot number to the next higher assembly to ensure traceability of lot numbers incorporated into next higher assemblies.

7. ENGINEERING RELEASE INFORMATION

7.1 Engineering Release. The contractor shall establish an engineering release system to issue configuration documentation to functional activities and to authorize the use of configuration documentation associated with an approved configuration. The contractor shall maintain current and historical engineering release information for all CIs and their component parts. The contractor shall release engineering documentation for which it has design responsibility or for equipment furnished to the contractor as Government Furnished Equipment (GFE). Engineering release actions shall cite the authority for the release (ECP, CCBD, contract letter). The contractor shall also cite the release authority for internal engineering releases. The engineering release system shall be capable of defining product attributes and shall be in such a format as to allow recovery and review to assure an actual match with actual built units. The engineering release shall be included in configuration status accounting records.

7.1.1 Specification Release and Approval. For contractor-prepared specifications, the contractor shall submit the proposed specification by ECP to MSFC for approval if required by contract. The Government reviews the ECP and specification and provides comments to the contractor as necessary. Following incorporation of agreed-to comments into the specification, the contractor is informed of ECP approval as specified in the contract. The contractor shall release the specification and establish or revise the appropriate baseline. If MSFC prepares a specification, MSFC submits the specification and obtains contractor agreement on implementation via appropriate contract procedures. The contractor shall release the MSFC-prepared specification as part of its design baseline release system.

7.1.2 Engineering Release Information. The contractor shall use engineering release information to release new or revised configuration documentation. The content requirements for Engineering Release may utilize contractor's formats, systems, and procedures. Each release shall identify the data (documents/drawings/databases) released; the authorization for release; whether the release is an initial release or a change release; the configuration item or system affected (with effectivities); and date of release.

The contractor is not required to meet standardized formats for an engineering release system. However, the contractor shall prepare and maintain engineering release records in accordance with the minimum requirements stated herein. The contractor's formats, systems, and procedures may include information in addition to these minimum requirements, provided that the engineering release records conform to the following:

The contractor shall maintain only one release record for each drawing number. The contractor shall only release engineering documentation for which the contractor has design responsibility or engineering documentation that is Government furnished. Engineering release actions that result in the initial release of baseline engineering documentation shall cite the authority for that release (e.g., ECP, Configuration Control Board Directive (CCBD).

7.2 Elements of Data Required for Hardware Items. The contractor's engineering release records for hardware items shall contain the following information.

7.2.1 CI Elements.

a. Item number

b. Item serial number(s) (Effectivity)

c. Top drawing number

d. Item specification identification number

7.2.2 Drawing Elements.

a. Drawing number

b. Drawing title

c. CAGE code

d. Number of sheets

e. Date of release

f. Drawing change or revision letter and release date of authorizing document which directed the change or revision

g. Ancillary document numbers, e.g., engineering change notices, engineering orders

h. Specification document, specification control drawing, or source control drawing number

7.2.3 Part Number Elements.

a. Controlling drawing number

b. Part numbers released

c. Identification of change that created the part number

7.3 Elements of Data Required for Software Items. The contractor's engineering release records shall reference the software CSCI Version Description Document that contains the elements required in the contract and the guidance provided in IEEE/EIA 12207.1.

7.4 Production Release Functional Capabilities. To the extent that the contractor has detailed design responsibility, the contractor's release function (for documentation, drawings, and associated lists) shall be capable of determining these released engineering requirements:

a. The composition of any part number at any level in terms of subordinate part numbers.

b. All next higher or next assembly part numbers in which the part is used.

c. The composition of any software CSCI in terms of components and units and subordinate item numbers.

d. The CI/CSCI number and serial numbers (effectivity) on which any subordinate part is used. This does not apply to subcontractors, vendors, and suppliers who are not producing CIs/CSCIs.

e. The Class I and Class II change identification numbers for engineering change packages that have been partially or completely released for any part number or CI/CSCI number and serial number.

f. The hardware CI numbers and serial numbers or software CSCI and version numbers that constitute the effectivity of any change identification number.

g. The subcontractor, vendor, or supplier part numbers which have been assigned in response to critical component (item) specification documents, specification control drawings, or source control drawings issued by the contractor.

h. The contractor's specification document, specification control drawings, or source control drawing numbers associated with any subcontractor, vendor, or supplier part number.

7.5 Release of Engineering Changes. The contractor's release function and records shall be capable of identifying Class I and Class II engineering change packages. The contractor shall retain the record of superseded configuration requirements.

7.5.1 Release Records. Contractor release records shall identify all Class I and Class II engineering releases accomplished under the authority of each contractor CCB directive. In addition, for all Class I changes, the ECP number shall be identified.

7.5.2 Release Change Packages. All Class I and Class II engineering change packages released for incorporation shall be completely released before formal acceptance of the deliverable unit.

7.5.3 Retention of Records. The configuration released for each CI unit at the time of its formal acceptance shall be retained for the life of the contract or otherwise dispositioned by MSFC contractual authority.

7.6 Field Release Functional Capabilities. Engineering data defining equipment that is under the jurisdiction of the contractor or MSFC and is progressing through testing or through activation programs shall be maintained current with all field activity requirements and releases.

8. CONFIGURATION CONTROL

8.1 General. Configuration control is the systematic process of presentation, evaluation, and disposition of proposed changes and the implementation of approved changes into CIs and baseline documentation after establishment of the baselines as defined in Section 6. Configuration control begins with the establishment of a configuration baseline and continues through the life cycle of the CI. The contractor shall establish and operate a configuration control process that meets the requirements contained in this document.

8.2 Configuration Control Boards. The contractor shall establish Configuration Control Boards (CCBs) for control of internal configuration identification documentation and to review, evaluate, and approve the submission of proposed changes, deviations, or waivers to established configuration baselines to MSFC. (Limited scope contracts, such as a single avionics product, may not require a formal CCB. However, the contractor shall provide evidence of internal configuration control processes.)

8.3 Changes, Deviations, and Waivers.

8.3.1 General. For the purposes of configuration control, the term "change" is hereby defined to include Engineering Change Proposals (ECPs), Field Engineering Changes (FECs), Deviations, and Waivers (DARs) that affect an established configuration baseline.

8.3.2 Change Criteria. The contractor shall limit the initiation of changes to those that meet one or more of the following criteria:

a. Correct safety, design, or performance deficiencies;

b. Satisfy a change in operational or support requirements;

c. Effect overall cost savings;

d. Prevent or control program/project schedule slippage;

e. Implement design improvements;

f. Implement performance requirements changes.

8.3.3 Change Classification. For purposes of configuration control, changes shall be classified as Class I or Class II, depending upon their impact on established configuration baselines or other contract requirements. Change classification definitions and submission requirements are stated in the following paragraphs.

8.3.3.1 Class I Change. The contractor shall designate a proposed change as Class I when any of the baseline factors listed in Table 1 are impacted. The contractor shall submit all Class I changes to the MSFC contracting officer. The contractor shall not implement a Class I change without specific direction from the MSFC contracting officer.

8.3.3.2 Class II Change. When the proposed change does not qualify as a Class I change, the contractor shall designate the proposed change as Class II. The contractor shall process, disposition, and implement Class II changes within the contractor's CM system. Concurrent with internal processing, the contractor shall submit copies of all Class II changes to the responsible MSFC CCB, or its designated representative, for concurrence with the classification. In the case of notification of nonconcurrence with the classification, the contractor shall resubmit the change as a Class I change.

8.3.4 Program Control Number. MSFC utilizes a Program Control Number (PCN) to identify the total contents of all Class I change packages. Upon request from the contractor, the PCN is assigned by the MSFC CM function supporting the program or project. The contractor shall use this PCN on all change proposals, supporting documents, and implementing documents related to the change.

8.3.5 Change Priority. For all Class I changes, the contractor shall assign a proposed priority of emergency, urgent, or routine in accordance with the following criteria:

a. Emergency. The contractor shall assign this priority if the proposed change is to correct a safety condition that could result in fatal or serious injury to personnel or in extensive damage to or destruction of equipment.

b. Urgent. The contractor shall assign this priority if the proposed change is to correct a potentially hazardous condition that, if uncorrected, could result in injury to personnel or in damage to equipment and reduction of mission effectiveness. The contractor shall also use this classification for the following:

(1) Changes necessary to meet contractual requirements when lead-time would necessitate slipping baselined production, activation, or construction schedules;

(2) Mission capability changes when delay would compromise the mission capability and result in unacceptable impact to contract, production, or mission launch schedules; and

(3) Changes associated with interface problems resulting from compatibility changes made by other contractors.

c. Routine. The contractor shall assign this priority to a proposed change when "emergency" or "urgent" is not applicable.

The contractor shall not process a proposed change through the contractor's CM process in one priority level and upgrade to a more critical priority upon submission to MSFC.

8.3.6 Submission of Changes. The contractor shall ensure that all proposed changes are properly processed through the contractor's CM system and that proper engineering and management approvals are obtained before submission to MSFC. Requirements for the specific categories are covered in paragraphs 8.4 through 8.5.

8.4 Engineering Change Proposal. The contractor shall submit Class I engineering changes originated by contractor organizations or subcontractors, as an Engineering Change Proposal (ECP), in accordance with contract requirements and instructions. Class I engineering changes shall also contain project control considerations (e.g., cost estimates, schedule impact). Each change that involves related changes on other items or facilities for which the same contractor is responsible shall be presented as a total package for contractual implementation. A separate ECP shall be submitted for each change that has its own distinct objective. A single ECP shall not cover unrelated changes. The receipt of contractual approval shall constitute the sole authority for the contractor to implement a Class I engineering change. MSFC Form 2348 Engineering Change Proposal identifies information required for ECP submittal. Appendix E illustrates this form for reference only. Contractor format is acceptable.

8.5 Record Engineering Change Proposal (RECP). The contractor shall submit an RECP to indicate acceptance of a change to the interface baseline. (The RECP sometimes is authorized as a general format to process no-impact changes other than interface.) The RECP indicates that the change is acceptable and in accordance with the contractor's design. In other cases, the contractor shall submit a formal ECP describing the changes required to comply with the proposed interface changes. MSFC Form 4242, Record Engineering Change Proposal, identifies information required for RECP submittal. Appendix D illustrates this form for reference only. Contractor format is acceptable.

8.6 Field Engineering Change (FEC). An FEC is the expedited means for proposing emergency or urgent engineering changes at using sites on equipment for which MSFC retains design responsibility and shall be submitted in accordance with contract requirements and instructions. An FEC shall be used when time is insufficient to process an ECP. Approval of an FEC by MSFC authorizes implementation of the change and requires that the contractor submit a follow-up ECP. It is mandatory that a copy of the approved FEC be incorporated into the ADP... Before the FEC submittal, the contractor shall obtain a PCN for each FEC.

8.7 Software/Firmware Field Engineering Change. A software/firmware field engineering change permits emergency or urgent changes to the software product after deployment. The

Using Site or Design Activity shall initiate an urgent or emergency change request when field conditions warrant. With prior authorization by the Government, the software engineering group shall prepare a software change to correct the problem. The Design Activity shall evaluate the change, propose and test a fix, and prepare a software package, including the Version Description Document (VDD). It shall submit the change package to the Government. The Government's Control Board Disposition provides direction on how the software change is to be distributed and that an Installation Notification Card (INC) is required to confirm proper installation and test. The Control Board, based on the urgency or emergency of the change, determines the extent of verification/validation required and the extent of document changes. If the change involves more than code, the Program/Project provides direction that a formal ECP be submitted by the contractor to update documentation and fully incorporate the change. Appendix H describes the process in detail.

8.8 Deviation and Waiver Request. The contractor shall submit Deviation/Waiver Approval Request (DAR), originated by contractor organizations or subcontractors, in accordance with contract requirements and instructions. Deviation and Waiver criteria are as follows:

a. When a departure from a specification, drawing, or related documents, which impacts Class I change criteria, is known or planned before the production of an item, the contractor shall submit a DAR as a deviation to identify and obtain authorization for the departure. Deviations shall be used to obtain approval of departures when the "as-required" or "as-designed" definition is correct, but a temporary departure from baseline requirements is necessitated.

b. When a departure from a specification, drawing, or related documents, which impacts Class I change criteria, is identified during or after production of an item, and the item is considered suitable for use "as-is" or usable after repair by an approved method (other than previously approved standard repairs), the contractor shall submit a DAR as a waiver to obtain MSFC authorization for use of the item. Nonconformances which do not meet Class I change criteria shall be processed in accordance with the contractor's internal material review procedures (Material Review Board or equivalent). MSFC Form 460 Discrepancy Record may be used to record discrepancies that can lead to a deviation/waiver. MSFC Form 460 is used during hardware testing and provides a waiver option if class I criteria are violated. For software, a problem report serves the same purpose as the MSFC Form 460. The use of the MSFC Form 460 does not obviate the use of the Deviation/Waiver Approval Request (MSFC Form 847). (See Appendix E for MSFC Form 460.)

c. Deviations or waivers shall not be used as a means of correcting design errors or for permanent changes to technical requirements. Permanent engineering changes require submission of an ECP.

d. MSFC Form 847 Deviation/Waiver Approval Request (DAR) contains information required for deviation/waiver submittal. AppendixE illustrates this form for reference only. Contractor format is acceptable.

