MIL-STD-1521 B (USAF
4 JUNE 1985
SUPERSEDING
MIL-STD-1521A (USAF)
1 JUNE 1976

MILITARY STANDARD

TECHNICAL REVIEWS AND AUDITS FOR SYSTEMS, EQUIPMENTS, AND COMPUTER SOFTWARE

AMSC NO. F3631 AREA CMAN

DEPARTMENT OF DEFENSE

WASHINGTON, D.C. 20301

Technical Reviews and Audits for Systems, Equipments, and Computer Software

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Hq ESD/ALET, Hanscom AFB, MA 01731 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FOREWORD

This standard has been designed to take advantage of current technological advancement and management procedures in conducting reviews and audits.

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SECTION 1

SCOPE

1.1 Purpose. This standard prescribes the requirements for the conduct of Technical Reviews and Audits on Systems, Equipments, and Computer Software.

1.2 Classification. The following technical reviews and audits shall be selected by the program manager at the appropriate phase of program development. Each review/audit is generally described in Section 3, Definitions, and more specifically defined in a separate appendix.

System Requirements Review (SRR)
System Design Review (SDR)
Software Specification Review (SSR)
Preliminary Design Review (PDR)
Critical Design Review (CDR)
Test Readiness Review (TRR)
Functional Configuration Audit (FCA)
Physical Configuration Audit (PCA)
Formal Qualification Review (FQR)
Production Readiness Review (PRR)

NOTE: A typical engineering and test flow relative to program activities is illustrated in Figure 1.

1.3 Application. Technical Reviews and Audits defined herein shall be conducted in accordance with this standard to the extent specified in the contract clauses, Statement of Work (SOW), and the Contract Data Requirements List. Guidance in applying this standard is provided in Appendix J. The contracting agency shall tailor this standard to require only what is needed for each individual acquisition.

SECTION 2

REFERENCED DOCUMENTS

2.1 Reference documents are not included in this document. The Statement of Work shall be referenced for applicable documents.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the contracting agency or as directed by the contracting officer).

SECTION 3

DEFINITIONS

TECHNICAL REVIEWS AND AUDITS

3.1 System Requirements Review (SRR). The objective of this review is to ascertain the adequacy of the contractor's efforts in defining system requirements. It will be conducted when a significant portion of the system functional requirements has been established.

3.2 System Design Review (SDR). This review shall be conducted to evaluate the optimization, correlation, completeness, and risks associated with the allocated technical requirements. Also included is a summary review of the system engineering process which produced the allocated technical requirements and of the engineering planning for the next phase of effort. Basic manufacturing considerations will be reviewed and planning for production engineering in subsequent phases will be addressed. This review will be conducted when the system definition effort has proceeded to the point where system characteristics are defined and the configuration items are identified.

3.3 Software Specification Review (SSR). A review of the finalized Computer Software Configuration Item (CSCI) requirements and operational concept. The SSR is conducted when CSCI requirements have been sufficiently defined to evaluate the contractor's responsiveness to and interpretation of the system, segment, or prime item level requirements. A successful SSR is predicated upon the contracting agency's determination that the Software Requirements Specification, Interface Requirements Specification(s), and Operational Concept Document form a satisfactory basis for proceeding into preliminary software design.

3.4 Preliminary Design Review (PDR). This review shall be conducted for each configuration item or aggregate of configuration items to (1) evaluate the progress, technical adequacy, and risk resolution (on a technical, cost, and schedule basis) of the selected design approach, (2) determine its compatibility with performance and engineering speciality requirements of the Hardware Configuration Item (HWCI) development specification, (3) evaluate the degree of definition and assess the technical risk associated with the selected manufacturing methods/processes, and (4) establish the existence and compatibility of the physical and functional interfaces among the configuration item and other items of equipment, facilities, computer software, and personnel. For CSCIs, this review will focus on: (1) the evaluation of the progress, consistency, and technical adequacy of the selected top-level design and test approach, (2) compatability between software requirements and preliminary design, and (3) on the preliminary version of the

operation and support documents.

3.5 Critical Design Review (CDR). This review shall be conducted for each configuration item when detail design is essentially complete. The purpose of this review will be to (1) determine that the detail design of the configuration item under review satisfies the performance and engineering specialty requirements of the HWCI development specifications, (2) establish the detail design compatibility among the configuration item and other items of equipment, facilities, computer software and personnel, (3) assess configuration item risk areas (on a technical, cost, and schedule basis), (4) assess the results of the producibility analyses conducted on system hardware, and (5) review the preliminary hardware product specifications. For CSCIs, this review will focus on the determination of the acceptability of the detailed design, performance, and test characteristics of the design solution, and on the adequacy of the operation and support documents.

3.6 Test Readiness Review (TRR). A review conducted for each CSCI to determine whether the software test procedures are complete and to assure that the contractor is prepared for formal CSCI testing. Software test procedures are evaluated for compliance with software test plans and descriptions, and for adequacy in accomplishing test requirements. At TRR, the contracting agency also reviews the results of informal software testing and any updates to the operation and support documents. A successful TRR is predicated on the contracting agency's determination that the software test procedures and informal test results form a satisfactory basis for proceeding into formal CSCI testing.

3.7 Functional Configuration Audit (FCA). A formal audit to validate that the development of a configuration item has been completed satisfactorily and that the configuration item has achieved the performance and functional characteristics specified in the functional or allocated configuration identification. In addition, the completed operation and support documents shall be reviewed.

3.8 Physical Configuration Audit (PCA). A technical examination of a designated configuration item to verify that the configuration item "As Built" conforms to the technical documentation which defines the configuration item.

3.9 Formal Qualification Review (FQR). The test, inspection, or analytical process by which a group of configuration items comprising the system are verified to have met specific contracting agency contractual performance requirements (specifications or equivalent). This review does not apply to hardware or software requirements verified at FCA for the individual configuration item.

3.10 Production Readiness Review (PRR). This review is intended to determine the status of completion of the specific actions which must be satisfactorily accomplished prior to executing a production go-ahead decision. The review is accomplished in an incremental fashion during the Full-Scale Development phase, usually two initial reviews and one final review to assess the risk in exercising the production go-ahead decision. In its earlier stages the PRR concerns itself with gross level manufacturing concerns such as the need for identifying high risk/low yield manufacturing processes or materials or the requirement for manufacturing development effort to satisfy design requirements. The reviews become more refined as the design matures, dealing with such concerns as production planning, facilities allocation, incorporation of producibility-oriented changes, identification and fabrication of tools/test equipment, long lead item acquisition etc. Timing of the incremental PRRs is a function of program posture and is not specifically locked in to other reviews.

OTHER DEFINITIONS

3.11 For further guidance on cost terminology see the latest edition of DODI 5000.33, Uniform Budget/Cost Terms and Definitions.

3.12 New titles are being phased in for the levels of maintenance. They are (with their former terms): On Equipment (Organizational), Off Equipment - On Site (Intermediate), Off Equipment - Off Site (Depot). See the latest edition of AFR 66-14, Equipment Maintenance Policies, Objectives, and Responsibilities.

3.13 For definitions of the various levels of repair, see the latest edition of MIL-STD-280A, Definition of Item Levels, Item Exchangeability, Models, and Related Terms.

3.14 Configuration item. Hardware or software, or an aggregation of both, which is designated by the contracting agency for configuration management.

SECTION 4

GENERAL REQUIREMENTS

4.1 Contractor Participation and Responsibilities. The contractor shall be responsible for conducting the Technical Reviews and Audits in accordance with the following requirements except as amended by the contract.

4.1.1 Subcontractors and Suppliers. The contractor shall be responsible for insuring that subcontractors, vendors, and suppliers participate in formal Reviews/Audits, as appropriate.

4.1.2 Location. Unless otherwise specified in the Statement of Work, the Reviews/Audits shall be conducted at the contractor's facility or at a designated subcontractor facility, if approved by the contracting agency. Accordingly, the contractor shall be required to provide the necessary resources and material to perform the Review/Audit effectively. This includes the following items to the extent appropriate for the type and scope of Review/Audit required by the contract:

a. Meeting agenda/plans

b. Conference room(s)

c. Applicable system engineering data, specifications, drawings, manuals, schedules, and design and test data

d. Specialty study results

e. Trade study results

f. Risk analysis results

g. Mockups, breadboards, in-process hardware, and finished hardware

h. Test methods and data

i. Meeting minutes

4.1.3 Contractor Requirements. The contractor shall be responsible for establishing the time, place and agenda for each Review/Audit in consonance with the master milestone schedule, subject to coordination with the contracting agency. This should be accomplished sufficiently in advance of each Review/Audit to allow adequate preparation for the meeting by both the contractor and the contracting agency (see 6.2). In addition, the contractor shall:

4.1.3.1 Insure that each Review/Audit schedule is compatible with the availability of the necessary information and contract

articles, e.g., system engineering data, trade study results, producibility analysis results, risk analysis results, specifications, manuals, drawings, reports, hardware, software, or mockups.

4.1.3.2 Prepare for each Review/Audit in sufficient detail consistent with the scope and magnitude of the Review/Audit.

4.1.3.3 Designate a Co-Chairperson for each Review/Audit. Participating contractor and subcontractor personnel or those chosen to make presentations shall be prepared to discuss in technical detail any of the presented material within the scope of the review.

4.1.3.4 Provide a stenographer or other acceptable method to record inputs to official meeting minutes. Minutes shall be recorded only as dictated by either Co-Chairperson and shall consist of significant questions and answers, action items, deviations, conclusions, recommended courses of action resulting from presentations or discussions. Conclusions from discussions conducted during side meetings shall be summarized in the main meeting at an appointed time, and appropriate comments shall be read into the official minutes. Recommendations not accepted should also be recorded together with the reason for non-acceptance. The minutes of each daily session shall be available for review by both the contractor and contracting agency personnel at the conclusion of each day's session (see 6.2).

4.1.3.5 Clearly record all action items in the minutes and identify whether contracting agency and/or contractor action is required for its resolution. (See Figure 2 for Sample Action Item Form).

4.1.3.6 Publish and distribute official minutes.

4.2 Contracting Agency Participation.

4.2.1 Serves as Co-Chairperson.

4.2.2 Provides the name, organization, and security clearance of each participating individual to the contractor prior to each Review/Audit.

4.2.3 Reviews the daily minutes and ensures that they reflect all significant contracting agency inputs.

4.2.4 Provides formal acknowledgement to the contractor of the accomplishment of each Review/Audit after receipt of Review/Audit minutes (see 6.1). The contracting agency establishes the adequacy of the contractor's review performance by notification of:

a. Approval -- to indicate that the review was satisfactori

completed.

b. Contingent approval -- to indicate that the review is not considered accomplished until the satisfactory completion of resultant action items.

c. Disapproval -- to indicate that the review was seriously inadequate.

4.3 Sample Forms. A sample action item form and sample certification attachment are provided for guidance purposes (see Figures 2, 3 and 4).

SECTION 5

DETAILED REQUIREMENTS

5.1 The appropriate Reviews or Audits will be conducted as specified in the following appendices (as selected and/or modified in the contract):

5.1.1 System Requirements Review. See Appendix A.

5.1.2 System Design Review. See Appendix B.

5.1.3 Software Specification Review. See Appendix C.

5.1.4 Preliminary Design Review. See Appendix D.

5.1.5 Critical Design Review. See Appendix E.

5.1.6 Test Readiness Review. See Appendix F.

5.1.7 Functional Configuration Audit. See Appendix G.

5.1.8 Physical Configuration Audit. See Appendix H.

5.1.9 Formal Qualification Review. See Appendix I.

5.1.10 Application Guide For Tailoring MIL-STD-1521. See Appendix J.

5.1.11 Production Readiness Review. See Appendix K.

SECTION 6

NOTES

6.1 Intended use. This standard prescribes the requirements for conducting Technical Reviews and Audits on Systems, Equipments, and Computer Software. Official acknowledgement by the contracting agency of the accomplishment of a Review/Audit is not to be interpreted as approval of statements made in the minutes or of matters discussed at the Review/Audit and does not relieve the contractor from requirements which are a part of the contract.

6.2 Data requirements list and cross reference. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of the DOD FAR clause on data requirements (currently DOD FAR Supplement 52.227-7031) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard is cited in the following paragraphs.