8.9 Modification Kit and Instructions. Modification of a CI at a using site shall be accomplished by a released Modification Kit (mod kit), except for FECs originated and processed at the using site. The documentation for a Mod Kit shall be submitted by the contractor via an ECP. The Mod Kit documentation shall include the modification instructions, installation notification requirements, and validation/testing requirements. The Mod Kit shall be in accordance with contract requirements and instructions.

Table 1. Class I Change Definition

Functional Baseline	Allocated Baseline	Product Baseline
(1) Approved Program/Project Specification or equivalent. (2) Preliminary Software Requirements specification. (3) Interface characteristics/ documents. (4) Safety. (5) Other imposed technical requirements definition document. (6) Imposed or agreed-to price, fee, guarantees, or schedules.	(1) through (6) Same as functional baseline. (7) Approved Specification(s). (8) Imposed qualification and acceptance verification requirements. (9) Qualification status previously accepted by the Government. (10) Government-Furnished Equipment. (11) Specified critical processes. (12) Change of vendors of engineering critical components. (13) Retrofit. (14) Software Design Requirements Specification(s). (15) Software Interface Requirements.	(1) through (15) Same as functional and allocated baseline. (16) Change to approved Product baseline documentation if any of the following are affected: (a) Interchangeability, substitutability, or replaceability as applied to CIs (hardware/software), and to all subassemblies and parts except the pieces and parts of nonrepairable subassemblies. (b) Operation, test/checkout, logistics, maintenance documentation, or computer software. (c) Compatibility with support equipment trainers, training devices/equipment. (d) Preset adjustments or schedules affecting operating limits or performance to such an extent as to require assignment of a new identification number. (e) Electrical interference to communications – electrical equipment or electromagnetic radiation hazards. (f) Functional or performance characteristics demonstrated or experienced in previously delivered articles. (g) Electromagnetic characteristics. (h) Responsibilities of other program elements. (17) Software Detail Design Specification(s) – As-Built.

9. CONFIGURATION ACCOUNTING

9.1 General. Configuration accounting is the process of ensuring the accuracy and timeliness of information throughout the life cycle. Configuration information content evolves and is captured over the product life cycle as tasks occur. The contractor shall identify configuration baselines, provide for the accounting of changes to those baselines, and provide the status of all in-process changes. The contractor shall establish or utilize existing information systems to meet the requirements of configuration accounting.

9.2 Configuration Accounting Requirements. The contractor shall implement and maintain a configuration accounting system capable of the following general requirements:

a. Providing a complete record of configuration identification documentation for each CI;

b. Providing a record of all changes to configuration baseline documents, including manufacturing records and field modifications, throughout the life cycle of the CI;

c. Providing status of all pending, in process, changes;

d. Maintaining a record of all internal change activity (e.g., Class II changes, minor nonconformance) against CIs;

e. Accumulating and formatting data necessary to provide routine and special configuration accounting reports as outlined in Sections 9.3.1 through 9.3.4 and as required by the contract.

9.3 Configuration Accounting Reports. The contractor shall provide configuration accounting reports as required by the contract. Report data element outlines are contained in Sections 9.3.1 through 9.3.4.

9.3.1 Dispositioned Class I Change Activity Report. This report shall list all proposed changes, including deviations and waivers that have received MSFC disposition action and shall be arranged in a change proposal number sequence. The following data elements are as follows:

a. Identification of the change proposal, including the basic number, revision number, title, and associated PCN

b. Identification of the CI affected, including the number, nomenclature, and CI effectivity by serial number(s)

c. Identification of contractual change authorization including number and date

d. Disposition of the change proposal, i.e., “Approved”, “Approved with Changes”, or “Disapproved”

e. Identification and date of contractor's internal authorization documentation

9.3.2 Pending Class I Change Activity Report. This report shall list all Class I change proposals that are pending, either internal contractor approval or MSFC approval, and shall be arranged in a change proposal number sequence. The following data elements shall be included:

a. Identification of the change action, including the basic number, revision number, title, and associated PCN;

b. Identification of the CI affected, including number, nomenclature and CI effectivity by serial number(s); and

c. Depending on the processing status, enter the actual or estimated date of submittal to MSFC.

9.3.3 Configuration Identification Report. This report shall identify the baseline configuration and all configuration change actions for each CI. Hardware and software changes shall be listed separately from Deviation/Waiver Approval Requests (DAR) actions. The following data elements shall be included:

a. Contract and contractor identification;

b. CI identification including, as appropriate, CI number and nomenclature, part number, and specification number;

c. Configuration change data including the following:

(1) Change proposal identification including type of action (e.g., ECP, Class II change, or DAR), number, title, and associated Program Control Number (PCN) (if applicable);

(2) Change application including item(s) affected (e.g., hardware, software, or documentation), first and total effectivities, and the incorporation or installation points; and

(3) Change disposition including the identification of contractual change authorization.

9.3.4 Change Incorporation Status Report. This report shall list the status of ECP incorporation into CIs and shall be organized by CI number. The following data elements shall be included:

a. CI identification number and serial number;

b. Change proposal number, title, type of change, and associated PCN;

c. Change effectivity, engineering release date, and incorporation point;

d. In-line incorporation completion date, scheduled and actual, as appropriate; and

e. Mod Kit data shall include identification, authorization, effectivity, man-hour estimates and status, installation location, shipping date (scheduled and actual), and completion date(s) for installation and retest, if required.

9.3.5 Software Configuration Status Accounting. Like hardware, the purpose of software configuration status accounting is to record and report the status of evolving software throughout the life cycle. The contractor's software accounting shall provide reports as follows:

a. Released documentation, including specifications, interface information

b. Problem reporting, deviations/waiver activity including dispositions and open actions

c. Promotion tracking of code for each file through development, testing, validation/verification and operational deployment

d. Build records and version control – provide data for the Version Description Document

10. CONFIGURATION VERIFICATION AND AUDIT

10.1 General. Configuration verification and audit determine that the design output has been achieved and is accurately documented. The Functional Configuration Audit (FCA) verifies the CI or system performance against its approved configuration documentation. The Physical Configuration Audit (PCA) formally examines the as-built configuration of the CI or system against its design documentation. Certification of successful FCA and PCA assures the design meets performance requirements (FCA) and the build is accurate (PCA). The product baseline is established following completion of the FCA/PCA.

The Government performs a verification of configuration documentation to assure that CIs and systems have been identified, baselined, and controlled throughout the life cycle. The Government performs verification as a continuous process to assure authenticity of documentation used during a program/project's life cycle.

10.2 Planning. A verification and audit effort is introduced to the contractor by a formal plan that requires input and agreement between the contractor and MSFC. The process requires that participants identify discrepancies or anomalies, and recommend courses of action. The Chairperson shall review findings and determine appropriate actions. Audit minutes shall provide a record of findings, conclusions, recommendations, and action items. Follow-up occurs until all required action items are complete.

a. The plan shall clearly state the purpose and objectives of the review. The plan shall state data required to perform the review.

Note: Appendix I identifies data relevant to the FCA/PCA. The exact data that is required is identified in the contract Data Procurement Document (DPD).

b. The plan shall define criteria for a successful audit and provide formal certification thereto.

c. The plan shall define a means of recording and tracking open actions.

10.3 Contractor Support. The Government may elect to perform an overview FCA/PCA. In this instance, the Contractor shall perform detailed functions necessary to assure compliance with FCA/PCA criteria and provide all pertinent data to the Government to verify FCA/PCA findings. In this instance, the Contractor shall perform the detailed reviews necessary to assure the following:

a. Baseline for FCA/PCA established – a viable and complete history of the product is available.

b. All documentation, drawings, test documentation reviewed – traceability is evident.

c. Deltas between as-designed configuration and as-built configuration identified and resolved.

d. All prior open actions from previous design reviews resolved – or closure actions are clearly defined.

e. Verification complete and exceptions recorded.

f. Interface control diagrams either complete - or exceptions being tracked.

g. All prior open actions for spec requirements closed or being specifically tracked – one open action per requirement.

h. Material Identification and Usage List complete.

i. All agreements with other organizations (Government, contractor, academia) are current and available.

j. Differences among models (test, production) identified.

k. All deviations and waivers identified.

l. Qualification testing complete and documented – waivers or deviations available when criteria not met or explanation and action item expressed.

m. Verification matrix complete and available.

n. All technical issues identified and documented.

o. Acceptance Data Package meets criteria of Appendix F.

For software/firmware, the following actions in addition to those stated above, shall be performed by the contractor:

a. Results of all prior reviews, including verification and validation, are available

b. Traceability exists from requirements documents through coding and actual software performance

c. Interface issues are resolved or individually identified

d. Version Description Document available and reflects actual build of software

e. For firmware, control of both the hardware and software components is identified

10.4 Objectives. Regardless of the extent of participation, the contractor shall participate in Functional and Physical Configuration Audits (or equivalents) to assure accomplishment of the following objectives:

a. Document differences between the as-built configuration and the as-designed configuration

b. Provide the configuration identification documentation suitable for establishment of the Product Baseline.

c. Provide the product specifications and associated drawings and software documentation formally accepted as audited and reflect the qualified configuration.

d. When established, utilize the product baseline as a basis for processing and tracking changes.

e. Assure that the released engineering documentation, including authorized deviations, waivers, and Material Review Board actions, reflects the configuration of the as-built and tested CIs selected for audit.

f. Assure that the built hardware is tested to the released engineering documentation.

g. Compare the physical configuration of the CI unit selected for PCA with that unit's as-built technical data package.

Note: The as-built configuration includes details of manufacturing including a complete description of physical characteristics such as tolerancing, material processes, and machine tool computer controls. It also includes waivers/deviations, Material Review Board activities, and all activities that affect how the product is built.

h. Specify the differences between the configurations specified in the PCA technical data package and the as-built configuration and present for review and reconciliation before establishment of the Product Baseline.

i. Identify the differences between the configuration of the PCA qualification unit and the CI unit selected for the verification.

j. Submit any document changes necessary in accordance with the change clause in the contract.

k. Check and verify the hierarchy of specification tree and drawing tree of the CI/CSCI for continuity and integrity.

l. Verify the validity of all computer software and media applicable to the Product Baseline for format, completeness, and conformance to software requirement specifications.

10.5 Contractor Responsibilities. The contractor shall participate in each verification and audit required by contract and shall comply with the following:

a. Provide space, facilities, and support effort for conducting PCAs.

b. Appoint a single contractor representative to be responsible for each PCA review and identify this representative by name to the designated MSFC program/project chairperson. The representative shall have full decision-making capability and commitment authority.

c. Ensure availability of designated CIs and the associated documentation required for performance of the PCA. The documentation shall include engineering drawings (and/or computer presentations), specifications, Interface Control Documents, test procedures, software, and test data proposed for release as the Product Baseline. If required by contract, furnish preliminary documentation for review before PCA.

d. Provide identification listings of each item to be inspected including nomenclature, specification identification number, drawing and part numbers, item identification, serial numbers, and CAGE codes. Where applicable, document revision levels shall be included.

e. Provide lists of all outstanding engineering changes that have been incorporated into the CI and are awaiting incorporation into documentation.

f. Provide a complete shortage list.

g. Provide a noncompliance listing.

h. Examine the Acceptance Data Package (ADP) to ensure compatibility with established review data plans or requirements. Appendix F provides more specific guidance on the content and presentation of the ADP.

i. Provide and maintain a system for recording, processing, tracking, and reporting the status of all action items emanating from an audit.

j. Establish organizational procedures for the preparation, processing, and disposition of hardware verification and software/firmware verification and validation records, including as-built records and ADPs.

Note: Guidance is provided in Appendix I regarding data required for FCA/PCA of designated CIs and the associated documentation required for performance of the PCA. The documentation shall include engineering drawings (and/or computer presentations), specifications, Interface Control Documents, test procedures, software, and test data proposed for release of the Product Baseline

10.6 In-process Configuration Management Audits. In-process CM audits are conducted periodically by MSFC to verify the adequacy of the contractor's implementation of contractual CM requirements and to identify any areas needing correction or improvement. The contractor shall support audits as contractually required. MPR 8040.1 defines the two-part audit process utilized by which MSFC assures compliance with program/project requirements. Phase I of the two part audit is self-assessment by the contractor; Phase II is the auditor's evaluation of the validity and adequacy of Phase I and the evaluation of areas that may not have been addressed by Phase I.