Paragraph No.	Data Requirement Title	Applicable DID No.
4.1.3	Conference Agenda	DI-A-7088
4.1.3.4	Conference Minutes	DI-A-7089

(Data item descriptions related to this standard, and identified in section 6 will be approved and listed as such in DOD 5000.19-L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

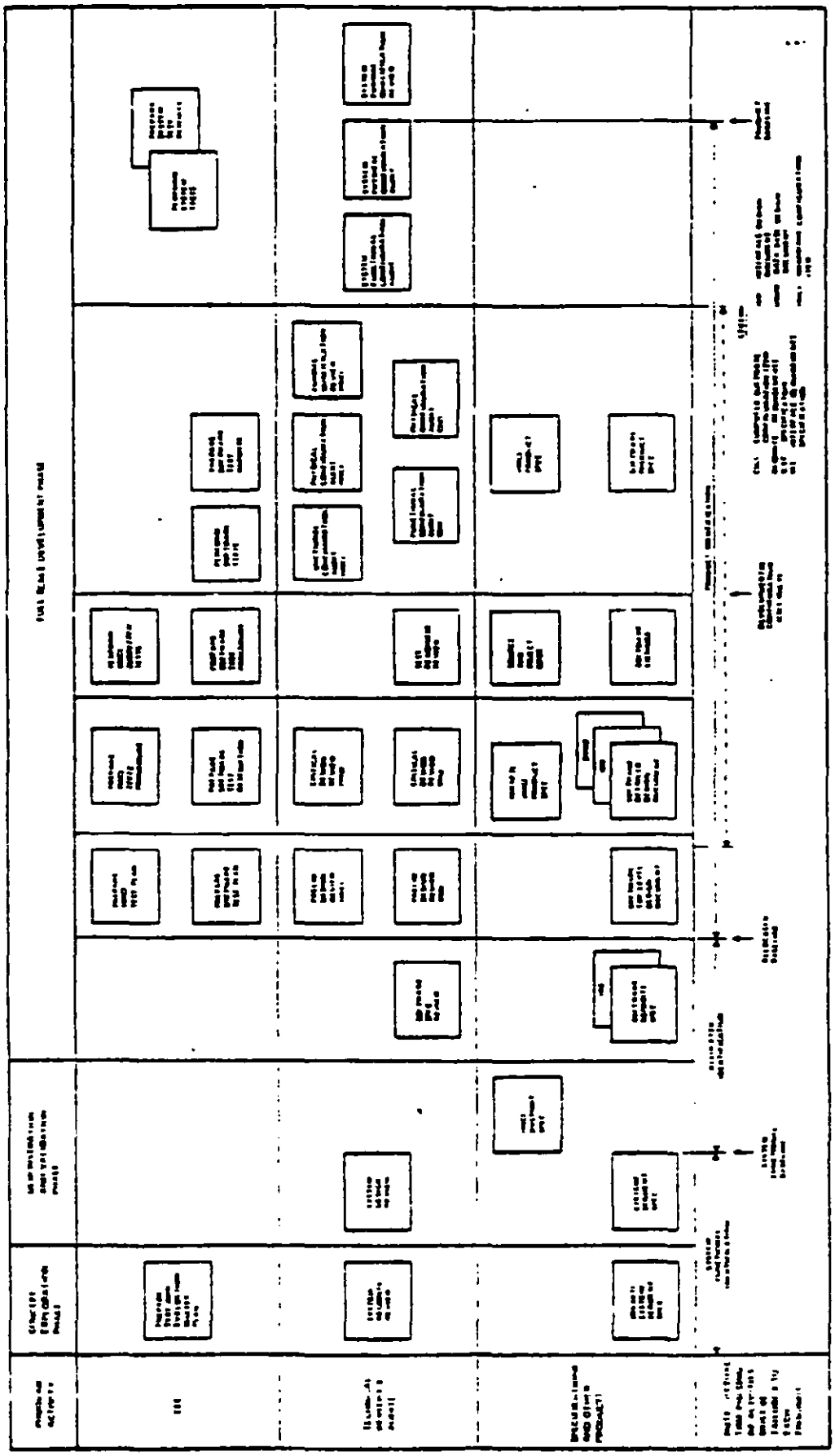

FIGURE 1. Engineering and Test Flow.

ACTION ITEM

CONTROL NUMBER _____

DATE OF MEETING	SUBJECT:	LOCATION
ACTION REQUIRED/COMPLIANCE		DUE DATE _____
ASSIGNED TO: _____		ORIGINATOR
_____		AGENCY
FOLLOW UP STATUS: _____		
ASSIGNEE:		
DATE COMPLETED:		DOCUMENT NO.

COORDINATORS		TECHNICAL APPROVAL	
PHONE	AGENCY	SIGNATURE	DATE
PHONE	AGENCY	SIGNATURE	DATE
PHONE	AGENCY	SIGNATURE	DATE

CONTRACTING AGENCY	DATE	CONTRACTOR	DATE	CONTRACTS	DATE

Figure 2 Sample Action Item Form

10. System Requirements Review (SRR).

10.1 General. The SRRs are normally conducted during the system Concept Exploration or Demonstration and Validation phase. Such reviews may be conducted at any time but normally will be conducted after the accomplishment of functional analysis and preliminary requirements allocation (to operational/maintenance/training Hardware Configuration Items (HWCIs), Computer Software Configuration Items (CSCIs), facility configuration items, manufacturing considerations, personnel and human factors) to determine initial direction and progress of the contractor's System Engineering Management effort and his convergence upon an optimum and complete configuration.

10.2 Purpose. The total System Engineering Management activity and its output shall be reviewed for responsiveness to the Statement of Work and system/segment requirements. Contracting agency direction to the contractor will be provided, as necessary, for continuing the technical program and system optimization.

10.3 Items to be Reviewed. Representative items to be reviewed include the results of the following, as appropriate:

a. Mission and Requirements Analysis

b. Functional Flow Analysis

c. Preliminary Requirements Allocation

d. System/Cost Effectiveness Analysis

e. Trade Studies (e.g., addressing system functions in hardware/firmware/software)

f. Synthesis

g. Logistics Support Analysis

h. Specialty Discipline Studies (i.e., hardware and software reliability analysis, maintainability analysis, armament integration, electromagnetic compatibility, survivability/vulnerability (including nuclear), inspection methods/techniques analysis, energy management, environmental considerations).

i. System Interface Studies

j. Generation of Specifications

k. Program Risk Analysis

l. Integrated Test Planning

m. Producibility Analysis Plans

n. Technical Performance Measurement Planning

o. Engineering Integration

p. Data Management Plans

q. Configuration Management Plans

r. System Safety

s. Human Factors Analysis

t. Value Engineering Studies

u. Life Cycle Cost Analysis

v. Preliminary Manufacturing Plans

w. Manpower Requirements/Personnel Analysis

x. Milestone Schedules

10.3.1 The contractor shall describe his progress and problems in:

10.3.1.1 Risk identification and risk ranking (the interrelationship among system effectiveness analysis, technical performance measurement, intended manufacturing methods, and costs shall be discussed, as appropriate).

10.3.1.2 Risk avoidance/reduction and control (the interrelationships with trade-off studies, test planning, hardware proofing, and technical performance measurement shall be discussed, as appropriate).

10.3.1.3 Significant trade-offs among stated system/segment specification requirements/constraints and resulting engineering design requirements/constraints, manufacturing methods/process constraints, and logistic/cost of ownership requirements/constraints and unit production cost/design-to-cost objectives.

10.3.1.4 Identifying computer resources of the system and partitioning the system into HWCIs and CSCIs. Include any trade-off studies conducted to evaluate alternative approaches and methods for meeting operational needs and to determine the effects of constraints on the system. Also include any evaluations of logistics, technology, cost, schedule, resource limitations, intelligence estimates, etc., made to determine their impact on the system. In addition, address the following specific tradeoffs related to computer resources:

a. Candidate programming languages and computer architectures evaluated in light of DoD requirements for approved higher order languages and standard instruction set architectures.

b. Alternative approaches evaluated for implementing security requirements. If an approach has been selected, discuss how it is the most economical balance of elements which meet the total system requirements.

c. Alternative approaches identified for achieving the operational and support concepts, and, for joint service programs, opportunities for interservice support.

10.3.1.5 Producibility and manufacturing considerations which could impact the program decision such as critical components, materials and processes, tooling and test equipment development, production testing methods, long lead items, and facilities/personnel/skills requirements.

10.3.1.6 Significant hazard consideration should be made here to develop requirements and constraints to eliminate or control these system associated hazards.

10.3.2 Information which the contractor identifies as being useful to his analysis and available through the contracting agency shall be requested prior to this review (e.g., prior studies, operational/support factors, cost factors, safety data, test plan(s), etc.). A separate SRR may be conducted for each of the operational support subsystems depending upon the nature and complexity of the program.

10.4 Post Review Action. After completing the SRR, the contractor shall publish and distribute copies of Review minutes. The contracting agency officially acknowledges completion of the SRR as indicated in paragraph 4.2.4.

20. System Design Review (SDR).

20.1 General. The SDR shall be conducted to evaluate the optimization, traceability, correlation, completeness, and the risk of the allocated requirements, including the corresponding test requirements in fulfilling the system/segment requirements (the functional baseline). The review encompasses the total system requirements, i.e., operations/maintenance/test/training hardware, computer software, facilities, personnel, preliminary logistic support considerations. Also included shall be a summary review of the System Engineering Management Activities (e.g., mission and requirements analysis, functional analysis, requirements allocation, manufacturing methods/process selection, program risk analysis, system/cost effectiveness analysis, logistics support analysis, trade studies, intra- and inter-system interface studies, integrated test planning, specialty discipline studies, and Configuration Management) which produced the above system definition products. A technical understanding shall be reached on the validity and the degree of completeness of the following information:

a. System/Segment Specification

b. The engineering design/cost of the system (see Section 3, Definitions).

c. Preliminary Operational Concept Document

d. Preliminary Software Requirements Specification

e. Preliminary Interface Requirements Specification(s)

f. As appropriate:

(1) Prime Item Development Specification

(2) Critical Item Development Specification

20.2 Purpose. An SDR shall be conducted as the final review prior to the submittal of the Demonstration and Validation Phase products or as the initial Full Scale Development Review for systems not requiring a formal Demonstration and Validation Phase but sufficiently complex to warrant the formal assessment of the allocated requirements (and the basis of these requirements) before proceeding with the preliminary design of HWCIs or the detailed requirements analysis for CSCIs. The SDR is primarily concerned with the overall review of the operational/support requirements (i.e., the mission requirements), updated/completed System/Segment Specification requirements, allocated performance requirements, programming and manufacturing methods/processes/planning, and the accomplishment of the System Engineering Management activities to insure that the definition

effort products are necessary and sufficient. The purposes of the SDR are to:

20.2.1 Insure that the updated/completed System/Segment Specification is adequate and cost effective in satisfying validated mission requirements.

20.2.2 Insure that the allocated requirements represent a complete and optimal synthesis of the system requirements.

20.2.3 Insure that the technical program risks are identified, ranked, avoided, and reduced through:

a. Adequate trade-offs (particularly for sensitive mission requirements versus engineering realism and manufacturing feasibility to satisfy the anticipated production quantities of corresponding performance requirements);

b. Subsystem/component hardware proofing;

c. A responsive test program; and

d. Implementation of comprehensive engineering disciplines (e.g., worst case analysis, failure mode and effects analysis, maintainability analysis, producibility analysis and standardization.)

20.2.4 Identify how the final combination of operations, manufacturing, maintenance, logistics and test and activation requirements have affected overall program concepts; quantities and types of equipment, unit product cost (see Section 3, Definitions, paragraph 3.11), computer software, personnel, and facilities.

20.2.5 Insure that a technical understanding of requirements has been reached and technical direction is provided to the contractor.

20.3 Items to be Revieved. The SDR shall include a review of the following items, as appropriate:

20.3.1 System Engineering Management Activities, e.g.:

a. Mission and Requirements Analysis

b. Functional Analysis

c. Requirements Allocation

d. System/Cost Effectiveness

e. Synthesis

f. Survivability/Vulnerability (including nuclear)

g. Reliability/Maintainability/Availability (R/M/A)

h. Electromagnetic Compatibility

i. Logistics Support Analysis (to address, as appropriate, integrated logistics support including logistics support concept, maintenance, supply, software support facilities, etc.)

j. System Safety (emphasis shall be placed on system hazard analysis and identification of safety test requirements)

k. Security

l. Human Factors

m. Transportability (including Packaging and Handling)

n. System Mass Properties

o. Standardization

p. Electronic Warfare

q. Value Engineering

r. System Growth Capability

s. Program Risk Analysis

t. Technical Performance Measurement Planning

u. Producibility Analysis and Manufacturing

v. Life Cycle Cost/Design to Cost Goals

w. Quality Assurance Program

x. Environmental Conditions (Temperature, Vibration, Shock, Humidity, etc.)

y. Training and Training Support

z. Milestone Schedules

aa. Software Development Procedures

20.3.2 Results of significant trade studies, for example:

a. Sensitivity of selected mission requirements versus

realistic performance parameters and cost estimates.

b. Operations design versus maintenance design

c. System centralization versus decentralization

d. Automated versus manual operation

e. Reliability/Maintainability/Availability

f. Commercially available items versus new developments

g. National Stock Number (NSN) items versus new development

h. Testability trade studies (Allocation of fault detection/isolation capabilities between elements of built-in test, on board/on-site fault detection/isolation subsystems, separate support equipment, and manual procedures)

i. Size and weight

j. Desired propagation characteristics versus reduction in interference to other systems (optimum selection of frequencies)

k. Performance/logistics trade studies

l. Life cycle cost reduction for different computer programming languages

m. Functional allocation between hardware, software, firmware and personnel/procedures

n. Life Cycle Cost/system performance trade studies to include sensitivity of performance parameters to cost.

o. Sensitivity of performance parameters versus cost

p. Cost versus performance

q. Design versus manufacturing consideration

r. Make versus buy

s. Software development schedule

20.3.3 Updated design requirements for operations/maintenance functions and items.

20.3.4 Updated requirements for manufacturing methods and processes.

20.3.5 Updated operations/maintenance requirements for facilities.

20.3.6 Updated requirements for operations/maintenance personnel and training.

20.3.7 Specific actions to be performed include evaluations of:

a. System design feasibility and system/cost effectiveness

b. Capability of the selected configuration to meet requirements of the System/Segment Specification

c. Allocations of system requirements to subsystems/configuration items

d. Use of commercially available and standard parts

e. Allocated inter- and intra- system interface requirements

f. Size, weight, and configuration of HWCIs to permit economical and effective transportation, packaging, and handling consistent with applicable specifications and standards

g. Specific design concepts which may require development toward advancing the state-of-the-art

h. Specific subsystems/components which may require "hardware proofing" and high-risk long-lead time items

i. The ability of inventory items to meet overall system requirements, and their compatibility with configuration item interfaces

j. The planned system design in view of providing multi-mode functions, as applicable

k. Considerations given to:

(1) Interference caused by the external environment to the system and the system to the external environment.

(2) Allocated performance characteristics of all system transmitters and receivers to identify potential intra-system electromagnetic (EM) incompatibilities.

(3) Non-design, spurious and harmonic system performance characteristics and their effect on electromagnetic environments of operational deployments.

l. Value Engineering studies, preliminary Value Engineering Change Proposals (VECPs) and VECPs (as applicable).

20.3.8 Review the Preliminary Operational Concept Document, and sections 1.0, 2.0, 3.0, 5.0, 6.0, and 10.0 of the System/Segment Specification, all available HWCI Development Specifications, preliminary Software Requirements, and Interface Requirements Specifications for format, content, technical adequacy, completeness and traceability/correlation to the validated mission/support requirements. All entries marked "not applicable (N/A)" or "to be determined (TBD)" are identified and explained by the contractor.

20.3.9 Review section 4.0 of the System/Segment Specification, all available hardware Development Specifications, and preliminary Software Requirements and Interface Requirements Specifications for format, content, technical adequacy, and completeness. All available test documentation, including HWCI/subsystem and system test plans, shall be reviewed to insure that the proposed test program satisfies the test requirements of section 4.0 of all applicable specifications. All entries labeled "not applicable (N/A)" or "to be determined (TBD)" in section 4.0 of any applicable specification are identified and explained by the contractor.

20.3.10 Review the system, HWCI, and CSCI design for interaction with the natural environment. If any effect or interaction is not completely understood and further study is required, or it is known but not completely compensated for in the design, the proposed method of resolution shall also be reviewed. All proposed environmental tests shall be reviewed for compatibility with the specified natural environmental conditions.

20.3.11 Maintenance functions developed by the contractor to determine that support concepts are valid, technically feasible, and understood. In particular, attention is given to:

a. R/M/A considerations in the updated System/Segment Specification

b. Maintenance design characteristics of the system

c. Corrective and preventive maintenance requirements

d. Special equipment, tools, or material required

e. Requirements or planning for automated maintenance analysis

f. Item Maintenance Analysis compatibility with required maintenance program when weapon is deployed

g. Specific configuration item support requirements

h. Forms, procedures, and techniques for maintenance analysis

i. Maintenance related trade-off studies and findings (includes commercially available equipment, software fault diagnostic techniques)

j. Logistic cost impacts

k. Support procedures and tools for computer software which facilitate software modification, improvements, corrections and updates

l. Hardness critical items/processes

20.3.12 System compliance with nuclear, non-nuclear and laser hardening requirements. High risk areas or design concepts requiring possible advances of the state-of-the-art as a result of survivability critieria shall be identified, and prepared approach(es) to the problem reviewed. Prepared test programs shall be reviewed for sufficiency and compatibility with the specified threat environment and existing simulation test facilities.

20.3.13 The optimization, traceability, completeness, and risks associated with the allocated technical requirements, and the adequacy of allocated system requirements as a basis for proceeding with the development of hardware and software configuration items. Include any available preliminary Software Requirements and Interface Requirements Specifications.

20.3.14 Manufacturing (HWCIs only).

20.3.14.1 Production feasibility and risk analyses addressed at the SRR shall be updated and expanded. This effort should review the progress made in reducing production risk and evaluate the risk remaining for consideration in the Full Scale Development Phase. Estimates of cost and schedule impacts shall be updated.

20.3.14.2 Review of the Production Capability Assessment shall include:

20.3.14.2.1 A review of production capability shall be accomplished which will constitute an assessment of the facilities, materials, methods, processes, equipment and skills necessary to perform the full scale development and production efforts. Identification of requirements to upgrade or develop manufacturing capabilities shall be made. Requirements for Manufacturing Technology (MANTECH) programs will also be identified as an element of this production assessment.

20.3.14.3 Present the management controls and the design/manufacturing engineering approach to assure that the equipment is producible.

20.3.14.4 Present a review of trade-off studies for design requirements against the requirement for producibility, facilities, tooling, production test equipment, inspection, and capital equipment for intended production rates and volume.

20.3.14.5 The analysis, assessments and trade-off studies should recommend any additional special studies or development efforts as needed.

20.4 Post Review Action. After completing the SDR, the contractor shall publish and distribute copies of Review Minutes. The contracting agency officially acknowledges completion of the SDR as indicated in paragraph 4.2.4.

30. Software Specification Review (SSR).

30.1 General. The SSR shall be a formal review of a CSCI's requirements as specified in the Software Requirements Specification and the Interface Requirements Specification(s). Normally, it shall be held after System Design Review but prior to the start of CSCI preliminary design. A collective SSR for a group of configuration items, treating each configuration item individually, may be held when such an approach is advantageous to the contracting agency. Its purpose is to establish the allocated baseline for preliminary CSCI design by demonstrating to the contracting agency the adequacy of the Software Requirements Specification (SRS), Interface Requirements Specification(s) (IRS), and Operational Concept Document (OCD).

30.2 Items to be reviewed. The contractor shall present the following items for review by the contracting agency:

a. Functional overview of the CSCI, including inputs, processing, and outputs of each function.

b. Overall CSCI performance requirements, including those for execution time, storage requirements, and similar constraints.

c. Control flow and data flow between each of the software functions that comprise the CSCI.

d. All interface requirements between the CSCI and all other configuration items both internal and external to the system.

e. Qualification requirements that identify applicable levels and methods of testing for the software requirements that comprise the CSCI.

f. Any special delivery requirements for the CSCI.

g. Quality factor requirements; i.e., Correctness, Reliability, Efficiency, Integrity, Usability, Maintainability, Testability, Flexibility, Portability, Reusability, and Interoperability.

h. Mission requirements of the system and its associated operational and support environments.

i. Functions and characteristics of the computer system within the overall system.

j. Milestone schedules.

k. Updates since the last review to all previously delivered

software related CDRL items.

1. Any actions or procedures deviating from approved plans.

30.3 Post Review Action. After completing the SSR, the contractor shall publish and distribute copies of Review Minutes. The contracting agency officially acknowledges completion of the SSR as indicated in paragraph 4.2.4.

30.3.1 The accomplishment of the SSR shall be recorded on the configuration item Development Record by the contractor (see MIL-STD-483, Appendix VII).

40. Preliminary Design Review (PDR)

40.1 General. The PDR shall be a formal technical review of the basic design approach for a configuration item or for a functionally related group of configuration items. It shall be held after the Hardware Development Specification(s), the Software Top Level Design Document (STLDD), the Software Test Plan (STP), the HWCI Test Plan, and preliminary versions of the Computer System Operator's Manual (CSOM), Software User's Manual (SUM), Computer System Diagnostic Manual (CSDM), and Computer Resources Integrated Support Document (CRISD) are available, but prior to the start of detailed design. For each configuration item the actions described below may be accomplished as a single event, or they may be spread over several events, depending on the nature and the extent of the development of the configuration item, and on provisions specified in the contract Statement of Work. A collective PDR for a group of configuration items, treating each configuration item individually, may be held when such an approach is advantageous to the contracting agency; such a collective PDR may also be spread over several events, as for a single configuration item. The overall technical program risks associated with each configuration item shall also be reviewed on a technical, cost, and schedule basis. For software, a technical understanding shall be reached on the validity and the degree of completeness of the STLDD, STP, and the preliminary versions of the CSOM, SUM, CSDM, and CRISD.

40.2 Items to be Reviewed. The contractor shall present the following for review by the contracting agency:

40.2.1 HWCIs:

a. Preliminary design synthesis of the hardware Development Specification for the item being reviewed.

b. Trade-studies and design studies results (see paragraph 20.3.2 of SDR for a representative listing).

c. Functional flow, requirements allocation data, and schematic diagrams.

d. Equipment layout drawings and preliminary drawings, including any proprietary or restricted design/process/components and information.

e. Environment control and thermal design aspects

f. Electromagnetic compatibility of the preliminary design

g. Power distribution and grounding design aspects

h. Preliminary mechanical and packaging design of consoles,

racks, drawers, printed circuit boards, connectors, etc.

i. Safety engineering considerations

j. Security engineering considerations

k. Survivability/Vulnerability (including nuclear) considerations

l. Preliminary lists of materials, parts, and processes

m. Pertinent relability/maintainability/availability data

n. Preliminary weight data

o. Development test data

p. Interface requirements contained in configuration item Development Specifications and interface control data (e.g., interface control drawings) derived from these requirements

q. Configuration item development schedule

r. Mock-ups, models, breadboards, or prototype hardware when appropriate

s. Producibility and Manufacturing Considerations (e.g., materials, tooling, test equipment, processes, facilities, skills, and inspection techniques). Identify single source, sole source, diminishing source.

t. Value Engineering Considerations, Preliminary VECPs and VECPs (if applicable).

u. Transportability, packaging, and handling considerations

v. Human Engineering and Biomedical considerations (including life support and Crew Station Requirements).

w. Standardization considerations

x. Description and characteristics of commercially available equipment, including any optional capabilities such as special features, interface units, special instructions, controls, formats, etc., (include limitations of commercially available equipment such as failure to meet human engineering, safety, and maintainability requirements of the specification and identify deficiencies).

y. Existing documentation (technical orders, commercial manuals, etc.,) for commercially available equipment and copies of contractor specifications used to procur

equipment shall be made available for review by the contracting agency.

z. Firmware to be provided with the system: microprogram logic diagrams and reprogramming/instruction translation algorithm descriptions, fabrication, packaging (integration technology (e.g., LSI, MSI), device types (e.g., CMOS, PMOS)), and special equipment and support software needed for developing, testing, and supporting the firmware.

aa. Life Cycle Cost Analysis

ab. Armament compatibility

ac. Corrosion prevention/control considerations

ad. Findings/Status of Quality Assurance Program

40.2.2 CSCIs:

a. Functional flow. The computer software functional flow embodying all of the requirements allocated from the Software Requirements Specification and Interface Requirements Specification(s) to the individual Top-Level Computer Software Components (TLCSCs) of the CSCI.

b. Storage allocation data. This information shall be presented for each CSCI as a whole, describing the manner in which available storage is allocated to individual TLCSCs. Timing, sequencing requirements, and relevant equipment constraints used in determining the allocation are to be included.

c. Control functions description. A description of the executive control and start/recovery features for the CSCI shall be available, including method of initiating system operation and features enabling recovery from system malfunction.

d. CSCI structure. The contractor shall describe the top-level structure of the CSCI, the reasons for choosing the components described, the development methodology which will be used within the constraints of the available computer resources, and any support programs which will be required in order to develop/maintain the CSCI structure and allocation of data storage.

e. Security. An identification of unique security requirements and a description of the techniques to be used for implementing and maintaining security within the CSCI shall be provided.

f. Reentrancy. An identification of any reentrancy requirements and a description of the techniques for implementing reentrant routines shall be available.

g. Computer software development facilities. The availability, adequacy, and planned utilization of the computer software development facilities shall be addressed.

h. Computer software development facility versus the operational system. The contractor shall provide information relative to unique design features which may exist in a TLCSC in order to allow use within the computer software development facility, but which will not exist in the TLCSC installed in the operational system. The contractor shall provide information on the design of support programs not explicitly required for the operational system but which will be generated to assist in the development of the CSCI(s). The contractor shall also provide details of the Software Development Library controls.

i. Development tools. The contractor shall describe any special simulation, data reduction, or utility tools that are not deliverable under the terms of the contract, but which are planned for use during software development.

j. Test tools. The contractor shall describe any special test systems, test data, data reduction tools, test computer software, or calibration and diagnostic software that are not deliverable under terms of the contract, but which are planned for use during product development.

k. Description and characteristics of commercially available computer resources, including any optional capabilities such as special features, interface units, special instructions, controls, formats, etc. Include limitations of commercially available equipment such as failure to meet human engineering, safety and maintainability requirements of the specification and identify deficiencies.

l. Existing documentation (technical orders, commercial manuals, etc.) for commercially available computer resources and copies of contractor specifications used to procure computer resources shall be made available for review by the contracting agency.

m. Support resources. The contractor shall describe those resources necessary to support the software and firmware during operational deployment of the system, such as operational and support hardware and software, personnel, special skills, human factors, configuration management, test, and facilities/space.

n. Operation and support documents. The preliminary versions of the CSOM, SUM, CSDM, and CRISD shall be reviewed for technical content and compatability with the top-level design documentation.

o. Updates since the last review to all previously delivered software related CDRL items.

p. Review considerations applicable to 40.2.1 as appropriate.

40.2.3 Support Equipment (SE):

a. Review considerations applicable to paragraph 40.2.1 and 40.2.2 as appropriate.

b. Verify testability analysis results. For example, on repairable integrated circuit boards are test points available so that failures can be isolated to the lowest level of repair (See Section 3 Definitions, for "Levels of repair").

c. Verify that the Government furnished SE is planned to be used to the maximum extent possible.

d. Review progress of long-lead time SE items, identified through interim release and SE Requirements Document (SERD) procedures.

e. Review progress toward determining total SE requirements for installation, checkout, and test support requirements.

f. Review the reliability/maintainability/availability of support equipment items.

g. Identify logistic support requirements for support equipment items and rationale for their selection.

h. Review calibration requirements.

i. Describe technical manuals and data availability for support equipment.

j. Verify compatibility of proposed support equipment with the system maintenance concept.

k. If a Logistic Support Analysis (LSA) is not done, then review the results of SE trade-off studies for each alternative support concept. For existing SE and printed circuit board testers, review Maintainability data resulting from the field use of these equipments. Review the cost difference between systems using single or multipurpose SE vs. proposed new SE. Examine technical feasibility in

using existing, developmental, and proposed new SE. For mobile systems, review the mobility requirements of support equipment.

l. Review the relationship of the computer resources in the system/subsystem with those in Automatic Test Equipment (ATE). Relate this to the development of Built In Test Equipment (BITE) and try to reduce the need for complex supporting SE.