10.7 "Other" Reviews. The Contractor may be required to support various readiness reviews conducted by engineering activities and project or program activities with Configuration Management records. The contractor shall make available, within the terms of the contract, CM data and reports to facilitate the objectives of these reviews. Readiness reviews may be conducted at various levels of control to review the status and readiness of all elements associated with the project or program. Based on the result of incremental reviews, a top level NASA Flight Readiness Review (FRR) may be conducted to establish the readiness level of all engineering, operational, and support elements to accomplish and support a specific flight mission. Contractor CM support to the incremental and final Flight Readiness Reviews (FRRs) shall include the following:

a. Provide an accurate baseline configuration identification of the item(s) being reviewed.

b. Provide an accurate identification of configuration differences between item(s) selected for the current mission and identical or similar item(s) used in previous missions.

c. Provide a current status of all in-process changes affecting the item(s) under review.

d. Provide configuration control support to ensure the expeditious and proper disposition of open changes, deviations and waivers.

11. SOFTWARE CONFIGURATION MANAGEMENT

11.1 Preparation. The contractor shall describe how Configuration Management of the software product is to be performed in the project/project Configuration Management Plan. The development and production of software/firmware Computer Software Configuration Item (CSCI) shall be described with life cycle events and products defined. If authorized by the contract, the contractor shall also prepare a detailed software Configuration Management Plan that describes software Configuration Management within the context of the contractor's software development function.

11.2 Independent Verification and Validation (IV&V). The software or firmware product is accepted by the Government through means of a software FCA and software PCA. The FCA compares test results achieved with those defined in requirements. The PCA examines the as-coded software against its design or delivery documentation. Quality Assurance may choose to perform Independent Verification and Validation (IV&V), which measures how well software performs its functions and, conversely, determines that the software is not performing unintended functions. If IV&V is performed, the Government accepts the IV&V results as part of the FCA/PCA. The FCA/PCA includes review of IV&V results in conjunction with the ADP furnished. (See Appendix F.)

11.3 Delivery. The contractor shall deliver software deliverables for review, approval, and baselining in accordance with contract requirements. As a minimum, MSFC controls CSCI software/firmware requirements (design specifications) and release (the software version description). Software deliverables shall be released using the baseline definitions in Section 6. For FCA/PCA, deliverables shall also include the ADP as defined in Appendix F.

11.4 Software/Firmware Marking and Labeling

11.4.1 Software. The software identifier and version and computer program identification number (CPIN), where applicable, shall be embedded in the source code header.

a. Software medium (e.g., magnetic tape, disk) containing copies of tested and verified software entities shall be marked with a label containing or providing cross-reference to a listing of the applicable software identifiers of the entities it contains.

b. Media for deliverable CSCIs shall be labeled with the government contract number, CSCI number, CPIN, or other government identifier, CAGE code, media number (e.g., 1 of 2, 2 of 2, if there are multiple units per set) and copy number of the medium or media set (if there is more than one copy being delivered).

c. Medium copy numbers shall distinguish each copy of the software from its identical copies. Each time a new version of software is issued, new copy numbers, starting from 1, shall be assigned.

11.4.2 Firmware. Firmware shall be labeled on the device or if the device is too small, on the next higher assembly, as follows:

a. Where both the hardware device and the embedded code are controlled via a single engineering drawing. The part number representing the device with the code embedded shall comprise the label.

b. Where the product configuration documentation for the source code consists of a software product specification, both the unloaded device part number and the software identifier of the embedded code, including version number, shall comprise the label. In addition, the software identification(s) shall be labeled on an identification plate or decal located adjacent to the nameplate on the equipment containing the firmware.

APPENDIX A

CONFIGURATION MANAGEMENT PLAN

1. SCOPE/PURPOSE

This Appendix provides the format and guidelines to be followed in the development of a CM plan for the implementation of contractual CM requirements.

The requirements in this Appendix shall be implemented in accordance with the terms and conditions of the contract. The plan, when approved, shall establish the formal agreement between MSFC and the contractor on the CM policy and methods to fulfill the CM requirements for a given contract.

2. CM PLAN REQUIREMENTS

2.1 Section 1. Scope/Purpose. State the plan's purpose and objective(s) and briefly describe the contractor's general management policy and methods as applied to Configuration Management.

The scope shall include a brief description of the system and/or top-level hardware, firmware, and software items and the lower level components to which the CM plan pertains.

2.2 Section 2. Applicable Documents. Only those documents referenced in the following sections of the CM plan shall be listed. If the applicable documents list is extensive, it may be included in an Appendix or a separate document and referenced in this section. This section shall be organized as described in the following paragraphs.

2.2.1 Government Documents. The documents shall be listed in the following order:

a. Specifications

b. Standards

c. Drawings

d. Other Publications (e.g., manuals, regulations, handbooks)

2.2.2 Non-Government Documents. The documents shall be listed in the following order:

a. Specifications

b. Standards

c. Drawings

d. Other Publications (e.g., manuals, regulations, handbooks)

2.3 Section 3. Organization. This section shall describe and graphically portray the contractor's organization with emphasis on CM activities and shall include the following:

a. The relationship to and integration of the contractor's project organization and functional organization(s).

b. The responsibility and authority for CM in all participating groups and organizations including their roles in Configuration Control Boards (CCBs).

c. The functional integration of CM activities into other program activities such as technical, management, and design reviews.

d. The identification and description of the contractor's CM organization, including responsibilities.

e. The organizational interfaces for both the hardware and the firmware/software products that show the contractor's organization and the Government, other contractors, and subcontractors.

f. The management integration activities between CM and project management. The contractor shall define the relationship between events critical to CM and schedule control; e.g., sequencing of design reviews, engineering release, production, testing.

2.4 Section 4. Configuration Management Phasing and Milestones. The contractor shall propose the major milestones for implementation of CM. These milestones shall include, but not be limited to, the following:

a. Phasing for implementation of the specification program, including release and submittal of specifications and supporting configuration documentation.

b. Establishment of internal developmental and contractual configuration baselines.

c. Implementation of internal and Government configuration control.

d. Establishment of the contractors' CCBs.

e. Implementation of a status accounting system and provision of reports or access to status accounting information.

f. Establishment of interface control agreements.

2.5 Section 5 - Configuration Identification. This section shall describe the contractor's methods and procedures for meeting the requirements of Section 2 of the basic portion of this document, including the following:

a. Selection of hardware and software items requiring the application of CM.

b. Establishment of the Functional, Allocated, Design Requirements and Product Baselines, definition of the configuration baseline documentation required for each, and

a graphic illustration of configuration documentation relationships. Explain development baseline and process.

c. Definition of engineering release process and correlation to manufactured/fabricated products.

d. Assignment, application, and control of hardware and software configuration identifiers including specification, drawing, and document numbers; nomenclature; serial, lot, and part numbers; and version identifiers for software and firmware.

2.5.1 Specifications. The plan shall identify the hardware and software specifications needed to establish and control the configuration baselines. A Specification Tree shall be included that depicts the interrelationship of the contractor-prepared specifications and the relationship to applicable higher-level specifications. The plan shall also specify the intended time in the program when the above specifications are to be presented for delivery (or otherwise made available) to MSFC. Any limitation on delivery to, or use by, MSFC of contractor-prepared specifications shall be stated.

2.5.2 Drawings. This section shall specify the drawing practices for application to the contract including the effects of application of this document and standards referenced therein. Drawings and associated lists shall be prepared in accordance with ASME Y14.100 as defined in the contract. Any limitation on delivery or use of contractor-prepared drawings shall be stated.

2.6 Section 6. Interface Control. This section shall describe the methods for controlling interface requirements between elements of the program/ project. These methods shall cover the following elements of interface control:

a. Establishment of initial interface baseline documents.

b. Incorporation of and compliance with contractually imposed interface documents.

c. Control of changes to interface documents including initiation of proposed changes, change coordination, change submission, and incorporation of approved changes.

d. Review and evaluation of proposed and authorized changes to related interface documents controlled by other contractors or activities.

2.7 Section 7. Configuration Control. The contractor shall describe the procedures to be used for meeting the requirements of Section 8 of the basic portion of this document, plus any applicable Appendices or references. In these requirements, the term "processing" is defined as the range of activities from initiation of the action through verification of change incorporation or resolution of nonconformances. This description shall include the following:

a. Establishing organization, functions, responsibilities, and authority of CCBs;

b. Classifying changes and determining the level of authority for change approval or concurrence;

c. Processing Class I ECPs and PCPs and processing Class II engineering changes;

d. Processing DARs;

e. Processing Specification Change Notices (SCNs)/Document Change Notices (DCNs);

f. Processing Interface Revision Notices (IRNs) and Preliminary IRNs (PIRNs);

g. Processing and controlling Field Engineering Changes (FECs); and

h. Processing and controlling mod kits.

2.8 Section 8. Configuration Accounting. The contractor shall describe procedures for meeting the requirements of Section 9 of the basic portion of this document, including the following:

a. Methods for collecting, recording, processing, and maintaining data necessary to provide CM accounting information by means of reports or database access.

b. Description of reports or information system content as related to the identified data elements.

c. Frequency of reporting and distribution and/or methods of access to CM information database.

2.9 Section 9. Configuration Verification and Validation. The contractor shall describe the system for verification of the hardware product and verifying and validating software/firmware product. Verification and validation shall assure that the configuration identification documentation and deliverable CIs are in compliance with the contractual baseline. As a minimum, the contractors' methods shall be addressed for the following:

a. Demonstrating that the contractually required qualification verification was accomplished and that it substantiated compliance of the "as-verified" and "as validated" (software/firmware) design with the original performance and configuration design requirements and approved changes.

b. Demonstrating that the contractually required acceptance verification/validation was accomplished and that it substantiated compliance of the performance and configuration of the article being delivered with the "as-qualified" design.

2.10 Section 10. Configuration Reviews, Inspections, and Audits. The contractor shall describe his plans for conducting and/or providing CM support to appropriate reviews, inspections, and audits.

2.11 Section 11. Subcontractor/Vendor Configuration Management Control. The contractor shall describe the methods for ensuring that subcontractors and vendors comply with CM requirements, insofar as their activity impacts the contractors CM commitments to MSFC.

2.12 Section 12. Modification Kits and Instructions. The contractor shall specify the planning for and methods to be used in (1) identification of retrofit actions, (2) development of mod kits and instructions, and (3) control and closeout of kit installation.

3. CM PLAN APPROVAL AND MAINTENANCE

The contractor shall submit the plan for approval by MSFC and shall maintain the plan with all proposed changes and revisions submitted to MSFC for review and approval. Submittal and update of the plan shall be as specified in the contract data requirements.

APPENDIX B

SOFTWARE CONFIGURATION MANAGEMENT PLAN

1. SCOPE/PURPOSE

This Appendix provides the format and guidelines to be followed in the development of a software CM plan for the implementation of contractual CM requirements.

Note: The content outlined below follows the subject matter topics included in NPR 7150.2

The requirements in this Appendix shall be implemented in accordance with the terms and conditions of the contract. The plan, when approved, shall establish the formal agreement between MSFC and the contractor on the CM policy and methods to fulfill software CM requirements for a given contract.

The Program/Project Software Configuration Management (SCM) Plan shall be prepared in accordance with the template and contents defined below. This template was derived from IEEE-828, *Standard for Software Configuration Management Plans*. Sections not applicable to a specific program or project shall be addressed as "Not Applicable."

a. Title Page.

b. Signature Page (For Non-electronic Documents). This page contains: (1) document number; (2) document title; (3) effective date; and (4) approval signature(s).

c. Document History Log.

d. Table of Contents. The Table of Contents lists the title and page number of all paragraphs, subparagraphs, figures, tables, and appendices, in that order.

e. Section 1: Introduction. Introduction information provides a simplified overview of the SCM activities so that those approving, those performing, and those interacting with SCM can obtain a clear understanding of the SCM Plan.

(1) Purpose. The purpose shall briefly address why the SCM Plan exists and who the intended audience is.

(2) Scope. The scope shall address SCM applicability, limitations, and assumptions on which the SCM Plan is based.

(3) Definitions. This section contains definitions of key terms in order to establish a common terminology among all users of the SCM Plan.

(4) References. This section lists the specifications, standards, manuals, and other documents, including policy directives, specified in the plan by title, document number, revision, and, when applicable, change notice, amendment number, and date of issue. This section may provide definitions, glossaries, and acronym listing if necessary for plan clarification.

f. Section 2: SCM Management. SCM management information shall describe the allocation of responsibilities and authorities for SCM activities to organizations and individuals within the project structure.

(1) Organization. The SCM Plan shall include all organizations that participate in or are responsible for any SCM activity on the project, the functional roles of these organizations within the project structure, and the relationships between the organizations.