40.3 Evaluation of Electrical, Mechanical, and Logical Designs

40.3.1 HWCIs. The material of paragraph 40.2.1 above shall be evaluated to:

a. Determine that the preliminary detail design provides the capability of satisfying the performance characteristics paragraph of the HWCI Development specifications.

b. Establish compatibility of the HWCI operating characteristics in each mode with overall system design requirements if the HWCI is involved in multi-mode functions.

c. Establish the existence and nature of physical and functional interfaces between the HWCI and other items of equipment, computer software, and facilities.

40.3.2 CSCIs. The material of paragraph 40.2.2 above shall be evaluated to:

a. Determine whether all interfaces between the CSCI and all other configuration items both internal and external to the system meet the requirements of the Software Requirements Specification and Interface Requirements Specification(s).

b. Determine whether the top-level design embodies all the requirements of the Software Requirements and Interface Requirements Specifications.

c. Determine whether the approved design methodology has been used for the top-level design.

d. Determine whether the appropriate Human Factors Engineering (HFE) principals have been incorporated in the design.

e. Determine whether timing and sizing constraints have been met throughout the top-level design.

f. Determine whether logic affecting system and nuclear safety has been incorporated in the design.

40.4 Electromagnetic Compatibility. Review HWCI design for compliance with electromagnetic compatibility/electromagnetic interference (EMC/EMI) requirements. Use Electromagnetic Compatibility Plan as the basis for this review. Check application of MIL-STDs and MIL-Specs cited by the system/equipment specification(s) to the HWCI/Subsystem design. Review preliminary EMI test plans to assess adequacy to confirm that EMC requirements have been met.

40.5 Design Reliability.

40.5.1 Identify the quantitative reliability requirements specified in the hardware Development and Software Requirements Specification(s), including design allocations, and the complexity of the CSCIs.

40.5.2 Review failure rate sources, derating policies, and prediction methods. Review the reliability mathematical models and block diagrams as appropriate.

40.5.3 Describe planned actions when predictions are less than specified requirements.

40.5.4 Identify and review parts or components which have a critical life or require special consideration, and general plan for handling. Agencies so affected shall present planned actions to deal with these components or parts.

40.5.5 Identify applications of redundant HWCI elements. Evaluate the basis for their use and provisions for "on-line" switching of the redundant element.

40.5.6 Review critical signal paths to determine that a fail-safe/fail-soft design has been provided.

40.5.7 Review margins of safety for HWCIs between functional requirements and design provisions for elements, such as: power supplies, transmitter modules, motors, and hydraulic pumps. Similarly, review structural elements; i.e., antenna pedestals, dishes, and radomes to determine that adequate margins of safety shall be provided between operational stresses and design strengths.

40.5.8 Review Reliability Design Guidelines for HWCIs to insure that design reliability concepts shall be available and used by equipment designers. Reliability Design Guidelines shall include, as a minimum, part application guidelines (electrical derating, thermal derating, part parameter tolerances), part selection order of preference, prohibited parts/materials, reliability apportionments/predictions, and management procedures to ensure compliance with the guidelines.

40.5.9 Review for HWCIs preliminary reliability demonstration plan: failure counting ground rules, accept-reject criteria, number of test articles, test location and environment, planned starting date, and test duration.

40.5.10 Review elements of reliability program plan to determine that each task has been initiated toward achieving specified requirements.

40.5.11 Review subcontractor/supplier reliability controls.

40.6 Design Maintainability

40.6.1 Identify the quantitative maintainability requirements specified in the hardware Development and Software Requirements Specifications; if applicable, compare preliminary predictions with specified requirements.

40.6.2 Review HWCI preventive maintenance schedules in terms of frequencies, durations, and compatibility with system schedules.

40.6.3 Review repair rate sources and prediction methods.

40.6.4 Review planned actions when predictions indicate that specified requirements will not be attained.

40.6.5 Review planned designs for accessibility, testability, and ease of maintenance characteristics (including provisions for automatic or operator-controlled recovery from failure/malfunctions) to determine consistency with specified requirements.

40.6.6 Determine if planned HWCI design indicates that parts, assemblies, and components will be so placed that there is sufficient space to use test probes, soldering irons, and other tools without difficulty and that they are placed so that structural members of units do not prevent access to them or their ease of removal.

40.6.7 Review provisions for diagnosing cause(s) of failure; means for localizing source to lowest replaceable element; adequacy and locations of planned test points; and planned system diagnostics that provide a means for isolating faults to and within the configuration item . This review shall encompass on-line diagnostics, off-line diagnostics, and proposed technical orders and/or commercial manuals.

40.6.8 Review for HWCIs the Design for Maintainability Checklist to insure that listed design principles shall lead to a mature maintainability design. Determine that contractor design engineers are using the checklist.

40.6.9 Evaluate for HWCIs the preliminary maintainability demonstration plan, including number of maintenance tasks that shall be accomplished; accept-reject criteria; general plans for introducing faults into the HWCI and personnel involved in the demonstration.

40.6.10 Review elements of maintainability program plan to determine that each task has been initiated towards achieving specified requirements.

40.6.11 Insure that consideration has been given to optimizing the system/item from a maintainability and maintenance viewpoint and that it is supportable within the maintenance concept as developed. Also, for HWCIs insure that a Repair Level Analysis (RLA) has been considered.

40.7 Human Factors

40.7.1 The contractor shall present evidence that substantiates the functional allocation decisions. The Review shall cover all operational and maintenance functions of the configuration item. In particular, ensure that the approach to be followed emphasizes the functional integrity of the man with the machine to accomplish a system operation.

40.7.2 Review design data, design descriptions and drawings on system operations, equipments, and facilities to insure that human performance requirements of the hardware Development and Software Requirements Specifications are met. Examples of the types of design information to be reviewed are:

a. Operating modes for each display station, and for each mode, the functions performed, the displays and control used, etc.

b. The exact format and content of each display, including data locations, spaces, abbreviations, the number of digits, all special symbols (Pictographic), alert mechanisms (e.g., flashing rates), etc.

c. The control and data entry devices and formats including keyboards, special function keys, cursor control, etc.

d. The format of all operator inputs, together with provisions for error detection and correction.

e. All status, error, and data printouts - including formats, headings, data units, abbreviations, spacings, columns, etc.

These should be presented in sufficient detail to allow contracting agency personnel to judge adequacy from a human usability standpoint, and design personnel to know what is required, and test personnel to prepare tests.

40.7.3 Make recommendations to update the System/Segment, or Software Requirements Specification and Interface Requirements Specification(s) in cases where requirements for human performance need to be more detailed.

40.7.4 Review man/machine functions to insure that man's capabilities are utilized and that his limitations are not exceeded.

40.8 System Safety

40.8.1 Review results of configuration item safety analyses, and quantitative hazard analyses (if applicable).

40.8.2 Review results of system and intra-system safety interfaces and trade-off studies affecting the configuration item.

40.8.3 Review safety requirements levied on subcontractors.

40.8.4 Review known special areas of safety, peculiar to the nature of the system (e.g., fuel handling, fire protection, high levels of radiated energy, high voltage protection, safety interlocks, etc.).

40.8.5 Review results of preliminary safety tests (if appropriate).

40.8.6 Generally review adequacy and completeness of configuration item from design safety viewpoint.

40.8.7 Review compliance of commercially available configuration items or configuration item components with system safety requirements and identify modifications to such equipment, if required.

40.9 Natural Environment

40.9.1 Review contractor's planned design approach toward meeting climatic conditions (operating and non-operating ranges for temperature, humidity, etc.) that are specified in the HWCI Development Specification.

40.9.2 Insure that the contractor clearly understands the effect of, and the interactions between, the natural aerospace environment and HWCI design. In cases where the effect and interactions are not known or are ambiguous, insure that studies are in progress or planned to make these determinations.

40.9.3 Current and forecast natural aerospace environment parameters may be needed for certain configuration items; e.g., display of airbase conditions in a command and control system, calculation of impact point for a missile, etc. Insure

compatibility between the configuration item design and appropriate meteorological communications by comparing characteristics of the source (teletype, facsimile, or data link) with that of the configuration item. Insure that arrangements or plans to obtain needed information have been made and that adequate display of natural environmental information shall be provided.

40.10 Equipment and Part Standardization

40.10.1 Equipment and Components:

a. Review current and planned contractor actions to determine that equipment or components for which standards or specifications exist shall be used whenever practical. (Standard item with NSN should have first preference).

b. Review specific trade-offs or modifications that may be required of existing designs if existing items are, or will be, incorporated in the HWCI.

c. Existing designs will be reviewed for use or non-use based on the potential impact on the overall program in the following areas:

(1) Performance

(2) Cost

(3) Time

(4) Weight

(5) Size

(6) Reliability

(7) Maintainability

(8) Supportability

(9) Producibility

d. Review HWCI design to identify areas where a practical design change would materially increase the number of standard items that could be incorporated.

e. Insure that Critical Item Specifications shall be prepared for hardware items identified as engineering or logistics critical.

40.10.2 Parts Standardization and Interchangeability:

a. Review procedures to determine if maximum practical use will be made of parts built to approved standards or specifications. The potential impact on the overall program is to be evaluated when a part built to approved standards and specifications cannot be used for any of the following reasons:

(1) Performance

(2) Weight

(3) Size

(4) Reliability/Mantainability/Availability

(5) Supportability

(6) Survivability (including nuclear)

b. Identify potential design changes that will permit a greater use of standard or preferred parts and evaluate the trade-offs.

c. Insure understanding of parts control program operations for selection and approval of parts in new design or major modifications.

d. Review status of the Program Parts Selection List.

e. Review status of all non-standard parts identified.

f. Review pending parts control actions that may cause program slippages, such as non-availability of tested parts.

40.10.3 Assignment of Official Nomenclature:

a. Insure understanding of procedure for obtaining assignment of nomenclature and approval of nameplates.

b. Determine that a nomenclature conference has been held and agreement has been reached with the contracting agency on the level of nomenclature; i.e., system, set, central, group, component, sub-assembly, unit, etc.

40.11 Value Engineering

40.11.1 Review the Contractor's in-house incentive Value Engineering Program, which may include but not be limited to the following:

a. Contractor's Value Engineering organization, policies and procedures.

b. Contractor's Value Engineering Training Program.

c. Potential Value Engineering projects, studies and VECPs.

d. Schedule of planned Value Engineering tasks/events.

e. Policies and procedures for subcontractor Value Engineering Programs.

40.12 Transportability

40.12.1 Review HWCI to determine if design meets contracts requirements governing size and weight to permit economical handling, loading, securing, transporting, and disassembly for shipment within existing capabilities of military and commercial carriers. Identify potential outsized and overweight items. Identify system/items defined as being hazardous. Ensure packaging afforded hazardous items complies with hazardous materials regulations.

40.12.2 Identify HWCIs requiring special temperature and humidity control or those possessing sensitive and shock susceptibility characteristics. Determine special transportation requirements and availability for use with these HWCIs.

40.12.3 Review Transportability Analysis to determine that transportation conditions have been evaluated and that these conditions are reflected in the design of protective, shipping, and handling devices. In addition to size and weight characteristics, determine that analysis includes provisions for temperature and humidity controls, minimization of sensitivity, susceptibility to shock, and transit damage.

40.13 Test

40.13.1 Review all changes to the System/Segment, HWCI Development, Software Requirements, and Interface Requirements Specifications subsequent to the established Allocated Baseline to determine whether Section 4.0 of all these specifications adequately reflects these changes.

40.13.2 Review information to be provided by the contractor regarding test concepts for Development Test and Evaluation (DT&E) testing (both informal and formal). Information shall include:

a. The organization and responsibilities of the group that will be responsible for test.

b. The management of his in-house development test effort provides for:

(1) Test Methods (plans/procedures)

(2) Test Reports

(3) Resolution of problems and errors

(4) Retest procedure

(5) Change control and configuration management

(6) Identification of any special test tools that are not deliverable under the contract.

c. The methodology to be used to meet quality assurance requirements/qualification requirements, including the test repeatability characteristics and approach to regression testing.

d. The progress/status of the test effort since the previous reporting milestone.

40.13.3 Review status of all negative or provisional entries such as "not applicable (N/A)" or "to be determined (TBD)" in Section 4.0 of the System/Segment, hardware Development, Software Requirements or Interface Requirements Specifications. Review all positive entries for technical adequacy. Insure that associated test documentation includes these changes.

40.13.4 Review interface test requirements specified in Section 4.0 of the hardware Development, Software Requirements, and Interface Requirements Specifications for compatibility, currency, technical adequacy, elimination of redundant test. Insure that all associated test documents reflect these interface requirements.

40.13.5 Insure that all test planning documentation has been updated to include new test support requirements and provisions for long-lead time support requirements.

40.13.6 Review contractor test data from prior testing to determine if such data negates the need for additional testing.

40.13.7 Examine all available breadboards, mock-ups, or devices which will be used in implementing the test program or which affect the test program, for program impact.

40.13.8 Review plans for software Unit testing to ensure that they:

a. Address Unit level sizing, timing, and accuracy requirements.

b. Present general and specific requirements that will be demonstrated by Unit testing.

c. Describe the required test-unique support software, hardware, and facilities and the interrelationship of these items.

d. Describe how, when, and from where the test-unique support items will be obtained.

e. Provide test schedules consistent with higher level plans.