(2) SCM Responsibilities. The allocation of SCM activities to specific organizations shall be specified. For each activity listed within SCM Activities, the name of the organization or job title to perform this activity shall be provided.

g. Section 3: Configuration Data Management. This section describes the methods for meeting the configuration management technical data requirements under the computer-aided transmission and distribution requirements for the program/project. The following lists some, but not necessarily all, of the areas to be considered when addressing this subject in the SCM Plan:

(1) Data Management. The plan shall address how the configuration management identification data is to be managed and processed. This shall include information concerning the type(s) of data records, and how the data is accessed and updated or changed.

(2) Data Status Accounting. The plan shall address data status accounting.

h. Section 4: Software Configuration Management Activities. SCM activities information identifies all functions and tasks required to manage the configuration of the software system as specified in the scope of the SCM Plan. Both technical and managerial SCM activities shall be identified.

(1) Configuration Identification. This section describes the procedures and requirements for establishing and maintaining identification of software, firmware, and related interfaces during the life of the project and/or CI(s).

a) Identifying Configuration Items. The SCM Plan shall record the items to be controlled, the project CI(s) and their definitions as they evolve or are selected.

b) Naming Configuration Items. The SCM Plan shall specify an identification system for assigning unique identifiers to each item to be controlled. It shall also specify how different versions of each are to be uniquely identified.

c) Acquiring Configuration Items. The SCM Plan shall identify the controlled software libraries for the project and describe how the code, documentation, and data of the identified baselines are to be physically placed under control in the appropriate library. For each library the format, location, documentation requirements, receiving and inspection requirements, and access control procedures shall be specified.

(2) Configuration Control. Configuration control activities request, evaluate, approve or disapprove, and implement changes to baselined CI(s). Changes include both error correction and enhancement.

a) Requesting Changes. The SCM Plan shall specify the procedures for requesting a change to a baselined CI and the information to be documented for the request.

b) Evaluating Changes. The SCM Plan shall specify the analysis required to determine the impact of the proposed change and the procedures for reviewing the results of the analysis. Changes should be evaluated according to their effect on the deliverable and their impact on project resources.

c) Approving or Disapproving Changes. The SCM Plan shall identify each configuration control board (CCB) and its level of authority for approving proposed changes.

d) Implementing Changes. The SCM Plan shall specify the activities for verifying and implementing an approved change.

(3) Configuration Status Accounting. Configuration status accounting activities record and report the status of project CI(s). If an automated system is used for any status accounting activity, its function shall be described or referenced.

(4) Configuration Audits and Reviews. The SCM Plan shall identify the configuration audits and reviews to be held for the project.

(5) Interface Control. This section describes the procedures for identification of interface requirements, establishment of interface agreements, and participation in Interface Control Working Groups (ICWGs).

(6) Subcontractor/Vendor Control. The SCM Plan shall define the activities to incorporate the externally developed items into the project CI(s) and to coordinate changes to these items with their development organizations for both subcontracted and acquired software.

i. Section 5: SCM Schedule. The SCM schedule provides guidance on the timeline of important SCM activities.

j. Section 6: SCM Resources. SCM resource information identifies the software tools, techniques, equipment, personnel and training necessary for the implementation of the specified SCM activities.

k. Section 7: SCM Plan Maintenance. The maintenance information identifies the activities and responsibilities necessary to ensure continued SCM planning during the life cycle of the project.

NOTE: The appendix requirements above shall be implemented to define the specific requirements for each program/project/CI utilizing accepted software life cycle practices.

APPENDIX C

SPECIFICATION CHANGE INSTRUCTIONS

1. SCOPE/PURPOSE

This Appendix provides uniform practices for the preparation of proposing and recording changes in specifications.

a. Information Required for Specification Changes

(1) Contractor Name and CAGE Code

(2) Specification Number - the identification number of the specification affected.

(3) Rev. - the revision letter of the baselined specification affected.

(4) Date – normally the date of the submitting ECP.

(5) Program/Project Name

(6) CI Nomenclature and CI Number - the nomenclature and identification number of the hardware, firmware, or software CI or critical item governed by the specification.

(7) ECP Number, PCN, Contract Number – identifiers for contract records.

(8) Effectivity - CI or other effectivity of this change.

(9) Description of Change - Provide definitive description of the change as described in paragraph 6.2.2.1

b. Required Data Elements for Specification Change History Log

The following data elements shall be included for each entry in the log

(1) Release Date – The date the document is approved for release.

(2) Change Identification, including ECP No., date and PCN – (PCN is provided by MSFC.)

(3) Disposition – approving disposition and date

(4) Description of the change – summary of content changed and rationale

(5) Identify new revision level.

APPENDIX D

INTERFACE CONTROL

1. SCOPE/PURPOSE

The following is an example of the Preliminary/Interface Revision Notice (PIRN/IRN). MSFC Form 4229 or a contractor equivalent form may be used. Required content is described for each field in the instructions that follow the form.

Interface Revision Notice

1. AFFECTED ICD NO. & REV.:	2. PIRN NO.:	3. IRN NO.:	4. SHEET **1** of
5. PROGRAM:		6. PCN:	7. PANEL AFFECTED:
8. ICD TITLE:			
9. EFFECTIVITY(IES):		1O. REASON FOR CHANGE:	
CHANGE ICD	11. TO:	12. FROM:	
13. IRN NO.:	14. NEW IRN EFFECTIVITY:	15. PREVIOUS IRN EFFECTIVITY:	
16. DESCRIPTION OF CHANGE:			
17. PREPARED BY:	18. ORG:	19. DATE:	20. CONCURRENCE:

FOR REFERENCE ONLY

21. CONCURRENCES					
SIGNATURE			SIGNATURE		

22. APPROVALS						
	APPROVAL &	DATE	APPROVAL &	DATE	APPROVAL &	

MSFC Form 4229 (January 1994) Computer Generated

Interface Revision Notice

Complete all applicable blocks. If needed, continuation sheets may be used. The Preliminary IRN should be of sufficient quality so that, if approved, it may be released to the ICD custodian and/or the MSFC Repository for reproduction and distribution. The following instructions are keyed to the numbers on the form.

1. **AFFECTED ICD NO. & REV**. Enter the complete number and revision of the ICD affected by the PIRN.
2, **PIRN NO**. Enter an organizational tracking number for identification until an IRN number is assigned, and the PCN (if assigned) of the basic change action.
3. **IRN NO**. Leave blank. To be completed by CCB secretary. (IRN number will be assigned only after approval of the proposed change.)
4. **SHEET 1 of _____** Enter total number of sheets.
5. **PROGRAM** Enter the applicable program; e.g., SEDS-2, AADSF, etc.
6. **PCN** Enter the PCN (if assigned) of the basic change action.
7. **PANEL AFFECTED** Enter the identification of the IWG or other organization controlling the ICD.
8. **TITLE** Enter the exact title of the affected ICD or the IRD.
9. **EFFECTIVITY(IES)** Enter the effectivity(ies) of the change described by the PIRN, including launch vehicle elements, upper stages, payloads, experiments, etc., as appropriate.
10. **REASON FOR CHANGE** Enter a brief statement of the reason for the change and include related ECP number.
11. **CHANGE ICD EFFECTIVITY TO** Leave blank except when this PIRN is used to change the effectivity of the ICD.
12. **CHANGE ICD EFFECTIVITY FROM** Leave blank except when this PIRN is used to change the effectivity of the ICD.
13. **IRN NO**. Leave blank except when this PIRN is used to change the effectivity of a previous IRN.
14. **NEW IRN EFFECTIVITY** Leave blank except when this PIRN is used to change the effectivity of a previous IRN.
15. **PREVIOUS IRN EFFECTIVITY** Leave blank except when this PIRN is used to change the effectivity of a previous IRN.
16. **DESCRIPTION OF CHANGE** Enter the proposed change to the affected ICD for all sides of the affected interfaces, using continuation sheets, if required.
17. **PREPARED BY** Enter the name of the engineer preparing the PIRN.
18. **ORGANIZATION** Enter the name of the preparing organization.
19. **DATE** Enter the date prepared.
20. **CONCURRENCE** Enter the name of the engineering manager concurring in the PIRN.
21. **CONCURRENCES** Leave blank. These fields are to be used to record technical acceptance by the authorized representatives of the interfacing activities or recognized IWG.
22. **APPROVALS** These fields are to be used to identify the applicable CCB and record their approval.

MSFC Form 4229 (Reverse Side

APPENDIX E – CHANGE CONTROL

1. SCOPE/PURPOSE

This Appendix provides reference forms that describe requirements to identify and record proposed changes and to provide a means of evaluating the effects on design, performance, cost and schedule. The contractor may use its own format.

1.	NAME OF CONTRACTOR:		**ENGINEERING CHANGE PROPOSAL (ECP)**	PCN:	DATE: 09/19/2003 PAGE 1 OF	
2.	CONTRACT NUMBER:	CAGE CODE:	SYSTEM DESIGNATION:	ECP NUMBER:	SUFFIX:	REV.:
3.	RECOMMENDED PRIORITY: ☐ EMERGENCY ☐ URGENT ☐ ROUTINE					
4.	CEI NUMBER AND NOMENCLATURE:			PART OR LOWEST ASSEMBLY AFFECTED PART NUMBER:	NAME:	
5.	TITLE OF CHANGE:					
6.	JUSTIFICATION FOR CHANGE (Include consequences if not incorporated): ☐ REQUESTED ☐ DIRECTED BY PROCURING ACTIVITY PER REF.: _____					
7.	ENVIRONMENTAL IMPACT: ☐ YES ☐ NO If "YES", identify the enclosure containing the Environmental Impact Statement:					
8.	DESCRIPTION OF CHANGE (Alternate solutions included): ☐ YES ☐ NO **FOR REFERENCE ONLY**					
9.	DATE BY WHICH CONTRACTUAL AUTHORITY IS NEEDED:					

10. **EFFECTIVITY AND MANDATORY CHANGE PERIOD(S) FOR INCORPORATION**

VEHICLE/SITE AND ITEM SERIAL NUMBER	CHANGE PERIOD	MOD. KIT DELIVERY DATE	EST. M/H FOR MOD. KIT INSTL.	OUT-OF-SERVICE TIME

11.

EFFECT ON:		ITEM	ENCL.	PARA.
YES	NO			
☐	☐	PREVIOUSLY ISSUED MODIFICATION INSTRUCTIONS AFFECTED (EXPLAIN)	_____	_____
☐	☐	PROOFING OF MODIFICATION INSTRUCTIONS AND KIT INSTALLATION REQUIRED (EXPLAIN) PROOFING LOCATION: _____	_____	_____
☐	☐	RETEST REQUIRED (IDENTIFY TEST INVALIDATED BY CHANGE)	_____	_____
☐	☐	REQUALIFICATION REQUIRED (INCLUDE DESCRIPTION OF TEST PLAN FOR REQUALIFICATION)	_____	_____

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12.	NAME OF CONTRACTOR:	ECP NUMBER:	PCN:	PAGE 2 OF

	EFFECT ON:		ITEM	ENCL.	PARA.
	YES	NO			
13.	☐	☐	DEVELOPMENT REQUIREMENTS AND STATUS		
	☐	☐	SAFETY		
	☐	☐	RELIABILITY (INCLUDE RELIABILITY DATA SUMMARY)		
	☐	☐	SERVICE LIFE		
	☐	☐	TEST AND CHECKOUT REQUIREMENTS		
	☐	☐	TEST/OPERATING PROCEDURES		
	☐	☐	PROCESS SPECIFICATIONS		
	☐	☐	RADIO FREQUENCY OR ELECTROMAGNETIC INTERFERENCE		
	☐	☐	COMPUTER PROGRAMS (FOR USE AT USING SITE)		
	☐	☐	ENGINEERING-CRITICAL COMPONENTS (ITEMS)		
	☐	☐	OTHER ECP'S AFFECTED BY THIS CHANGE		
14.	☐	☐	LOGISTICS		
	☐	☐	SPARES (INCLUDE SPARES MODIFICATION PLAN)		
	☐	☐	GFE/GFP/TRAINERS		
	☐	☐	DATA/PUBLICATIONS		
	☐	☐	AGE AND CYCLE-CRITICAL COMPONENTS (ITEMS)		
15.	☐	☐	INTERFACE		
	☐	☐	PIRN'S ATTACHED:		
			IRD/ICD NO.: _____ PIRN NO.: _____		
			IRD/ICD NO.: _____ PIRN NO.: _____		
			IRD/ICD NO.: _____ PIRN NO.: _____		
	☐	☐	ECP/PIRN COORDINATED WITH ASSOCIATE CONTRACTOR(S) OR MSFC. PROVIDE NAME(S) AND DATE(S) OF INITIATION AND RESULTS OF COORDINATION		
16.	☐	☐	CONTRACT SPECIFICATION(S)/DRAWINGS		
			SPEC. NO.: _____ DWG. NO.: _____		
			SPEC. NO.: _____ DWG. NO.: _____		
	☐	☐	TEXT OF SPECIFICATIONS AFFECTED		
	☐	☐	CONTRACT AND SPECIFICATION REQUIREMENTS		
	☐	☐	PERFORMANCE		
	☐	☐	PAYLOAD CAPABILITY		
	☐	☐	DELIVERY SCHEDULE (UNDELIVERED ITEMS)		
	☐	☐	OTHER		
	☐	☐	SPECIFICATION CHANGE NOTICES ATTACHED:		
			SPEC. NO.: _____ SCN. NO.: _____		
			SPEC. NO.: _____ SCN. NO.: _____		
17.	ESTIMATED TOTAL PROGRAM COSTS AND DETAILED BREAKDOWN ARE PROVIDED IN ENCLOSURE				
18.	SUMMARY OF EFFECT OF PROPOSED AND PREVIOUSLY APPROVED CHANGES ON MAJOR CEI				

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ENGINEERING CHANGE PROPOSAL (ECP)
PREPARATION INSTRUCTIONS - PAGE 2

BLOCK **INSTRUCTIONS**

b. Urgent: Assign this priority if the proposed change is to correct a potentially hazardous condition which, if uncorrected, could result in injury to personnel or in damage to equipment and reduction of mission effectiveness. Also use this classification for the following:

(1) Changes necessary to meet contractual requirements when lead time would necessitate slipping baselined production, activation, or construction schedules.