40.13.9 Review plans for CSC integration testing to ensure that they:

a. Define the type of testing required for each level of the software structure above the unit level.

b. Present general and specific requirements that will be demonstrated by CSC integration testing.

c. Describe the required test-unique support software, hardware, and facilities and the interrelationship of these items.

d. Describe how, when, and from where the test-unique support items will be obtained.

e. Describe CSC integration test management, to include:

(1) Organization and responsibilities of the test team

(2) Control procedures to be applied during test

(3) Test reporting

(4) Review of CSC integration test results

(5) Generation of data to be used in CSC integration testing.

f. Provide test schedules consistent with higher level plans.

40.13.10 Review plans for formal CSCI testing to ensure that they:

a. Define the objective of each CSCI test, and relate the test to the software requirements being tested.

b. Relate formal CSCI tests to other test phases.

c. Describe support software, hardware, and facilities required for CSCI testing; and how, when, and from where they will be obtained.

d. Describe CSCI test roles and responsibilities.

e. Describe requirements for Government-provided software, hardware, facilities, data, and documentation.

f. Provide CSCI test schedules consistent with higher-level plans.

g. Identify software requirements that will be verified by each formal CSCI test.

40.14 Maintenance and Maintenance Data (HWCIs)

40.14.1 Describe System Maintenance concept for impact on design and SE. Review adequacy of maintenance plans. Coverage shall be provided for On Equipment (Organizational), Off Equipment - On Site (Intermediate), Off Equipment - Off Site (Depot) level maintenance of Government Furnished Equipment (GFE), and Contractor Furnished Equipment (CFE). (See Section 3, Definitions, para 3.12 for levels of maintenance.)

40.14.2 Determine degree of understanding of the background, purpose, requirements, and usage of Maintenance (failure) Data Collection and Historical/Status Records. (Ref Data Item titled, "Reliability and Maintainability Data Reporting and Feedback Failure Summary Reports").

40.14.3 Describe method of providing Maintenance, Failure, Reliability, Maintainability Data to contracting agency.

40.14.4 Describe how requirements are submitted to the contracting agency for Equipment Classification (EQ/CL) Codes (formerly Work Order Number Prefix/Suffix Codes) when this requirement exists.

40.14.5 Review plans for (and status of) Work Unit Coding of the equipment. Work Unit codes shall be available for documenting Maintenance Data commencing with configuration item/Subsystem Testing. (Ref. Data Item titled "Technical Orders" and the military specification on work unit coding).

40.15 Spares and Government Furnished Property (GFP).

40.15.1 Review logistics and provisioning planning to insure full understanding of scope of requirements in these areas and that a reasonable time-phased plan has been developed for accomplishment. Of specific concern are the areas of: provisioning requirements,

GFP usage, and spare parts, and support during installation, checkout, and test.

40.15.2 Review provisioning actions and identify existing or potential provisioning problems - logistic critical and long-lead time items are identified and evaluated against use of the interim release requirements.

40.15.3 Review plans for maximum screening and usage of GFP, and extent plans have been implemented.

40.15.4 Review progress toward determining and acquiring total installation, checkout, and test support requirements.

40.16 Packaging/SDPE (Special Design Protective Equipment)

40.16.1 Analyze all available specifications (System/Segment, HWCI Development, Software Requirements, Interface Requirements, and Critical Items) for packaging (Section 5) requirements for each product fabrication and material specification.

40.16.2 Evaluate user/operational support requirements and maintenance concepts for effect and influence on package design.

40.16.3 Establish that time phased plan for package design development is in consonance with the development of the equipment design.

40.16.4 Review planned and/or preliminary equipment designs for ease of packaging and simplicity of package design, and identify areas where a practical design change would materially decrease cost, weight, or volume of packaging required.

40.16.5 Review requirements for SDPE necessary to effectively support configuration item during transportation, handling and storage processes. Insure SDPE is categorized as a configuration item utilizing specifications conforming to the types and forms as prescribed in the contract. Review SDPE development/product specifications for adequacy of performance/interface requirements.

40.16.6 Determine initial package design baselines, concepts, parameters, constraints, etc., to the extent possible at this phase of the configuration item development process.

40.16.7 Insure previously developed and approved package design data for like or similar configuration items is being utilized.

40.16.8 Establish plans for trade studies to determine the most economical and desirable packaging design approach needed to satisfy the functional performance and logistic requirements.

40.16.9 Verify the adequacy of the prototype package design.

40.16.10 Review Section 5 of Specification to insure full understanding by contractor for contractor requirements. Identify package specification used for hazardous materials.

40.17 Technical Manuals

40.17.1 Review status of the "Technical Manual Publications Plan" to insure that all aspects of the plan have been considered to the extent that all concerned agencies are apprised of the technical manual coverage to be obtained under this procurement. The suitability of available commercial manuals and/or modifications thereto shall also be determined.

40.17.2 Review the availability of technical manuals for validation/verification during the latter phases of DT&E testing.

40.17.3 If a Guidance Conference was not accomplished or if open items resulted from it, then review as applicable provisions for accomplishing TO in-process reviews, validation, verification, prepublication, and postpublication reviews.

40.18 System Allocation Document

40.18.1 Review the Draft System Allocation Document for completeness and technical adequacy to extent completed.

40.18.2 The format shall provide the following minimum information:

a. Drawing Number
b. Issue
c. Number of Sheets
d. Location
e. Configuration Item Number
f. Title
g. Part Number
h. Serial Number
i. Specification Number
j. Equipment Nomenclature
k. Configuration Item Quantity
l. Assembly Drawing

40.19 Design Producibility and Manufacturing

40.19.1 The contractor shall demonstrate and present evidence that manufacturing engineering will be integrated into the design process.

a. The contractor shall provide evidence of performing producibility analyses on development hardware trading off design requirements against manufacturing risk, cost, production, volume, and existing capability/availability.

Evidence of such analyses may be in the contractor's own format but must conclusively demonstrate that in-depth analyses were performed by qualified organizations/individuals and the results of those analyses will be incorporated in the design.

b. Preliminary manufacturing engineering and production planning demonstrations shall address: material and component selection, preliminary production sequencing, methods and flow concepts, new processes, manufacturing risk, equipment and facility utilization for intended rates and volume, production in-process and acceptance test and inspection concepts. (Efforts to maximize productivity in the above areas should be demonstrated.)

c. Management systems to be utilized will insure that producibility and manufacturing considerations are integrated throughout the FSD effort.

40.19.2 The producibility and manufacturing concerns identified in the SRR and the SDR shall be updated and expanded to:

a. Provide evidence that concerns identified in the Manufacturing Feasibility Assessment and the Production Capability Estimate have been addressed and that resolutions are planned or have been performed.

b. Make recommendations including manufacturing technology efforts and provide a schedule of necessary actions to the program office to resolve open manufacturing concerns and reduce manufacturing risk.

40.20 Post Review Action

40.20.1 After completing the PDR, the contractor shall publish and distribute copies of Review minutes. The contracting agency officially acknowledges completion of a PDR as indicated in paragraph 4.2.4.

40.20.2 The accomplishment of the PDR shall be recorded on the configuration item Development Record by the contractor.

50. Critical Design Review

50.1 General. The CDR shall be conducted on each configuration item prior to fabrication/production/coding release to insure that the detail design solutions, as reflected in the Draft Hardware Product Specification, Software Detailed Design Document (SDDD), Data Base Design Document(s) (DBDD(s)), Interface Design Document(s) (IDD(s)), and engineering drawings satisfy requirements established by the hardware Development Specification and Software Top Level Design Document (STLDD). CDR shall be held after the Computer Software Operator's Manual (CSOM), Software User's Manual (SUM), Computer System Diagnostic Manual (CSDM), Software Programmer's Manual (SPM), and Firmware Support Manual (FSM) have been updated or newly released. For complex/large configuration items the CDR may be conducted on an incremental basis, i.e., progressive reviews are conducted versus a single CDR. The overall technical program risks associated with each configuration item shall also be reviewed on a technical (design and manufacturing), cost and schedule basis. For software, a technical understanding shall be reached on the validity and the degree of completeness of the SDDD, IDD(s), DBDD(s), STD, CRISD, SPM, and FSM, and preliminary versions of the CSOM, SUM, and CSDM.

50.1.1 Equipment/Facilities configuration items. The detail design as disclosed by the hardware Product Specification, dravings, schematics, mockups, etc., shall be reviewed against the HWCI Development Specification performance requirements. For other than facilities, the result of a successful CDR shall be the establishment of the design baseline for detailed fabrication/production planning i.e., the contractor is permitted to use the detail design as presented at CDR and reflected in the hardware Product Specification for planning for production and, if specifically authorized, for initial fabrication/production efforts.

50.1.2 Computer Software configuration items (CSCIs). The CDR for a CSCI shall be a formal technical review of the CSCI detail design, including data base and interfaces. The CDR is normally accomplished for the purpose of establishing integrity of computer software design at the level of a Unit's logical design prior to coding and testing. CDR may be accomplished at a single review meeting or in increments during the development process corresponding to periods at which components or groups of components reach the completion of logical design. The primary product of the CDR is a formal identification of specific software documentation which will be released for coding and testing. By mutual agreement between the contractor and the contracting agency, CDRs may be scheduled concurrently for two or more CSCIs.

50.1.2.1 Since computer software development is an iterative process, the completion of a CDR for a CSCI is not necessarily sufficient for maintaining adequate visibility into the remaining

development effort through testing.

50.1.2.2 Additional In-Progress Reviews may be scheduled post-CDR which address:

a. Response to outstanding action items

b. Modifications to design necessitated by approved ECPs or design/program errors

c. Updating sizing and timing data

d. Updated design information, as applicable

e. Results obtained during in-house testing, including problems encountered and solutions implemented or proposed.

50.2 Items to be Reviewed. The contractor shall present the following for review by the contracting agency:

50.2.1 HWCIs

a. Adequacy of the detail design reflected in the draft hardware Product Specification in satisfying the requirements of the HWCI Development Specification for the item being reviewed.

b. Detail engineering drawings for the HWCI including schematic diagrams.

c. Adequacy of the detailed design in the following areas:

(1) Electrical design

(2) Mechanical design

(3) Environmental control and thermal aspects

(4) Electromagnetic compatibility

(5) Power generation and grounding

(6) Electrical and mechanical interface compatibility

(7) Mass properties

(8) Reliability/Maintainability/Availability

(9) System Safety Engineering

(10) Security Engineering

(11) Survivability/Vulnerability (including nuclear)

(12) Producibility and Manufacturing

(13) Transportability, Packaging and handling

(14) Human Engineering and Biomedical Requirements (including Life Support and Crew Station Requirements)

(15) Standardization

(16) Design versus Logistics Trade-offs

d. Interface control drawings

e. Mock-ups, breadboards, and/or prototype hardware

f. Design analysis and test data

g. System Allocation Document for HWCI inclusion at each scheduled location.

h. Initial Manufacturing Readiness (for example, manufacturing engineering, tooling demonstrations, development and proofing of new materials, processes, methods, tooling, test equipment, procedures, reduction of manufacturing risks to acceptable levels).

i. Preliminary VECPs and/or formal VECPs

j. Life cycle costs

k. Detail design information on all firmware to be provided with the system.

l. Verify corrosion prevention/control considerations to insure materials have been chosen that will be compatible with operating environment.

m. Findings/Status of Quality Assurance Program

50.2.2 CSCIs.

a. Software Detailed Design, Data Base Design, and Interface Design Document(s). In cases where the CDR is conducted in increments, complete documents to support that increment shall be available.

b. Supporting documentation describing results of analyses, testing, etc., as mutually agreed by the contracting agency and the contractor.

c. System Allocation Document for CSCI inclusion at each scheduled location.

d. Computer Resources Integrated Support Document.

e. Software Programmer's Manual

f. Firmware Support Manual

g. Progress on activities required by CSCI PDR (para 40.2.2).

h. Updated operation and support documents (CSOM, SUM, CSDM).

i. Schedules for remaining milestones.

j. Updates since the last review to all previously delivered software related CDRL items.

50.2.3 Support Equipment (SE):

a. Review requirements (paragraphs 50.2.1 and 50.2.2) for SE.

b. Verify maximum considerations GFE SE

c. Identify existing or potential SE provisioning problems

d. Determine qualitative and quantitative adequacy of provisioning drawings and data

e. Review reliability of SE

f. Review logistic support requirements for SE items

g. Review calibration requirements

h. Review documentation for SE.

50.3 Detailed Evaluation of Electrical, Mechanical, and Logical Designs.

50.3.1 HWCIs. Detailed block diagrams, schematics, and logic diagrams shall be compared with interface control drawings to determine system compatibility. Analytical and available test data shall be reviewed to insure the hardware Development Specification has been satisfied.

50.3.1.1 The contractor shall provide information on firmware which is included in commercially available equipment or to be included in equipment developed under the contract. Firmware in this context includes the microprocessor and associated sequence of micro-instructions necessary to perform the allocated tasks. As a minimum, the information presented during CDR shall provide

descriptions and status for the following:

a. Detailed logic flow diagrams

b. Processing algorithms

c. Circuit diagrams

d. Clock and timing data (e.g., timing charts for micro-instructions)

e. Memory (e.g., type (RAM, PROM), word length, size (total and spare capacity))

f. Micro-instruction list and format

g. Device functional instruction set obtained by implementation of firmware.

h. Input/output data width (i.e., number of bits for data and control.)

i. Self-test (diagnostics) within firmware.

j. Support software for firmware development:

(1) Resident assembler

(2) Loader

(3) Debugging routines

(4) Executive (monitor)

(5) Non-resident diagnostics

(6) Cross assembler and higher level language on host computer

(7) Instruction simulator

50.3.2 CSCIs. The contractor shall present the detailed design (including rationale) of the CSCI to include:

a. The assignment of CSCI requirements to specific Lower-Level Computer Software Components (LLCSCs) and Units, the criteria and design rules used to accomplish this assignment, and the traceability of Unit and LLCSC designs to satisfy CSCI requirements, with emphasis on the necessity and sufficiency of the Units for implementing TLCSC design requirements.

b. The overall information flow between software Units, the method(s) by which each Unit gains control, and the sequencing of Units relative to each other.

c. The design details of the CSCI, TLCSCs, LLCSCs, and Units including data definitions, timing and sizing, data and storage requirements and allocations.

d. The detailed design characteristics of all interfaces, including their data source, destination, interface name and interrelationships; and, if applicable, the design for direct memory access. The contractor shall also give an overview of the key design issues of the interface software design, and indicate whether data flow formats are fixed or subject to extensive dynamic changes.

e. The detailed characteristics of the data base. Data base structure and detailed design, including all files, records, fields, and items. Access rules, how file sharing will be controlled, procedures for data base recovery/regeneration from a system failure, rules for data base manipulation, rules for maintaining file integrity, rules for usage reporting, and rules governing the types and depth of access shall be defined. Data management rules and algorithms for implementing them shall be described. Details of the language required by the user to access the data base shall also be described.

50.4 Electromagnetic Compatibility:

a. Review contractor EMC design of all HWCIs. Determine compliance with requirements of the Electromagnetic Compatibility Plan and HWCI specifications.

b. Review system EMC including effects on the electromagnetic environment (inter-system EMC) and intra-system EMC. Determine acceptability of EMC design and progress toward meeting contractual EMC requirements.

c. Review EMC test plans. Determine adequacy to confirm EMC design characteristics of the system/HWCI/subsystem.

50.5 Design Reliability:

50.5.1 Review the most recent predictions of hardware and software reliability and compare against requirements specified in hardware Development Specification and Software Requirements Specification. For hardware, predictions are substantiated by review of parts application stress data.

50.5.2 Review applications of parts or configuration items with minimum life, or those which require special consideration to

insure their effect on system performance is minimized.

50.5.3 Review completed Reliability Design Review Checklist to insure principles have been satisfactorily reflected in the configuration item design.

50.5.4 Review applications of redundant configuration item elements or components to establish that expectations have materialized since the PDR.

50.5.5 Review detailed HWCI reliability demonstration plan for compatibility with specified test requirements. The number of test articles, schedules, locations, test conditions, and personnel involved are reviewed to insure a mutual understanding of the plan and to provide overall planning information to activities concerned.

50.5.6 Review the failure data reporting procedures and methods for determination of failure trends.

50.5.7 Review the thermal analysis of components, printed circuit cards, modules, etc. Determine if these data are used in performing the detailed reliability stress predictions.

50.5.8 Review on-line diagnostic programs, off-line diagnostic programs, support equipment, and preliminary technical orders (and/or commercial manuals) for compliance with the system maintenance concept and specification requirements.

50.5.9 Review software reliability prediction model and its updates based upon test data and refined predictions of component usage rates and complexity factors.

50.6 Design Maintainability

50.6.1 Review the most recent predictions of quantitative maintainability and compare these against requirements specified in the HWCI Development Specification and Software Requirements Specification.

50.6.2 Review preventive maintenance frequencies and durations for compatibility with overall system requirements and planning criteria.

50.6.3 Identify unique maintenance procedures required for the configuration item during operational use and evaluate their total effects on system maintenance concepts. Assure that system is optimized from a maintenance and maintainability viewpoint and conforms with the planned maintenance concept. This shall include a review of provisions for automatic, semi-automatic, and manual recovery from hardware/software failures and malfunctions.

50.6.4 Identify design-for-maintainability criteria provided by the checklist in the design detail to insure that criteria have, in fact been incorporated.

50.6.5 Determine if parts, assemblies, and other items are so placed that there is sufficient space to use test probes, soldering irons, and other tools without difficulty and that they are placed so that structural members of units do not prevent access to them or their ease of removal.

50.6.6 Review detailed maintainability demonstration plan for compatibility with specified test requirements. Supplemental information is provided and reviewed to insure a mutual understanding of the plan and to provide overall planning information to activities concerned.

50.7 Human Factors

50.7.1 Review detail design presented on drawings, schematics, mockups, or actual hardware to determine that it meets human performance requirements of the HWCI Development Specification and Software Requirements Specification, Interface Requirements Specification(s), and accepted human engineering practices.

50.7.2 Demonstrate by checklist or other formal means the adequacy of design for human performance.

50.7.3 Review each facet of design for man/machine compatibility. Review time/cost/effectiveness considerations and forced trade-offs of human engineering design.

50.7.4 Evaluate the following human engineering/biomedical design factors:

a. Operator controls

b. Operator displays

c. Maintenance features

d. Anthropometry

e. Safety features and emergency equipment

f. Work space layout

g. Internal environmental conditions (noise, lighting, ventilation, etc.)

h. Training equipment

i. Personnel accommodations

50.8 System Safety

50.8.1 Review configuration item detail design for compliance to safety design requirements.

50.8.2 Review acceptance test requirements to insure adequate safety requirements are reflected therein.

50.8.3 Evaluate adequacy of detailed design for safety and protective equipment/devices.

50.8.4 Review configuration item operational maintenance safety analyses and procedures.

50.9 Natural Environment

50.9.1 Review detail design to determine that it meets natural environment requirements of the hardware Development Specification.

50.9.2 Insure that studies have been accomplished concerning effects of the natural environment on, or interactions with, the HWCI. Studies which have been in progress shall be complete at this time.

50.9.3 Determine whether arrangements have been made to obtain current and/or forecast natural environment information, when needed for certain HWCIs. Assure compatibility of HWCI and source of information by comparing electrical characteristics and formats for the source and the HWCI.

50.10 Equipment and Parts Standardization.

50.10.1 Equipment and Components. Determine that every reasonable action has been taken to fulfill the standardization requirements for use of standard items (standard item with NSN should be first preference) and to obtain approval for use of non-standard or non-preferred items. Accordingly, the following criteria shall be evaluated:

a. Data sources that were reviewed.

b. Factors that were considered in the decision to reject known similar, existing designs.

c. Factors that were considered in decisions to accept any existing designs which were incorporated, and the trade-offs, if any, that had to be made.

50.10.2 Parts

a. Determine whether there are any outstanding non-standard or

non-preferred parts approval requests and action necessary for approval or disapproval. (Status of parts control program operations).

b. Identify non-standard-non-preferred parts approval problems and status of actions toward resolving the problems.

c. Review potential fabrication/production line delays due to non-availability of standard or preferred parts. In such cases, determine whether it is planned to request use of parts which may be replaced by standard items during subsequent support repair cycles. Assure that appropriate documentation makes note of these items and that standard replacement items shall be provisioned for support and used for repair.

d. Require certification that maximum practical interchangeability of parts exists among components, assemblies, and HWCIs. Reservations concerning interchangeability are identified, particularly for hardness critical items.

e. Sample preliminary drawings and cross check to insure that parts indicated on the drawings are compatible with the Program Parts Selection List.

50.10.3 Assignment of Official Nomenclature.

a. Determine whether official nomenclature and approval of nameplates have been obtained to extent practical.

b. Determine whether DD Form 61, Request for Nomenclature, has been processed to the agreed level of indenture.

c. Insure that approved nomenclature has been reflected in the Development and Product Specifications.

d. Identify problems associated with nomenclature requests (DD-61s) together with status of actions towards resolving the problems.

e. Insure that a software inventory numbering system has been agreed to and implemented to the CSCI level.

50.11 Value Engineering (VE)

50.11.1 Review status of all VECPs presented per the terms of the contract.

50.11.2 Review any new areas of potential Value Engineering considered profitable to challenge.

50.11.3 If required by contract (funded VE program), review the actual Value Engineering accomplishments against the planned VE program.

50.12 Transportability

50.12.1 Review transportability evaluations accomplished for those items identified as outsized, overweight, sensitive, and/or requiring special temperature and humidity controls.

50.12.2 Review actions taken as a result of the above evaluation to insure adequate facilities and military or commercial transporting equipment are available to support system requirements during Production and Deployment Phases.

50.12.3 Review design of special materials handling equipment, when required, and action taken to acquire equipment.

50.12.4 Insure DOD Certificates of Essentiality for movement of equipment have been obtained for equipment exceeding limitations of criteria established in contract requirements.

50.12.5 Insure transportability approval has been annotated on design documents and shall remain as long as no design changes are made that modify significant transportability parameters.

50.12.6 Identify equipment to be test loaded for air transportability of material in Military Aircraft.

50.13 Test

50.13.1 Review updating changes to all specifications subsequent to the PDR, to determine whether Section 4.0 of the specifications adequately reflects these changes.

50.13.2 Review all available test documentation for currency, technical adequacy, and compatibility with Section 4.0 of all Specification requirements.

50.13.3 For any development model, prototype, etc., on which testing may have been performed, examine test results for design compliance with hardware Development, Software Requirements, and Interface Requirements Specification requirements.

50.13.4 Review quality assurance provisions/qualification requirements in HWCI Product, Software Requirements, or Interface Requirements Specifications for completeness and technical adequacy. Section 4.0 of these specifications shall include the minimum requirements that the item, materiel, or process must meet to be acceptable.

50.13.5 Review all test documentation required to support test

requirements of Section 4.0 of HWCI Product Specifications for compatibility, technical adequacy, and completeness.

50.13.6 Inspect any breadboards, mockups, or prototype hardware available for test program implications.

50.13.7 Review Software Test Descriptions to ensure they are consistent with the Software Test Plan and they thoroughly identify necessary parameters and prerequisites to enable execution of each planned software test and monitoring of test results. As a minimum, test descriptions shall identify the following for each test:

a. Required preset hardware and software conditions and the necessary input data, including the source for all data.

b. Criteria for evaluating test results.

c. Prerequisite conditions to be established or set prior to test execution.

d. Expected or predicted test results.

50.14 Maintenance and Maintenance Data

50.14.1 Review adequacy of maintenance plans.

50.14.2 Review status of unresolved maintenance and maintenance data problems since the PDR.

50.14.3 Review status of compliance with Data Item titled "Reliability, Maintainability Data Reporting and Feedback Failure Summary Reports."

50.15 Spare Parts and Government Furnished Property (GFP).

50.15.1 Review provisioning planning through normal logistics channels and Administrative Contracting Officer (ACO) representative (Industrial Specialist) to insure its compatibility (content and time phasing) with contractual requirements (data and SOW items). The end objective is to provision by a method which shall insure system supportability at operational date of the first site. Also accomplish the following:

a. Insure contractor understanding of contractual requirements, including time phasing, instructions from logistics support agencies, interim release authority and procedure, and responsibility to deliver spare/repair parts by need date.

b. Determine that scheduled provisioning actions, such as, guidance meetings, interim release and screening, are being accomplished adequately and on time.

c. Identify existing or potential provisioning problems.

50.15.2 Determine quantitative and qualitative adequacy of provisioning drawings and data. Verify that Logistics Critical items are listed for consideration and that adequate procedures exist for reflecting design change information in provisioning documentation and Technical Orders.

50.15.3 Insure support requirements have been determined for installation, checkout, and test for approval by contracting agency. Insure screening has been accomplished and results are included into support requirements lists.

50.15.4 Determine that adequate storage space requirements have been programmed for on-site handling of Installation and Checkout (I&C), test support material, and a scheme has been developed for "down streaming" and joint use of insurance (high cost) or catastrophic failure support items.

50.15.5 Assure that Acquisition Method Coding (AMC) is considered.

50.16 Packaging/SDPE

50.16.1 Review proposed package design to insure that adequate protection to the HWCI, and the media on which the CSCI is recorded, is provided against natural and induced environments/hazards to which the equipment will be subjected throughout its life cycle, and to insure compliance with contractual requirements. Such analysis shall include, but not be limited to, the following:

a. Methods of preservation

b. Physical/mechanical/shock protection including cushioning media, shock mounting and isolation features, load factors, support pads, cushioning devices, blocking and bracing, etc.

c. Mounting facilities and securing/hold-down provisions

d. Interior and exterior container designs.

e. Handling provisions and compatibility with aircraft materials handling system (463L)

f. Container marking.

g. Consideration and identification of dangerous/hazardous commodities

50.16.2 Review design of SDPE HWCI to determine if a category I container is required. The analysis of the proposed container or handling, shipping equivalent shall encompass as a minimum:

a. Location and type of internal mounting or attaching provisions

b. Vibration - shock isolation features, based on the pre-determined fragility rating (or other constraint of the item to be shipped.)

c. Service items (indicators, relief valves, etc.)

d. Environmental control features

e. External handling, stacking and tie-down provisions with stress ratings

f. Dimensional and weight data (gross and net)

g. Bill-of-material

h. Marking provisions including the center-of-gravity location

i. For wheeled SDPE (self-powered or tractor/trailer) the overall length, width, and height with mounted item, turning radius, mobility, number of axles, unit contact load, number of tires, etc.

j. Position and travel of adjustable wheels, titling, or other adjustments to facilitate loading.

50.16.3 Review the results of trade studies, engineering analyses, etc., to substantiate selected package/SDPE design approach, choice of materials, handling provisions, environmental features, etc.

50.16.4 Insure that package/SDPE design provides reasonable balance between cost and desired performance.

50.16.5 Review all preproduction test results of the prototype package design to insure that the HWCI is afforded the proper degree of protection.

50.16.6 Review Section 5, Packaging, of the HWCI Product Specification for correct format, accuracy and technical adequacy.

50.16.7 Review contractor procedures to assure that the requirements of Section 5, Preparation for Delivery of the approved HWCI Product Specification, will be incorporated into the package design data for provisioned spares.