(2) Mission capability changes when delay would compromise the mission capability and result in unacceptable impact to contract, production, or mission launch schedules.

(3) Changes associated with interface problems resulting from compatibility changes made by other contractors.

c. Routine: Assign this priority to a proposed change when "emergency" or "urgent" is not acceptable.

A proposed change shall not be processed through the contractor's configuration management process in one priority level and upgrade to a more critical priority upon submission to MSFC.

4 **CEI NUMBER AND NOMENCLATURE** - Enter the contract end item (CEI) part number and nomenclature of the CEI.

PART OR LOWEST ASSEMBLY AFFECTED

PART NUMBER - Enter the part number of the lowest assembly affected by the change.

NAME - Enter the nomenclature of the part listed above.

5 **TITLE OF CHANGE** - Enter a brief but descriptive title indicating the purpose and/or subject of the change.

6 **JUSTIFICATION FOR CHANGE** - Enter a comprehensive definition of the problem which the change proposes to provide. Describe in detail the nature of the problem which substantiates the need for the change, including consequences if the change is not incorporated. The contractor shall make full use of applicable failure data and reference any nonconformance report(s) that provide(s) exact details applicable to the change. When the change is directed toward providing a new capability, describe the capability in quantitative terms (e.g., improvement in payload weight, mission parameters, performance, or data gathering accuracy). Summarize any correspondence or previous coordination leading to the submission of this change. Include a summary of any studies or testing accomplished prior to the submission of the ECP. Check whether this ECP is a contractor-requested change or a response to a procuring activity direction.

7 **ENVIRONMENTAL IMPACT** - Identify and define any potential environmental impact that may result from the approval or disapproval of this proposed change.

8 **DESCRIPTION OF CHANGE** - Check the appropriate block if alternate solution(s) are included. Provide sufficient detail on the change to permit ready identification and evaluation. Include inthe description which part(s) of the system or facility item is/are being changed and the type of change being made. Use supplemental drawings, sketches, and analyses to the extent necessary to clearly define the proposed change. Identify if the problem can be resolved by revised operation or maintenance procedures, revised schedules, etc. State the advantages and disadvantages inherent in any feasible alternative approaches to the problem. Include any alternataive solutions that may be available based on pre-change analysis.

ENGINEERING CHANGE PROPOSAL (ECP)
PREPARATION INSTRUCTIONS - PAGE 3

BLOCK	INSTRUCTIONS
9	**DATE BY WHICH CONTRACTUAL AUTHORITY IS NEEDED** - Enter the date that authority to proceed is required to maintain the effectiveness and change periods proposed in Block 10.
10	**EFFECTIVITY AND MANDATORY CHANGE PERIODS FOR INCORPORATION:** **VEHICLE/SITE AND ITEM SERIAL NUMBER** - List the applicable site, system, and CEI designation(s) and/or serial number(s) affected by the change. **CHANGE PERIOD** - Enter a change period designation for each proposed effectivity. MSFC will provide these designations to the contractor as soon as they are established for the specific MSFC programs. **MOD. (MODIFICATION) KIT DELIVERY DATE** - If applicable, enter the date based on the proposed contractual coverage data and change periods, or enter "Not Applicable." **EST. (ESTIMATED) M/H (MAN-HOURS) FOR MOD. (MODIFICATION) KIT INSTL. (INSTALLATION)** - Enter the estimated man-hours per unit required to install the change in the item. **OUT-OF-SERVICE TIME** - Enter the estimated unit out-of-service time or inoperative time that will be required to incorporate the change.
11	**MODIFICATION, RETEST, REQUALIFICATION:** **YES or NO BLOCKS** - Check the appropriate blocks and identify the enclosure and paragraph for any detailed explanation submitted with the ECP. Each block shall be checked and detailed explanation shall be provided for each "YES" block checked. **PREVIOUSLY ISSUED MODIFICATION INSTRUCTIONS AFFECTED** - Provide a brief description of any previous modification instructions that will be impacted by the ECP. **PROOFING OF MODIFICATION INSTRUCTIONS AND KIT INSTALLATION REQUIRED** - Explain what is required for the proofing of modification instructions and/or kit installation requirements. **RETEST REQUIRED** - Identify test(s) invalidated by the change and all retesting that will be required by the ECP. **REQUALIFICATION REQUIRED** - Identify the retesting and the plans for requalification for the CEI that that will be required by the ECP.
12	**PAGE TWO HEADING** Reenter appropriate data from page 1, Lines 1 and 2.
13	**GENERAL ITEMS AND ACTIVITIES** - Indicate the effect of the change by checking the appropriate "YES" or "NO" box. Enter the enclosure and paragraph identification of data which fully explains the advantages and disadvantages of the proposed change. Use quantitative values whenever applicable. Additional requirements applicable to specific blocks are included in the following subsections. **DEVELOPMENT REQUIREMENTS AND STATUS** - This block also includes any effect on items of flight or ground support equipment to be used in conjunction with the change, with a description of their relationship, availability, and impact.

ENGINEERING CHANGE PROPOSAL (ECP)
PREPARATION INSTRUCTIONS - PAGE 4

BLOCK **INSTRUCTIONS**

SAFETY - Provide a definitive description of any system safety impact(s) or have available the analysis which supports no impact. As a minimum, the following areas must be considered:

a. The elimination or introduction of and impact to single failure points that could result in loss of life or mission.

b. Any variation in established safety factors or margins.

c. Material changes that would either increase or decrease potential hazards or affect compatibility.

d. Changes that would affect the flammability of material, leakage, or explosions.

e. Changes that would affect limited life, cycle, or age items that are related to potential hazards.

f. Changes in redlines and other launch and flight constraints.

RELIABILITY - Submit a preliminary Reliability Data Summary (RDS) with each applicable ECP submitted for approval. An RDS is required only on flight hardware and/or mission events sequence change-oriented ECPs. The reliability data summary sheet shall include the following:

a. ECP title.
b. ECP number.
c. A brief description of the proposed change.
d. If the change affects the FMEA and criticality determination date for the CEI, provide a brief description. If the FMEA and criticality determination data is not impacted, so state.
e. If there is no change to the reliability data, briefly describe why.

SERVICE LIFE - If the change will have an impact on the service life, provide a description of the impact.

TEST AND CHECKOUT REQUIREMENTS - Describe the impact on or changes to test and checkout requirements. If there is no change, state why not.

TEST/OPERATING PROCEDURES - If there is an impact on the test or operation procedures, a description of the impact shall be provided. If additional test equipment or facilities will be required, the requirements shall be described. If there is no change, state why not.

PROCESS SPECIFICATIONS - If there is a change to process specifications, the requirements for new specifications or changes to existing documents shall be described.

RADIO FREQUENCY OR ELECTROMAGNETIC INTERFERENCE - If the radio frequency or electromagnetic interference requirements for the CEI will be impacted by the ECP, provide a description of the impact.

COMPUTER PROGRAMS - Describe the impacts on any computer programs ata the using site or to interfacing CEIs. Identify any impact on the software requirements for the CEI being changed. See Block 16 for additional informatioan related to changes to software requirements.

ENGINEERING-CRITICAL COMPONENTS (ITEMS) - If components (items) have been qualified, identify what impact the change will have on qualification, including requalification or changes to qualification requirements.

ENGINEERING CHANGE PROPOSAL (ECP)
PREPARATION INSTRUCTIONS - PAGE 5

BLOCK	INSTRUCTIONS
	OTHER ECPs AFFECTED BY THIS CHANGE - Define any impacts on other ECPs or requirements for additional ECPs to other CEIs that will be required because of this change. This will address any requirements to interfacing CEIs that will be required.
14	**LOGISTICS** - Check the applicable boxes for logistics support areas that will be affected. If there is no impact on logistics, rationale for the position shall be provided and the following blocks in Block 14 will all be marked "NO." Identify enclosures that provide the detailed explanations.
	SPARES (INCLUDE SPARES MODIFICATION PLAN) - If the spares requirements are impacted, the following information shall be addressed and rationale for the impact shall be provided:
	a. Identification and description of the specific support materials affected.
	b. Identification, description, recommended quantity, and anticipated delivery schedule of any new logistic support material.
	c. Effectivity for incorporation of the change in logistics support material and the estimated delivery schedule.
	d. Identification and description of logistic support material modification kits and recommended quantity, rework instructions, tools, and equipment required.
	e. Effectivity for incorporation of the change in logistics support material and the estimated delivery schedule.
	f. A summary of the estimated man-hours for complete and total logistics support conversion.
	GFE/GFP/TRAINERS - Identify any impact the ECP will have on existing or new requirements for GFE, GFP, etc.
	DATA/PUBLICATIONS - Identify any impact the ECP will have on existing requirements or requirements for new data and publications.
	AGE AND CYCLE-CRITICAL COMPONENTS (ITEMS) - Identify any impact the ECP will have on age and cycle-critical component requirements for the CEIs.
15	**INTERFACE** - Identify, by numbers, the documents that will require changes to reflect any change into the CEI's interface requirements and provide PIRNs or specification change notices defining the proposed changes required for the proposed ECP.
	PIRNs ATTACHED - List all PIRNs provided as a part of the ECP. If the interface requirements are being changed as a change to the specification, a notation listing the specification change notice that includes the proposed interface change shall be included.
	ECP/PIRN COORDINATION - Include the names, dates, and results of any interface coordination with associated contractors or MSFC. Include identifying numbers, if available, of the associated contractor's ECPs.
16	**CONTRACT SPECIFICATION(S)/DRAWINGS** - List the number of any specification or drawing affected by the proposed change. The proposed change to each specification and/or drawing for hardware and/or software shall be provided as a part of the ECP package.

ENGINEERING CHANGE PROPOSAL (ECP)
PREPARATION INSTRUCTIONS - PAGE 6

BLOCK	INSTRUCTIONS
	TEXT OF SPECIFICATION AFFECTED - The specification change notice submitted with the ECP shall identify the text requiring change in the hardware or software specification.
	CONTRACT AND SPECIFICATION REQUIREMENTS - Identify any change required to the contract for the implementation of the ECP. Identify any known changes to interfacing CEI requirements that are not controlled per the contractor's requirements.
	PERFORMANCE - Provide a clear description of the change in CEI's performance. Any negative or positive factors shall be included.
	PAYLOAD CAPABILITY - Provide a brief description of the impact on payload capability.
	DELIVERY CAPABILITY - Identify any impact on delivery if the ECP is approved and/or disapproved.
	OTHER - Provide any additional information that may be of benefit in supporting the need for the change.
	SPECIFICATION CHANGE NOTICES (AND DRAWING CHANGES) - List each specification change notice and each drawing change included in the ECP package. The drawing change shall provide the from/to information for changing the drawing. Format for drawing change is optional.
17	**ESTIMATED TOTAL PROGRAM COSTS AND DETAILED BREAKDOWN ARE PROVIDED IN ENCLOSURE** - Provide, in an attached enclosure, the estimated total change in Program costs, including a breakdown by the following cost elements, as applicable: a. Development requirements b. Changes in production, including logistics support. c. Mod kits, including logistics support material, GFP, and GFE. d. Special tools. e. New logistics support material. f. Retest required for requalification. g. Factory direct costs. h. Other cost elements affected by the ECP.
18	**SUMMARY OF EFFECT OF PROPOSED AND PREVIOUSLY APPROVED CHANGES ON MAJOR CEI** - Identify enclosure(s) that summarize(s) the cumulative effort upon performance, payload capabiality, electrical load, etc., caused by previously approaved ECPs when design limitations are being approached or exceeded.

RECORD ENGINEERING CHANGE PROPOSAL

RECORD ECP

1. SUBMITTING CONTRACTOR:	2. RECORD ECP NUMBER:	3. PCN:	4. DATE: 09/09/2003

THIS SUBMITTAL CONSTITUTES A RESPONSE TO:

5. INITIATOR (COMPANY NAME OR GOVERNMENT AGENCY):	6. CHANGE NUMBER:	7. MSFC LETTER NUMBER:

CHANGE IDENTIFICATION

8. PIRN/IRN/SCN/DCN NO.	9. DOCUMENT NO.	10. REVISION	11. DOCUMENT TITLE	12. EFFECTIVITY

FOR REFERENCE ONLY

FOR FURTHER INFORMATION CONCERNING THIS SUBMITTAL CONTACT:

13. NAME:	14. ORGANIZATION	15. EXTENSION:

16. THE ABOVE CHANGE(S) IS/ARE ACCEPTABLE AS A DOCUMENTATION CHANGE(S) AND DOES/DO NOT AFFECT COST, SCHEDULE, HARDWARE, AND/OR SOFTWARE. THE ABOVE CHANGE(S) ALSO AFFECT(S) THE FOLLOWING CONTRACTOR(S):

17. CONTRACTOR SIGNATURE:	18. DATE:

MSFC Form 4242 (September 1999)

Informed

RECORD ECP (ENGINEERING CHANGE PROPOSAL) (RECP) PREPARATION INSTRUCTIONS

BLOCK	INSTRUCTIONS
1	SUBMITTING CONTRACTOR: Enter the identification of contractor submitting the RECP.
2	RECORD ECP NUMBER: Enter the record ECP number assigned by the submitting contractor.
3	PCN: Enter the MSFC-assigned Project Control Number (PCN).
4	DATE: The date of the RECP is automatically generated by the system.
5	INITIATOR (Company Name or Government Agency): Enter the identification of the initiator of the charge.
6	CHANGE NUMBER: Enter the number, if available, of the initiator's change action.
7	MSFC LETTER NUMBER: Enter the number of the MSFC letter which forwarded the change (if applicable).
8	PIRN/IRN/SCN/DCN NUMBER: Enter the number(s) affected by the appropriate PIRN(s)/IRN(s)/DCN(s).
9	DOCUMENT NUMBER: Enter the number(s) of the document(s) affected by the PIRN(s)/ IRN(s)/DCN(s).
10	REVISION: Enter the revision letter(s) of the affected document(s).
11	DOCUMENT TITLE: Enter the title(s) of the affected document(s).
12	EFFECTIVITY: Enter the hardware and/or software effectivity(ies) of the change(s).

ENTER CONTACT INFORMATION FOR THIS SUBMITTAL.

13	NAME: Enter the name of the contractor contact responsible for submittal of this RECP.
14	ORGANIZATION: Enter the contractor organization responsible for submittal of this Record ECP.
15	EXTENSION: Enter the phone extension/number of the contractor contact responsible for submittal of this Record ECP.
16	STATEMENT OF ACCEPTANCE: Enter the name of other contractor(s) considered to be affected by this change. Use an attachment if required. Include any pertinent remarks concerning this change on the attachment.
17	CONTRACTOR SIGNATURE: To be signed by the responsible contractor official.
18	DATE: Enter the date the Record ECP was approved and signed.

1. INITIATOR'S NAME/ORG:	**DEVIATION/WAIVER APPROVAL REQUEST (DAR)**	2. PCN:	3. DATE: 09/19/2003
4. DAR NUMBER:	5. REVISION:	6. DEVIATION ☐ WAIVER ☐	7. CONTRACT NUMBER:
8. PART NUMBER/DOCUMENT NUMBER:	9. PART/DOCUMENT DESCRIPTION:		
10. DAR TITLE:			
11. REJECTION DOCUMENT NUMBER:	12. SERIAL NUMBER(S):	13. LOT NUMBER:	14. QUANTITY:
15. SUPPLIER OR SUBCONTRACTOR NAME AND ADDRESS:		16. CONFIGURATION ITEM EFFECTIVITY:	

FOR REFERENCE ONLY

17. SPECIFIED REQUIREMENTS:

18. DESCRIPTION OF DEPARTURE FROM REQUIREMENTS:

19. JUSTIFICATION FOR DAR:

20. ENVIRONMENTAL IMPACT: ☐ Yes ☐ No (If "yes", explain below or on MSFC Form 847-1)

21. CORRECTIVE ACTION TAKEN: ☐ Yes ☐ No (If "yes", explain below or on MSFC Form 847-1)

22. ICD AFFECTED: ☐ Yes ☐ No (If "yes", explain below or on MSFC Form 847-1)

23. FMEA/CIL AFFECTED: ☐ Yes ☐ No (If "yes", explain below or on MSFC Form 847-1)

24. CONTRACT COST IMPACTS: COST ADJUSTMENTS: ☐ Yes ☐ No (Explain below or on MSFC Form 847-1) -- Explanation required whether yes or no.

25. CONTRACTOR CERTIFICATION:

THE CONTRACTOR HEREBY CERTIFIES THAT THE ABOVE DESCRIBED DAR IS A DEPARTURE FROM THE CONTRACTUAL REQUIREMENTS IN THE QUANTITIES AND/OR CONDITIONS AS STATED ABOVE.

SIGNATURE OR APPROVING AUTHORITY OF AUTHORIZED REPRESENTATIVE — DATE

26. RESIDENT GOVERNMENT QUALITY REPRESENTATIVE: ☐ CONCURRENCE ☐ NONCONCURRENCE

COMMENTS: (Explain below or on MSFC form 847-1):

SIGNATURE OR APPROVING AUTHORITY OF AUTHORIZED GOVERNMENT QUALITY REPRESENTATIVE — DATE

27. MSFC CCBD NUMBER:

☐ APPROVED

☐ DISAPPROVED

☐ APPROVED SUBJECT TO CONDITIONS PER CCBD NUMBERED ABOVE

28. Contracting Officer's Technical Representative (COTR):

SIGNATURE OR CONCURRING OFFICIAL — DATE

29. CONTRACTING OFFICER'S APPROVAL:

☐ APPROVED

☐ DISAPPROVED

☐ APPROVED SUBJECT TO CONDITIONS STATED BELOW OR ON MSFC FORM 847-2

IMPLEMENTATION OF THIS DAR: ☐ SHALL PROCEED ☐ SHALL NOT PROCEED

SIGNATURE OR APPROVING AUTHORITY — DATE — CONTRACTOR NAME

MSFC Form 847 (Rev. March 2000) _____ OF _____ **PREVIOUS EDITIONS OBSOLETE** Informed

DEVIATION/WAIVER APPROVAL REQUEST (DAR) MSFC FORM 847, PREPARATION INSTRUCTIONS

NOTE: In some electronic systems producing the DAR form (MSFC Form 847), the blocks are completed without the use of continuation or subject to conditions pages (MSFC Forms 847-1 and 847-2).

The following instructions refer to the numbered blocks on the DAR, MSFC Form 847. If additional space is required, MSFC Form 847-1 will be used to continue any block number. Reference the number of the block continued.

BLOCK 1 - INITIATOR'S NAME AND ORGANIZATION. For MSFC in-house generated DARs, enter the initiator's name and organizational mail code. For contractor or other Government organizations, enter the initiator's name and the name, address, and phone number of the organization/contractor submitting the DAR.

BLOCK 2 - PROGRAM CONTROL NUMBER (PCN). The configuration control board secretariat will assign and enter the PCN.

BLOCK 3 - DATE. Enter date the form is prepared.

BLOCK 4 - DAR NUMBER. For MSFC in-house generated DARs, enter the DAR number as assigned by the Release Desk. In some electronic systems, the DAR number will be printed at the top of each page for reference. The numbering systems established by contractor or other Government organizations will be used for contractor or other Government organization DARs.

BLOCK 5 - REVISION. Leave blank for an original DAR issuance. DAR revisions shall be identified by A, B, C, D, etc. All revisions to a DAR subsequent to submittal for processing require a revision to the submitted version. When a revision entry is made in this block, the following statement must be entered in Block 18: "This revision supersedes DAR No. _____ [include revision if applicable] in its entirety."

BLOCK 6 - DEVIATION OR WAIVER. Check one box based on the definitions of a deviation and a waiver.

BLOCK 7 - CONTRACT NUMBER. For in-house projects, leave blank. For contract-related DARs, enter the contract or purchase order number.

BLOCK 8 - PART NUMBER/DOCUMENT NUMBER. Enter part number, assembly number, or document number.

BLOCK 9 - PART/DOCUMENT DESCRIPTION. Enter description of the document, affected part, or configuration item identified by the entry in Block 8.

BLOCK 10 - DAR TITLE. Enter a title that is descriptive of the nonconformance.

BLOCK 11 - REJECTION DOCUMENT NUMBER. Enter the identification of the instrument recording the nonconformance that caused a rejection of the product (hardware, software, or firmware).

BLOCK 12 - SERIAL NUMBER(S). Enter the serial number(s) of the item(s), if applicable.

BLOCK 13 - LOT NUMBER. Enter the lot number of the item(s), if applicable.

BLOCK 14 - QUANTITY. Enter the quantity of items affected by the DAR.

BLOCK 15 - SUPPLIER OR SUBCONTRACTOR NAME AND ADDRESS. Enter the item supplier or subcontractor, if applicable.

BLOCK 16 - CONFIGURATION ITEM EFFECTIVITY. Enter the serial number(s) of the configuration item(s) that will contain or utilize the product(s) authorized by the approved DAR.

BLOCK 17 - SPECIFIED REQUIREMENTS. State the drawings, specifications, or other baseline data requirements being deviated from or waived.

BLOCK 18 - DESCRIPTION OF DEPARTURE FROM REQUIREMENTS. Describe the requested departure from the specified requirements. Describe the nonconformance as completely as possible showing the extent of the departure. Attach or, in some electronic systems, specify locations of sketches if required for clarification. The actual difference between the specified requirements and the variation shall be readily discernible.

BLOCK 19 - JUSTIFICATION FOR DAR. Enter the supporting rationale for the DAR. Include the safety impact statement that identifies the hazard documentation affected, reflects any associated risks, and indicates if baseline hazard/critical item list (CIL) documentation update is necessary.

BLOCK 20 - ENVIRONMENTAL IMPACT. Check either the "Yes" or "No" block indicating whether acceptance or disapproval of the deviation or waiver will result in an environmental impact. If "Yes," provide details.

BLOCK 21 - CORRECTIVE ACTION TAKEN. Check either the "Yes" or "No" block indicating whether corrective action has been taken. If "Yes," describe the action taken to resolve the need for the waiver or deviation in future applications.

BLOCK 22 - ICD AFFECTED. Check either the "Yes" or "No" block as to whether an ICD is affected by this DAR. If "Yes," define the details of the impact on the product's interfaces.

DEVIATION/WAIVER APPROVAL REQUEST (DAR) MSFC FORM 847, PREPARATION INSTRUCTIONS (CONCLUDED)

BLOCK 23 - FMEA/CIL AFFECTED. Check either the "Yes" or "No" block as to whether the Failure Mode and Effects Analysis (FMEA)/Critical Items List (CIL) is affected by this DAR. If "Yes," provide analysis as to how the FMEA/CIL is affected by this DAR.

BLOCK 24 - CONTRACT COST IMPACTS. For MSFC-generated DARs, leave blank. For contractor-submitted DARs, check "Yes" or "No" as to whether there are cost impacts/cost adjustments. If "Yes," provide estimated cost benefits to the Government if the DAR is approved. If "No," provide justification why there is not a cost benefit to the Government.

BLOCK 25 - CONTRACTOR CERTIFICATION. Authorized representative signs and dates this block or, in the controlled electronic system, electronic approval and date approved are indicated to certify that the information described in the DAR is a departure from contractual requirements in the quantities and/or conditions stated in the DAR.

BLOCK 26 - RESIDENT GOVERNMENT QUALITY REPRESENTATIVE. For MSFC-generated DARs, this block shall be completed by the Quality representative assigned to the project. For contractor-generated DARs, the block shall be completed by the resident Quality Assurance Representative (QAR). Check "Concurrence" or "Nonconcurrence"; if "Nonconcurrence" is checked, enter comments. The block shall be signed and dated or, in the controlled electronic system, electronic approval and date approved are indicated.