50.17 System Allocation Document

50.17.1 Review maintenance of the System Allocation Document since PDR.

50.17.2 Insure plans are initiated for configuration item re-allocations that may be necessary due to actions occurring prior to, or during, CDR.

50.18 Design Producibility and Manufacturing

50.18.1 Review the status of all producibility (and productivity) efforts for cost and schedule considerations.

50.18.2 Review the status of efforts to resolve manufacturing concerns identified in previous technical reviews and their cost and schedule impact to the production program.

50.18.3 Review the status of Manufacturing Technology programs and other previously recommended actions to reduce cost, manufacturing risk and industrial base concerns.

50.18.4 Identify open manufacturing concerns that require additional direction/effort to minimize risk to the production program.

50.18.5 Review the status of manufacturing engineering efforts, tooling and test equipment demonstrations, proofing of new materials, processes, methods, and special tooling/test equipment.

50.18.6 Review the intended manufacturing management system and organization for the production program in order to show how their efforts will effect a smooth transition into production.

50.19 Post Review Action

50.19.1 After completing the CDR, the contractor shall publish and distribute copies of Review minutes. The contracting agency officially acknowledges completion of a CDR as indicated in paragraph 4.2.4.

50.19.2 The accomplishment of the CDR shall be recorded on the configuration item Development Record by the contractor.

60. Test Readiness Review (TRR).

60.1 General. The TRR shall be a formal review of the contractor's readiness to begin formal CSCI testing. It is conducted after software test procedures are available and CSC integration testing is complete. The purpose of TRR is for the contracting agency to determine whether the contractor is in fact ready to begin CSCI testing. A technical understanding shall be reached on the informal test results, and on the validity and the degree of completeness of the Computer System Operator's Manual (CSOM), Software User's Manual (SUM), and Computer System Diagnostic Manual (CSDM).

60.2 Items to be reviewed. The contractor shall present the following for review:

60.2.1 Requirements changes. Any changes to the Software Requirements Specification or Interface Requirements Specification(s) that have been approved since SSR, and which impact CSCI testing.

60.2.2 Design changes. Any changes to the Software Top-Level Design Document, Software Detailed Design Document, Data Base Design Document(s), or Interface Design Document(s) that have been made since PDR and CDR, and which impact CSCI testing.

60.2.3 Software test plans and descriptions. Any changes to approved Software Test Plans and Software Test Descriptions.

60.2.4 Software test procedures. Test procedures to be used in conducting CSCI testing, including retest procedures for test anomalies and corrections.

60.2.5 CSC integration test cases, procedures, and results. CSC integration test cases and procedures used in conducting informal CSC integration tests and the test results.

60.2.6 Software test resources. Status of the development facility hardware, Government Furnished Software (GFS), test personnel, and supporting test software and materials, including software test tool qualification and review of the traceability between requirements and their associated tests.

60.2.7 Test limitations. Identification of all software test limitations.

60.2.8 Software problems. Summary of software problem status including all known discrepancies of the CSCI and test support software.

60.2.9 Schedules. Schedules for remaining milestones.

60.2.10 Documentation Updates. Updates to all evolving and previously delivered CDRL items (e.g., CSOM, SUM, CSDM).

60.3 Post Review Action.

60.3.1 After completing the TRR, the contractor shall publish and distribute copies of Review Minutes. The contracting agency officially acknowledges completion of a TRR as indicated in paragraph 4.2.4.

60.3.2 The accomplishment of the TRR shall be recorded on the configuration item Development Record by the contractor.

70. Functional Configuration Audit.

70.1 General. The objective of the Functional Configuration Audit (FCA) shall be to verify that the configuration item's actual performance complies with its Hardware Development or Software Requirements and Interface Requirements Specifications. Test data shall be reviewed to verify that the hardware or computer software performs as required by its functional/allocated configuration identification. For configuration items developed at Government expense, an FCA shall be a prerequisite to acceptance of the configuration item. For software, a technical understanding shall be reached on the validity and the degree of completeness of the Software Test Reports, and as appropriate, Computer System Operator's Manual (CSOM), Software User's Manual (SUM), and Computer System Diagnostic Manual (CSDM).

70.1.1 The FCA for a complex configuration item may be conducted on a progressive basis, when so specified by the contracting agency, throughout the configuration item's development and culminates at the completion of the qualification testing of the configuration item with a review of all discrepancies at the final FCA. The FCA shall be conducted on that configuration of the configuration item which is representative (prototype or preproduction) of the configuration to be released for production of the operational inventory quantities. When a prototype or preproduction article is not produced, the FCA shall be conducted on a first production article. For cases where configuration item qualification can only be determined through integrated system testing, FCA's for such configuration items will not be considered complete until completion of such integrated testing.

70.1.2 Recommendations of configuration item acceptance or non-acceptance to the local contract management agency are based upon and governed by procedures and requirements outlined in subsequent paragraphs.

70.2 Contract Requirements

70.2.1 The schedules for the FCA shall be recorded on the configuration item development record by the contractor. A configuration item cannot be audited without the contracting agency authentication of the functional and allocated baseline. In addition, the contractor shall submit the final draft Product Specification for the configuration item to be audited to the contracting agency for review prior to FCA.

70.3 Contractor Responsibility

70.3.1 Prior to the FCA date (for configuration items to be audited), the contractor shall provide the following information to the contracting agency (this information shall be provided in addition to the general requirements of Section 4.):

a. Contractor representation (the test manager should be in attendance).

b. Identification of items to be audited:

(1) Nomenclature

(2) Specification identification number

(3) Configuration Item number

(4) Current listing of all deviations/waivers against the configuration item, either requested of, or approved by the contracting agency.

(5) Status of Test Programs to test configured items with automatic test equipment (when applicable).

70.4 Procedures and Requirements

70.4.1 The contractor's test procedures and results shall be reviewed for compliance with specification requirements.

70.4.2 The following testing information shall be available for the FCA team.

a. Test plans, specifications, descriptions, procedures, and reports for the configuration item.

b. A complete list of successfully accomplished functional tests during which pre-acceptance data was recorded.

c. A complete list of successful functional tests if detailed test data are not recorded.

d. A complete list of functional tests required by the specification but not yet performed. (To be performed as a system or subsystem test).

e. Preproduction and production test results

70.4.3 Testing accomplished with the approved test procedures and validated data (witnessed) shall be sufficient to insure configuration item performance as set forth in the specification Section 3 and meet the quality assurance provisions/qualification requirements contained in the specification Section 4.

70.4.4 For those performance parameters which cannot completely be verified during testing, adequate analysis or simulations shall have been accomplished. The results of the analysis or simulations will be sufficient to insure configuration item performance as outlined in the specification.

70.4.5 Test reports, procedures, and data used by the FCA team shall be made a matter of record in the FCA minutes.

70.4.6 A list of the contractor's internal documentation (drawings) of the configuration item shall be revieved to insure that the contractor has documented the physical configuration of the configuration item for which the test data are verified.

70.4.7 Drawings of HWCI parts which are to be provisioned should be selectively sampled to assure that test data essential to manufacturing are included on, or furnished with, the drawings.

70.4.8 Configuration items which fail to pass quality assurance test provisions/qualification requirements are to be analyzed as to the cause of failure to pass. Appropriate corrections shall be made before a configuration item is subjected to a requalification.

70.4.9 A checklist shall be developed which identifies documentation and hardware and computer software to be available and tasks to be accomplished at the FCA for the configuration item. See Pre-FCA checksheet.

70.4.10 Retests or additional tests shall be performed to assure compliance with paragraph 70.4.3.

70.4.11 Acknowledge accomplishment of partial completion of the FCA for those configuration items whose qualification is contingent upon completion of integrated systems testing.

70.4.12 For CSCIs the following additional requirements shall apply:

a. The contractor shall provide the FCA team with a briefing for each CSCI being audited and shall delineate the test results and findings for each CSCI. As a minimum, the discussion shall include CSCI requirements that were not met, including a proposed solution to each item, an account of the ECPs incorporated and tested as well as proposed, and a general presentation of the entire CSCI test effort delineating problem areas as well as accomplishments.

b. An audit of the formal test plans/descriptions/procedures shall be made and compared against the official test data. The results shall be checked for completeness and accuracy. Deficiencies shall be documented and made a part of the FCA minutes. Completion dates for all discrepancies shall be clearly established and documented.

c. An audit of the Software Test Reports shall be performed to validate that the reports are accurate and completely describe the CSCI tests.

d. All ECPs that have been approved shall be reviewed to ensure that they have been technically incorporated and verified.

e. All updates to previously delivered documents shall be reviewed to ensure accuracy and consistency throughout the documentation set.

f. Preliminary and Critical Design Review minutes shall be examined to ensure that all findings have been incorporated and completed.

g. The interface requirements and the testing of these requirements shall be reviewed for CSCIs.

h. Review data base characteristics, storage allocation data and timing, and sequencing characteristics for compliance with specified requirements.

70.5 Post Audit Actions

70.5.1 After completion of the FCA, the contractor shall publish and distribute copies of FCA minutes. The contracting agency officially acknowledges completion of the FCA as indicated in paragraph 4.2.4.

70.5.2 The accomplishment of the FCA shall be recorded on the configuration item Development Record by the contractor.

80. Physical Configuration Audit (PCA)

80.1 General. The Physical Configuration Audit (PCA) shall be the formal examination of the as-built version of a configuration item against its design documentation in order to establish the product baseline. After successful completion of the audit, all subsequent changes are processed by engineering change action. The PCA also determines that the acceptance testing requirements prescribed by the documentation is adequate for acceptance of production units of a configuration item by quality assurance activities. The PCA includes a detailed audit of engineering drawings, specifications, technical data and tests utilized in production of HWCIs and a detailed audit of design documentation, listings, and manuals for CSCIs. The review shall include an audit of the released engineering documentation and quality control records to make sure the as-built or as-coded configuration is reflected by this documentation. For software, the Software Product Specification and Version Description Document shall be a part of the PCA review.

80.1.1 The PCA shall be conducted on the first article of configuration items and those that are a reprocurement of a configuration item already in the inventory shall be identified and selected jointly by the contracting agency and the contractor. A PCA shall be conducted on the first configuration item to be delivered by a new contractor even though PCA was previously accomplished on the first article delivered by a different contractor.

80.1.2 Formal approval by the contracting agency of the configuration item Product specification, and the satisfactory completion of a PCA results in establishment of the product baseline.

80.1.3 Recommendations of configuration item acceptance or nonacceptance to the responsible contract adminstration office (CAO) are based upon and governed by procedures and requirements outlined in subsequent paragraphs.

80.1.4 A final review shall be made of all operation and support documents (i.e., Computer System Operator's Manual (CSOM), Software User's Manual (SUM), Computer System Diagnostic Manual (CSDM), Software Programmer's Manual (SPM), Firmware Support Manual (FSM)) to check format, completeness, and conformance with applicable data item descriptions.

80.2 Contract Requirements

80.2.1 The schedules for the PCA shall be recorded on the configuration item Development Record by the contractor. A current set of listings shall be provided for each CSCI being audited. The contractor shall submit the final draft of the

product specification for the configuration item to be audited to the contracting agency for review prior to PCA.

80.3 Contractor Responsibility

80.3.1 The contractor shall provide the following information to the contracting agency (this information shall be provided in accordance with the general instructions of Section 4 and the contractual requirements):

a. Contractor representation (the test manager should be in attendance).

b. Identification of items to be accepted by:

(1) Nomenclature

(2) Specification Identification Number

(3) Configuration item Identifiers

(4) Serial Numbers

(5) Drawing and Part Numbers

(6) Identification Numbers

(7) Code Identification Numbers

(8) Software inventory numbering system

c. A list delineating all deviations/waivers against the configuration item either requested or contracting agency approved.

80.3.2 The PCA cannot be performed unless data pertinent to the configuration item being audited is provided to the PCA team at time of the audit. The contractor shall compile and make this information available for ready reference. Required information shall include:

a. Configuration item product specification.

b. A list delineating both approved and outstanding changes against the configuration item.

c. Complete shortage list.

d. Acceptance test procedures and associated test data.

e. Engineering drawing index including revision letters.

f. Operating, maintenance, and illustrated parts breakdown manuals.

g. Proposed DD Form 250, "Material Inspection and Receiving Report".

h. Approved nomenclature and nameplates.

i. Software Programmer's Manuals (SPMs), Software User's Manuals (SUMs) Computer System Operator's Manual (CSOM), Computer System Diagnostic Manual (CSDM), and Firmware Support Manual (FSM).

j. Software Version Description Document.

k. FCA minutes for each configuration item.

l. Findings/Status of Quality Assurance Programs.

80.3.3 The contractor shall assemble and make available to the PCA team at time of audit all data describing the item configuration. Item configuration data shall include:

a. Current approved issue of hardware development specification, Software Requirements Specification, and Interface Requirements Specification(s) to include approved specification change notices and approved deviations/waivers.

b. Identification of all changes actually made during test.

c. Identification of all required changes not completed.

d. All approved drawings and documents by the top drawing number as identified in the configuration item product specification. All drawings shall be of the category and form specified in the contract.

e. Manufacturing instruction sheets for HWCIs identified by the contracting agency.

80.3.4 The contractor shall identify any difference between the physical configurations of the selected production unit and the Development Unit(s) used for the FCA and shall certify or demonstrate to the Government that these differences do not degrade the functional characteristics of the selected units.