BLOCK 27 - MSFC CCBD NUMBER. The CCB shall address cost adjustments. The configuration control board secretariat shall enter the configuration control board directive (CCBD) number and complete the block. In a non-electronic process, attach the CCBD to this form.

BLOCK 28 - CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE (COTR). For contract-related DARs, the COTR shall sign and date to indicate concurrence. For in-house Programs/Projects, leave blank.

B**LOCK 29 - CONTRACTING OFFICER'S APPROVAL.** For contract related DARs,this block shall be completed, signed, dated, and the contractor's name entered by the contracting officer or authorized representative; or, in the controlled electronic system, electronic approval and date approved are indicated. If "Approved Subject to Conditions" is checked, check either that "Implementation of this DAR shall proceed" or "Implementation of this DAR
shall not proceed." For MSFC in-house Program/Project DARs, leave blank.

PAGE NUMBER - The page number of the individual page and the total number of pages in the DAR shall be shown at the bottom center of each page (for example, 1 of 3, 2 of 3, 3 of 3, etc.).

DISCREPANCY RECORD

TOTAL SHEETS: 2 | 3 | 4 | 1A | 1B | 5 | 6 | 7 | 8 | 9 | 10

1. TDR NO.:
2. PAGE OF
3. PART NAME:
4. PART NO. AND REV.:
5. S/N/LOT NO.:
6. EPL/REV.:
7. D.R. NO.:
8. REF. DESIGN:
9. MEAS. NO.:
10. MFG. OR SUPPLIER:
11. EFFECTIVITY:
12. I.R. NO.:
13. NHA NAME:
14. NHA P/N:
15. DETECTED DURING:
16. REF. DOC. NO.:
17. SUBSYSTEM/PROGRAM:
18. WAIVER/E.O./CWG. REV.:
19.
20. HDW. CAT.: ☐ Flight ☐ GSE ☐ Other

21. ITEM NO. 22. STEP _____ DISCREPANCY TIME _____

FOR REFERENCE ONLY

23. INITIATOR:
24. ORGN.:
25. TEST CONDUCTOR/SUPERVISOR:
26. Q.C. STAMP:
27. DATE:

28. ITEM NO. 29. DISPOSITION

CONSTRAINT ☐ Yes ☐ No
SAFETY HAZARD ☐ Yes ☐ No
T/S PLAN REQ. ☐ Yes ☐ No

TO: _____
_____ T. ENGR.

30. WORKED BY
31. ITEM ACCEPTANCE

32. MATERIAL REVIEW REQUIRED: ☐ Yes

ITEM NO.	FUNCTIONAL FAIL.	FA REQ.:
	☐	☐ Yes ☐ No

33. FINAL DISPOSITION: ☐ Rpr ☐ UAI ☐ STD ☐ RwK ☐ Wvr ☐ RTV ☐ Scp ☐ G/BC ☐ Other

34. FINAL ACCEPTANCE & DATE:
35.
36. ACCEPT.:

MSFC Form 460 (Rev. June 1997) PDF

APPENDIX F

ACCEPTANCE DATA PACKAGE

1. SCOPE/PURPOSE

This Appendix provides guidance and requirements for the content of the Acceptance Data Package (ADP) provided at the time of each Acceptance Review; Functional and Physical Configuration Audit, or when a configuration item is transferred from one agency or site to another. Other data deliverables may also be identified in the Data Procurement Document (DPD) (like drawings, specifications or reports) to support Acceptance Reviews and Audits, in addition to the specific content of the ADP. These documents shall also be made available along with the ADP.

An ADP accompanies each configuration item when the configuration item is transferred to a different site or agency. Accordingly, the ADP is updated and maintained current throughout the life-cycle of the product.

2. REQUIREMENTS

a. Acceptance Data Package Submission. The ADP shall be submitted in accordance with contractual data delivery requirements. The ADP shall clearly identify the configuration of the CI/CSCI being delivered, any differences from baselined requirements, and any effort or deliveries that shall be accomplished after acceptance to fulfill contract requirements. The ADP and associated documents shall provide sufficient description to allow for transfer responsibility for a CI/CSCI from the contractor to MSFC.

b. Acceptance Data Package Contents (Hardware).

(1) Copy of DD form 250/1149

(2) Notes/Comments

(3) Waivers/Deviations

(4) Shortages, Unplanned/Deferred and Preplanned/Assigned Work

(5) Identification – As-built configuration (see paragraph 2.4)

(6) CI Log Books (see paragraph 2.5)

(7) Configuration Records (see paragraph 2.6)

(8) Age Sensitive/time Action Items

(9) Non-standard Calibration data

(10) Repair limitation data

(11) Other technical data specified by the contract

c. Acceptance Data Package Contents (software/firmware)

(1) Summary and status of all accepted Change Requests (CRs) to the baselined Software Requirements Specifications (SRSs)

(2) Summary and status of all major software capability changes since baselining of the Software Design documents (SDDs)

(3) Summary and status of all major software tests (including development, verification, and performance testing)

(4) Summary and status of all Discrepancy Reports (DRs) written against the software

(5) Summary and status of all software requirements deviations and waivers

(6) Summary and status of all software user notes

(7) Summary and status of all quality metrics historically and for this software

(8) Definition of open work, if any

(9) Software configuration records defining the verified and validated software, including the final Software Version Description (SVD) for this software

(10) Copy of proposed DD Form 250

d. As-built-As designed Documentation. The as-built as-designed comparison shall identify differences between the built item and the designed item. The as-built as-designed shall include the following:

(1) An indentured parts list of hardware being delivered.

(2) Identification of differences between the as-built and as-designed

(3) Necessary data elements include deliverable part number/serial number; part numbers; quantity; drawing traceability code (serial or lot traceability); drawing change letter and incorporated EOs; reference designations (electrical items only)

(4) Identification of source and spec controlled drawings

(5) Manufacturing build paper, including make or buy decision for each part

e. CI Log Books. Log books shall be current to the time of acceptance by MSFC; the following appropriate categories shall be included in the log book:

(1) Running/operating time and cycle log(s) for each time and cycle critical item of the CI. These logs shall identify the item(s) by nomenclature, part number and serial number and shall state the total authorized life and the life expended.

(2) Test history log, including post manufacturing checkout and final verification tests of the CI, with the following data:

(3) Actual measurements identified to specified tests. References to applicable test reports are satisfactory, provided that copies of the reports are included.

(4) Brief test summary.

(5) List of unaccomplished tests or portions of tests with estimated man-hours required for completion.

(6) List of actual and recommended retest(s) including status.

(7) Special test instructions, investigations, warnings, and problems encountered during factory testing

(8) Failure and corrective action data for all functional failures during the post manufacturing and final acceptance test and checkout of the CI

(9) Inspection records for all inspections performed, such as packaging, presentation, trouble shooting, removals and replacements, shortages, preventive maintenance, etc.

(10) Transfer records providing a history of all CI movement until time of transfer to the procuring agent

(11) Alignment data records for the total CI and all alignment critical components (items)

(12) Component (including Government-Furnished Property) log books

(13) Weight and balance logs covering total weight and horizontal, vertical, and lateral center of gravity

f. Configuration Records.

(1) Parts and drawing lists identifying all parts and drawings that have been changed from baseline configuration.

(2) Software configuration records defining the verified and validated software including the Version Description Document, Software Certification, and the validated software program.

(3) A list of authorized deviations and waivers.

(4) A complete list of hardware and software/firmware items shipped loose or separately. This list shall cover all items needed to complete the CI or satisfy programmed work and shall include scheduled dates of arrival.

g. Certifications. A copy of the proposed DD Form 250, Material Inspection and Receiving Report, or equivalent. The document shall identify the CI by model number, serial number, part number and the governing CI specification.

h. Format and Updating ADP. The Contractor shall develop a plan for formatting and maintaining the ADPs current for each audit, review, or transfer of CI/CSCI.

APPENDIX G

DEFINITIONS AND ACRONYMS

1. SCOPE/PURPOSE

This Appendix provides standardized definitions and explanations of the words, terms, phrases, abbreviations, and acronyms that characterize the terminology used in CM implementing instructions. Configuration Management terms and definitions are listed in alphabetical order in the following section.

This Appendix is applicable to MSFC contractors who are providing design, development, fabrication services, or products for MSFC-managed program or project activities.

2. DEFINITIONS

Acceptance Data Package (ADP). Complete documentation necessary to clearly identify the configuration of the CI being accepted, including test and operating logs, any differences from contract requirements, and any work to be performed after acceptance in order to fulfill contract requirements.

Baseline. The technical requirements of a program/project/CI as approved by the responsible CCB at a specific time during its life cycle and recorded in a configuration identification document or set of documents and changes thereto.

Class I Engineering Change Proposal. A change classification that proposes a change to an established baseline or affects a level of criticality (like form, fit, or function) of a configuration item. (Class II change is a proposed change that does not meet Class I criteria.)

Commercial and Government Entity (CAGE) Code. A five-character code listed in Cataloging Handbook H4/H8 which is assigned to commercial and Government activities that manufacture or develop items, or provide services or supplies for the Government. When used with a drawing number or part number, the CAGE code designates the design activity to which the drawing or part number is assigned. The CAGE Code was previously called manufacturer's code, code identification number, or Federal Supply Code for Manufacturers.

Computer Software Configuration Item (CSCI). An aggregation of software that satisfied an end use function and is designated by the Government for separate Configuration Management.

Configuration. The functional and physical characteristics of existing or planned hardware, firmware, software, or a combination thereof, as set forth in technical documentation and ultimately achieved in a product.

Configuration Audit (FCA). The formal examination of functional characteristics of a Configuration Item, or system, to verify that the item has achieved the requirements specified in its functional and/or allocated configuration documentation.

Configuration Accounting. The recording and reporting of the information that is needed to manage configuration effectively, including a listing of the approved configuration identification,

the status of proposed changes, deviations and waivers to configuration, and the implementation status of approved changes.

Configuration Control. The systematic definition, evaluation, coordination, and disposition of each proposed change, deviation or waiver, and the implementation of each approved change in the configuration of a program/project/CI after formal establishment of the configuration identification.

Configuration Control Board (CCB). The functional body responsible for establishing baselines and the reviewing and dispositioning of all changes, deviations or waivers to these baselines.

Configuration Control Board Directive (CCBD). The document used to record the actions of a CCB to establish baselines, disposition changes to baselines, and authorize deviations/waivers to baselines. The document specifies each action, actionee, and due date required to implement the change. The form contains a signature block for the concurrence or nonconcurrence of each board member and the authorization of the CCB chairman.

Configuration Identification. The establishment of approved technical documentation defining the approved configuration of a program/project/CI throughout its life cycle and its maintenance on a current basis. This documentation consists of specifications, drawings and associated lists, including documents referenced therein and approved changes thereto.

Configuration Identification Numbers. Numbers that, individually or in combination, permit accurate selection of the configuration required to perform a given function. These numbers may include: (a) specification identification numbers, (b) CI numbers, (c) drawing and part numbers, (d) engineering change identification numbers, (e) Commercial and Government Entity (CAGE) code numbers, (f) serial numbers, and (g) lot numbers.

Configuration Inspection. A formal review that is used to establish the Product Baseline and to verify that the contract end items have been, and other like items can be, manufactured, tested, etc., to the released engineering documentation. This is accomplished by a comparison of the "as-built" configuration to the "as-designed" requirements. The Configuration Inspection is a one-time review conducted for each family of Contract End Items.

Configuration Item (CI). An aggregation of hardware/software or any of its discrete parts and related documentation that satisfies an end-use function and is designated by MSFC for configuration management.

Configuration Management (CM). A discipline applying technical and administrative direction and surveillance to accomplish the following tasks:

— Identify and baseline the technical requirements of programs/projects/CIs.

— Control changes, deviations, and waivers to these technical requirements.

— Record and report change processing and implementation status.

— Account for approved changes and their incorporation into programs/projects/CIs.

— Verify that the configuration of systems and CIs is as specified in configuration identification documentation.

Configuration Verification. The task of ensuring that the program hardware, software, and firmware is certified as having been designed, built, and tested to the correct configuration baseline.

Contractor. An entity (e.g., individual, partnership, company, corporation, association) having a product or services contract with a procuring activity.

Data Element (Software/Firmware). A single piece of information, the smallest unit normally residing in a computer system (database). A record consists of one or more data elements.

Deviation. A specific written authorization, granted prior to the manufacture of an item, to depart from a particular requirement(s) of an item's current approved configuration documentation for a specific number of units or a specified period of time. (A deviation differs from an engineering change in that an approved engineering change requires corresponding revision of the item's current approved configuration documentation, whereas a deviation does not.)

Deviation/Waiver Approval Request (DAR). A form used to define and request approval of deviations and waivers.

Drawing (Engineering). An engineering document or digital data file(s) that discloses (directly or by reference), by means of graphic or textual presentations, or combinations of both, the physical and functional requirements of an item.

Effectivity. The specific hardware or software family and serial number(s), specific missions, or specific period of time to which part numbers, changes, deviations, waivers, etc., are identified.

Engineering Change Proposal (ECP). A proposed engineering change and the documentation by which the change is described, justified, and submitted to the Government for approval or disapproval.

Engineering Release Record. The single, authoritative data file identifying released documentation and changes thereto.

Engineering Release System. The single, authoritative control system for assigning document numbers, verifying requirements, recording and transmitting engineering documentation required for fabrication, assembly, installation, and test of program hardware/software.

Facility. Any fixed installation, e.g., test stand or launch mechanism, which is part of a program/project. This includes real property and installed equipment.

Field Engineering Change (FEC). The method for proposing emergency/urgent engineering changes at NASA using sites on equipment for which MSFC retains design responsibility and for which time is not adequate for preparation and processing of an ECP.

Firmware. The combination of a hardware device and computer instructions or computer data that resides as read-only software on the hardware device. The software cannot be readily modified under program control.

Flight Readiness Review (FRR). A detailed review by which the system is certified as flight worthy. The FRR includes review of the system verification process (both testing and analysis), system compatibility, operational planning, and team preparedness. The review results in certification of flight readiness of the operational team, the acceptability of the vehicle for each flight, and the readiness of the system to achieve all flight objectives.

Installation Notice Card (INC). The official document used after contract delivery to update the Configuration Management system and to inform the procuring activity and the contractor that a particular modification package has been installed, tested, verified, and accepted in accordance with its associated change instruction.

Interface. A region common to two or more elements, systems, projects, or programs characterized by mutual physical, functional, and procedural properties.

Interface Control Drawing/Document (ICD). Documentation in the form of drawings and/or written record that identifies the requirements that define and depict the physical, functional, and procedural interfaces that are required to be met by separate developing contractors and/or agencies.

Interface Requirements Document (IRD). A top level document that identifies and provides mutually agreeable interface requirements between different programs or projects and specifies basic requirements for allocation and quantification to lower level ICDs and/or interfacing specifications.

Interface Revision Notice (IRN). A form used to record approved changes to baselined interface documents.

Modification Instruction (Mod Instruction). A form initiated by the designer to be used as a checklist for mod kit completeness and to serve as instructions for accomplishing the modification.

Modification Kit (Mod Kit). A package containing necessary documentation, hardware, software, and Mod Instructions to incorporate an approved engineering change in Government-accepted or in-service articles.

Mod Kit Validation Requirements. Information provided with a Mod Kit which defines inspection and test requirements necessary to establish confidence in new system(s) added or to restore confidence of system(s) invalidated by incorporation of a Mod Kit.

Physical Configuration Audit (PCA). The formal examination of the "as-built" configuration of a Configuration Item against its technical documentation to establish or verify the Configuration Item's product baseline.

Preliminary Interface Revision Notice (PIRN). An IRN form used to describe proposed changes to IRDs/ICDs by participating contractors or design agencies.

Product Baseline. The technical requirements as recorded in the initial approved part II CI detailed specification and subordinate approved detail specifications and drawings. This baseline is finalized as a product of the Configuration Inspection.

Product Definition Data. Data elements required to completely define a product. (A product definition data set is a collection of one or more computer files that disclose (directly or by reference), by means of graphic or textual presentations, or combination of both, the physical and functional requirements of an item.)

Program Control Number (PCN). A unique number assigned to the first item of a change package which initiates a particular engineering change. The same number is assigned to all subsequent actions and documentation associated with that engineering change which, together with the initial engineering change document, is recognized as a change package.

This same concept applies to program control identification numbers, space station control numbers, and any other name that may be applied to a number used for this purpose.

Software. A combination of associated computer instructions and computer data definitions required to enable the computer hardware to perform computational or control functions.

Software Version Description Document (VDD). A specification documenting the exact "as-built" configuration of software to be delivered.

Specification. A document prepared specifically to support acquisition which clearly and accurately defines performance, design, and verification requirements.

Specification Change Instruction (SCI). A document that records all SCNs issued against a specification, provides a chronological listing of all changes to the specification, and provides the replacement page deletion/insertion instructions.

Specification Change Notice (SCN). A form used to propose, transmit, and record changes to a baselined specification.

Statement of Work (SOW). A document that accurately describes the requirements for contracts providing items, materials, or services including the standards used to determine whether requirements have been met.

Subcontractor. A contractor who provides an item and/or service under the terms of a contract with a prime contractor.

Supplier. A source from whom a purchased item is obtained; used synonymously with the term vendor.

System. A composite of equipment, skills, and techniques capable of performing and/or supporting an operational role. A complete system includes all equipment, related facilities, material, software, services, and personnel required for its operation and support to the degree that it can be considered a self-sufficient item in its intended operational environment.

Vendor. See Supplier.

Verification/Validation. The inspection and tests necessary to establish confidence in a new system, to restore confidence in an added system, or to restore confidence in a system invalidated by the installation of a modification into a CI.

Waiver. A written authorization to accept an item, which during manufacture, or after having been submitted for Government inspection or acceptance, is found to depart from specified requirements, but nevertheless is considered suitable for use "as is" or after repair by an approved method.

3. ACRONYMS/DEFINITIONS

ADP	Acceptance Data Package
CAGE Code	Commercial and Government Entity (Code)
CCB	Configuration Control Board
CCBD	Configuration Control Board Directive
CI	Configuration Item
CM	Configuration Management
CPIN	Computer Program Identification Number
CSCI	Computer Software Configuration Item
DAR	Deviation/Waiver Approval Request
DPD	Data Procurement Document
ECP	Engineering Change Proposal
FCA	Functional Configuration Audit
FEC	Field Engineering Change
FRR	Flight Readiness Review
ICD	Interface Control Document
INC	Installation Notice Card
IRD	Interface Requirement Document
IRN	Interface Revision Notice
PCA	Physical Configuration Audit
PCN	Program Control Number
PCP	Project Change Proposal
PDR	Preliminary Design Review
PIRN	Preliminary Interface Revision Notice
PRR	Program/Project Requirements Review
RECP	Record ECP
SCI	Specification Change Instruction
SCN	Specification Change Notice
SOW	Statement of Work

APPENDIX H

GUIDANCE FOR PROCESSING URGENT-EMERGENCY SOFTWARE CHANGES

1. SCOPE/PURPOSE

This appendix provides guidance on organizational roles and duties in processing urgent or emergency software changes.

Using Site or Design Activity	Identify need for emergency or urgent software update after receipt/delivery of software CSCI(s).
Design Activity	Generate Change Request (CR).
Design Activity	If approved by Program/Project manager, generate software update and documentation package including software Version Description Document (VDD).

Generate the software update instructions to include the following items:

a. Title
b. Software version number
c. Authorization
d. Date
e. Installation site
f. Installation sequence
g. Operational manuals affected
h. Safety considerations
i. Purpose of software update
j. Effectivity
k. Documentation required
l. Instructions for installation
m. Special test equipment
n. Estimated man-hours required
o. Validation requirements
p. Prepared by
q. Tested by
r. Software requirements

A copy of the software update will be provided for each installation site.

If validation requirements are not available for inclusion into the initial installation instructions, the validation requirements should be generated and shipped after delivery of initial software update.

MSFC Property Management and Transportation	Promulgate software update and documentation package.
Using Site Activity	Receive software update.
	Revise installation and operation documentation, as required.
	Implement software update per instructions.
	Complete installation and verification information and forward to the project configuration management secretariat. MSFC Form 2490, Installation Notice Card, or the using-site format is acceptable; however, the data items listed below are mandatory: a. Software version number b. ECR number that caused the modification c. Date and location of installation d. Work order number if applicable e. Name, address, and telephone number of the person responsible for the installation f. Date and location of verification g. Name, address, and telephone number of the person responsible for the verification h. Any additional remarks as required
	Transmit software update installation and verification information.
CCB Secretariat	Receive software update installation and verification information.
Design Activity	Generate revised ECR, as required, and process beginning with step 6.2.1.

APPENDIX I

DOCUMENTATION GUIDANCE FOR FCA/PCA

1. SCOPE/PURPOSE

This appendix lists documentation that may be required for the FCA/PCA. Specific requirements for documentation are identified in the contract.

Documentation for FCA

- Configuration Item Specifications
- Drawing and parts list
- ECPs and DARs incorporated and pending
- Drawing trees (UPA and PSM)
- Fracture control plan
- Structural dynamics, analyses, loads, and models documentation (updated)
- Material Usage Agreement (MUAs)
- Material Identification Usage List (MIUL)
- Certification of Qualifications (COQs)
- Verification Plan
- Software verification data
- Software version description
- Critical Design Review (CDR) RIDS and disposition
- Nonconformance reports (PRACAs
- Interface control drawings/documents
- Hazards analysis/risk assessment (SHA)
- Test procedures
- Verification reports
- Verification tracking log
- ALERTS tracking log (GIDEP Alert database

Documentation required for PCA

- Final verification of configuration item specifications
- Product drawings and parts list
- Configuration accounting and status report
- Final version of all software documents
- Final version of software version description document
- Copy of all FCA findings for each CI
- List of approved and outstanding ECPs and DARS
- Copies of ECPs and DARS as required at the audit
- Drawing trees
- Indentured parts list/as-design configuration definition
- As run test procedures (when applicable, include any test discrepancy reports).
- Copy of parts tags or verification closure for verification items verified by inspection method
- Manufacturing and inspection (build) records
- Inspection records
- As-built data
- Discrepancy reports (DRs and MRBs)
- ADP

DO

I. GENERAL INFORMATION

1. APPROVED PROJECT:	2. DOCUMENT/ DRAWING NUMBER:	3. CONTROL NUMBER:	4. RELEASE DATE:	5. SUBMITTAL DATE:
Multiprogram/Project Common Use	MSFC-STD-3394		01/31/2005	01/31/2005

6. DOCUMENT/DRAWING TITLE:
Standard for Contractor Configuration Management Requirements, MSFC Programs/Projects

7. REPORT TYPE: Standard

8. CONTRACT NUMBER / PERFORMING ACTIVITY:	9. DRD NUMBER:	10. DPD / DRL / IDRD NUMBER:
MSFC	n/a	n/a

11. DISPOSITION AUTHORITY (Check One):
- [x] Official Record - NRRS 8/12/A
- [ ] Reference Copy - NRRS 8/5/A/3 (destroy when no longer needed)

12. SUBMITTAL AUTHORITY: MSFC Multiprogram/Project Common Use Document Control Board (DCB)

13. RELEASING AUTHORITY:

14. SPECIAL INSTRUCTIONS:
Make available to NASA Technical Standards Program (externally accessible link).

15. CONTRACTOR/SUBMITTING ORGANIZATION, ADDRESS AND PHONE NUMBER:

16. ORIGINATING NASA CENTER: MSFC

17. OFFICE OF PRIMARY RESPONSIBILITY: ED03

18. PROJECT CODE: 949-10-E4

19. NUMBER OF PAGES: 70

II. ENGINEERING DRAWINGS

20. REVISION:	21. ENGINEERING ORDER:	22. PARTS LIST:	23. CCBD:
n/a	n/a	n/a	n/a

III. REPORTS, SPECIFICATIONS, ETC.

24. REVISION:	25. CHANGE:	26. VOLUME:	27. BOOK:	28. PART:	29. SECTION:
A					

30. ISSUE:	31. ANNEX:	32. SCN:	33. DCN:	34. AMENDMENT:

35. APPENDIX:	36. ADDENDUM:	37. CCBD:	38. CODE ID:	39. IRN:

IV. EXPORT AND DISTRIBUTION RESTRICTIONS

- [ ] Privacy Act (see MWI 1382.1)
- [ ] Proprietary (see MPD 2210.1, MPR 7120.3)
- [ ] Patent (see MPR 2220.1)
- [ ] ITAR (see MPR 2220.1, MPD 2190.1)
- [ ] EAR (see MPR 2220.1, MPD 2190.1)
- [ ] Other ACI (see MPR 1600.1)
- [x] No statutory or institutional restrictions applicable -- material may be electronically distributed to user in the NASA domain

V. DOCUMENTATION SUBMITTER (NASA OR CONTRACTOR)

40. ORG. CODE:	41. PHONE NUMBER:	42. NAME:	43. SIGNATURE/DATE:
ED03	(256) 544-7097	Amy Hemken	Amy Hemken 1/31/05

VI. TO BE COMPLETED BY MSFC DOCUMENTATION REPOSITORY

44. RECEIVED BY:	45. DATE RECEIVED:	46. WORK ORDER:
Tammy Wise	2-3-05	03-00334-5