80.4 PCA Procedures and Requirements

80.4.1 Drawing and Manufacturing Instruction Sheet Review Instructions:

a. A representative number of drawings and associated manufacturing instruction sheets for each item of hardware, identified by the contracting agency Co-Chairperson, shall be revieved to determine their accuracy and insure that they include the authorized changes reflected in the engineering drawings and the hardware. Unless otherwise directed by the contracting agency Co-Chairperson, inspection of drawings and associated manufacturing instruction sheets may be accomplished on a valid sampling basis. The purpose of this review is to insure the manufacturing instruction sheets accurately reflect all design details contained in the drawings. Since the hardware is built in accordance with the manufacturing instruction sheets, any discrepancies between the instruction sheets and the design details and changes in the drawings will also be reflected in the hardware.

b. The following minimum information shall be recorded for each drawing reviewed:

(1) Drawing number/title (include revision letter)

(2) Date of drawing approval

(3) List of manufacturing instruction sheets (numbers with change letter/titles and date of approval) associated with this drawing.

(4) Discrepancies/comments

(5) Select a sample of part numbers reflected on the drawing. Check to insure compatibility with the Program Parts Selection List, and examine the HWCI to insure that the proper parts are actually installed.

c. As a minimum, the following inspections shall be accomplished for each drawing and associated manufacturing instruction sheets:

(1) Drawing number identified on manufacturing instruction sheet should match latest released drawing.

(2) List of materials on manufacturing instruction sheets should match materials identified on the drawing.

(3) All special instructions called on the drawing should be on the manufacturing instruction sheets.

(4) All dimensions, tolerances, finishes, etc., called out on the drawing should be identified on the manufacturing instruction sheets.

(5) All special processes called out on the drawing should be identified on the manufacturing instruction sheets.

(6) Nomenclature descriptions, part numbers and serial number markings called out on the drawing should be identified on the manufacturing instruction sheets.

(7) Review drawings and associated manufacturing instruction sheets to ascertain that all approved changes have been incorporated into the configuration item.

(8) Check release record to insure all drawings revieved are identified.

(9) Record the number of any drawings containing more than five outstanding changes attached to the drawing.

(10) Check the drawings of a major assembly/black box of the hardware configuration item for continuity from top drawing down to piece-part drawing.

80.4.2 Review of all records of baseline configuration for the HWCI by direct comparison with contractor's engineering release system and change control procedures to establish that the configuration being produced does accurately reflect released engineering data. This includes interim releases of spares provisioned prior to PCA to ensure delivery of currently configured spares.

80.4.3 Audit of contractor's engineering release and change control system to ascertain that they are adequate to properly control the processing and formal release of engineering changes. The minimum needs and capabilities set forth below are required of his engineering release records system. The contractor's formats, systems, and procedures are to be used. Information in addition to the basic requirements is to be considered part of the contractor's internal system.*

80.4.3.1 As a minimum, the following information shall be contained on one release record supplied by the contractor, subcontractor, or vendor for each drawing number, if applicable:

a. Serial numbers, top drawing number, specification number;

b. Drawing number, title, code number, number of sheets, date

---

* Contract Administration Office (CAO) Quality Assurance Representative (QAR) records can be revieved for purpose of determining the contractor's present and most recent past performance.

of release, change letter, date of change letter release, engineering change order (ECO) number.

80.4.3.2 The contractor's release function and documentation will be capable of determining:

a. The composition of any part at any level in terms of subordinate part numbers (disregard standard parts);

b. The next higher assembly using the part number, except for assembly into standard parts;

c. The composition of the configuration item or part number with respect to other configuration items or part numbers;

d. The configuration item and associated serial number on which subordinate parts are used. (This does not apply to contractors below prime level who are not producing configuration items);

e. The accountability of changes which have been partially or completely released against the configuration item;

f. The configuration item and serial number effectively of any change.

g. The standard specification number or standard part numbers used within any nonstandard part number;

h. The contractor specification document and specification control numbers associated with any subcontractor, vendor, or supplier part number.

80.4.3.3 The engineering release system and associated documentation shall be capable of:

a. Identifying changes and retaining records of superseded configurations formally accepted by the contracting agency;

b. Identifying all engineering changes released for production incorporation. These changes shall be completely released and incorporated prior to formal acceptance of the configuration item;

c. Determining the configuration released for each configuration item at the time of formal acceptance.

80.4.3.4 Engineering data shall be released or processed through a central authority to ensure coordinated action and preclude unilateral release of data.

80.4.3.5 Engineering change control numbers shall be unique.

80.4.4 Difference between the configuration of the configuration item qualified and the configuration item being audited shall be a matter of record in the minutes of the PCA.

80.4.5 For HWCI acceptance tests data and procedures shall comply with its product specification. The PCA team shall determine any acceptance tests to be reaccomplished, and reserves the prerogative to have representatives of the contracting agency witness all or any portion of the required audits, inspections, or tests.

80.4.6 HWCIs which fail to pass acceptance test requirements shall be repaired if necessary and be retested by the contractor in the manner specified by the PCA team leader in accordance with the product specification.

80.4.7 The contractor shall present data confirming the inspection and test of subcontractor equipment end items at point of manufacture. Such data shall have been witnessed by Government representative.

80.4.8 The PCA team reviews the prepared back-up data (all initial documentation which accompanies the configuration item) for correct types and quantities to ensure adequate coverage at the time of shipment to the user.

80.4.9 Configuration items which have demonstrated compliance with the product specification are approved for acceptance as follows:

a. The PCA team shall certify by signature that the configuration item has been built in accordance with the drawings and specifications.

80.4.10 As a minimum, the following actions shall be performed by the PCA team on each CSCI being audited:

a. Review all documents which will comprise the Software Product Specification for format and completeness

b. Review FCA minutes for recorded discrepancies and actions taken

c. Review the design descriptions for proper entries, symbols, labels, tags, references, and data descriptions.

d. Compare Top-Level Computer Software Component (TLCSC) design descriptions with Lower-Level Computer Software Components (LLCSC) descriptions for consistency

e. Compare all lower-level design descriptions with all software listings for accuracy and completeness

f. Check Software User's Manual(s), Software Programmer's Manual, Computer System Operator's Manual, Firmware Support Manual, and Computer System Diagnostic Manual for format completeness and conformance with applicable data item descriptions. (Formal verification/acceptance of these manuals should be withheld until system testing to ensure that the procedural contents are correct)

g. Examine actual CSCI delivery media (card decks, tapes, etc.,) to insure conformance with Section 5 of the Software Requirements Specification.

h. Review the annotated listings for compliance with approved coding standards (e.g. Appendix C of DOD-STD-2167).

80.5 Post Audit Actions

80.5.1 Contracting agency acceptance or rejection of the configuration item and the configuration item product specification presented for PCA must be furnished to the contractor in writing by the responsible contract management agency or other designated agency after completion of PCA.

80.5.2 After completion of the PCA, the contractor shall publish and distribute copies of PCA minutes. The contracting agency officially acknowledges completion of the PCA as indicated in paragraph 4.2.4.

80.5.3 The accomplishment of the PCA shall be recorded on the configuration item Development Record by the contractor.

90. Formal Qualification Review.

90.1 General. The objective of the FQR shall be to verify that the actual performance of the configuration items of the system as determined through test comply with the hardware Development Specification, Software Requirements and Interface Requirements Specifications, and to identify the test report(s)/data which document results of qualification tests of the configuration items. The point of Government certification will be determined by the contracting agency and will depend upon the nature of the program, risk aspects of the particular hardware and software, and contractor progress in successfully verifying the requirements of the configuration items. When feasible, the FQR shall be combined with the FCA at the end of configuration item/subsystem testing, prior to PCA. If sufficient test results are not available at the FCA to insure the configuration items will perform in their system environment, the FQR shall be conducted (post PCA) during System testing whenever the necessary tests have been successfully completed to enable certification of configuration items. For non-combined FCA/FQRs, traceability, correlation, and completeness of the FQR shall be maintained with the FCA and duplication of effort avoided.

90.2 Requirements.

90.2.1 In cases where the FQR and the FCA can be accomplished in a single combined Audit/Review, contractor and Government "certification" of the configuration items shall be accomplished after completion of the FCA and such certification shall be considered as accomplishment of the FQR.

90.2.2 When the agency responsible for qualification of the configuration items at the contracting agency judges that the system is not ready for FQR at the time of FCA, the FQR will be delayed until it is determined that sufficient information on the system's qualification is available. The FQR may be delayed up to the end of System testing if deemed necessary.

90.2.3 When a separate FQR is necessary, the contractor shall notify the contracting agency of the sufficiency of the configuration items test results to substantiate a FQR and coordinate the agenda with the Deputy Director for Test and Deployment. The FQR team will be assembled in the same manner as that required for the FCA team. No duplication of FCA effort shall occur at the FQR; however, the following additional efforts must be accomplished:

90.2.3.1 A review of the FCA minutes must be performed and the FQR shall be considered as an extension of FCA. New/additional qualification data shall be audited and reviewed to insure qualification of the configuration items against the System/Segment, Software Requirements, and Interface Requirements

Specifica-

90.2.3.2 Any testing accomplished against configuration item qualification during System testing shall be considered.

90.2.3.3 The contractor shall, after notification of certification by the contracting agency enter the date of system certification of qualification and the identity of the test reports/documentation which sets forth the results of the associated test(s) in the configuration item Development Record.

90.2.4 All other factors such as: agenda, team organization, review procedures, data to be revieved, etc., shall be accomplished as delineated in the FCA and General Requirements and Procedures sections of this standard to the extent necessary to accomplish the FQR.

90.3 Post Review Action

90.3.1 After the conduct of the FQR, the contractor shall publish and distribute copies of FQR minutes. The contracting agency will officially acknowledge the conduct of the Review as indicated in paragraph 4.2.4.

SAMPLE CERTIFICATION ATTACHMENT

PRE-FCA CHECK SHEET

NOMENCLATURE _____

CONFIGURATION ITEM NO. _____ DATE _____

CONTRACTOR REQUIREMENTS	YES	NO
1. Waiver/Deviation List Prepared	____	____
2. Qualification Test Procedures Submitted	____	____
3. Qualification Testing Completed	____	____
4. Qualification Test Results Compiled & Available	____	____
5. Facilities for Conducting FCA Available	____	____
6. Qualification Test Procedures Reviewed and Approved	____	____
7. Qualification Testing Witnessed	____	____
8. Qualification Test Data and Results Reviewed and Approved	____	____

COMMENTS _____

Figure 3
Page 1 of 11

SAMPLE CERTIFICATION ATTACHMENT

FUNCTIONAL CONFIGURATION AUDIT (FCA)

FOR

CONFIGURATION ITEM NO. (s) _____

CONTRACT NO. _____

PRIME CONTRACTOR:

_____

_____

_____

EQUIPMENT MANUFACTURERS:

_____

_____

_____

APPROVED BY _____
(CONTRACTOR)

APPROVED BY _____
(CONTRACTING AGENCY)

DATE _____

DATE _____

Figure 3
Page 2 of 11

DEFINITIONS:

COMMENT: A note explaining, illustrating, or criticizing the meaning of a writing. Items of this nature should be explored by the contractor and/or the Contracting Agency, but corrective action is NOT necessary to successfully accomplish a FCA.

DEFICIENCY: Deficiencies consist of two types: (1) conditions of characteristics in any hardware/software which are not in compliance with specified configuration, or (2) inadequate (or erroneous) configuration, identification which has resulted, or may result in configuration items that do not fulfill approved operational requirements.

SCOPE/PURPOSE

Scope:

Functional Configuration Audit (FCA) was conducted on the following configuration item:

Configuration Item No.	Nomenclature	Part No.	Serial No.

PURPOSE: The purpose of this FCA was to verify that the configuration item's performance complies with the Type B Development Specification.

Figure 3
Page 4 of 11

FUNCTIONAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 1
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

Configuration Item No.: _____

_____

Qualification Test Procedures and Results. The qualification test/analysis results have been reviewed to ensure that testing is adequat properly done, and certified. (All test procedures and interface documents shall be reviewed to assure that the documents have been approved by the Contracting Agency. All test data sheets shall be reviewed to assure that the test was witnessed by a representative of the Contracting Agency.)

Attached is a list of the documents reviewed.

Check One

Procedures and results reviewed satisfy the requirements and are accepted. See Attachment __ for comments.

Attached is a list of deficiencies.

Signature(s) of FCA Team Member(s)

* _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

*Sub-Team Chairperson

Figure 3
Page 5 of 11

SPECIFICATION/TESTING REVIEW

Configuration Item No. ________________ Nomenclature ________________

Specification No. ____

Test Procedures ____

Spec Ref TP Ref	Description	Test Result

Figure 3
Page 6 of 11

FCA DEFICIENCY SUMMARY LIST

CONFIGURATION ITEM NO. _____ NOMENCLATURE _____

CONFIGURATION ITEM NUMBER	REPORT REFERENCE	DESCRIPTION	RESPONSIBILITY FOR CORRECTION	PLACE OF INSPECTION	INSPECTED BY

Figure 3
Page 7 of 11

FUNCTIONAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 2
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

Configuration Item No.: _____

_____

Review Deviations/Waivers. A review of all deviations/waivers to military specifications and standards that have been approved. The purpose is to determine the extent to which the equipment(s)/computer software undergoing FCA vary from applicable specifications and standards and to form a basis for satisfactory compliance with these specifications and standards.

In accordance with this paragraph, all applicable deviations/waivers have been reviewed with the following results:

Check One

☐ The equipment(s)/computer software listed on Certification Sheet No. 1 of this report complies with all applicable specifications and standards. See Attachment __ for comments.

☐ Attached is a list of discrepancies and/or comments.

Signature(s) of FCA Team Member(s)

* _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Sub-Team Chairperson

Figure 3
Page 8 of 11

A. Deviation/Waiver Review Team Instructions. All approved waivers and deviations to military specifications and standards shall be reviewed and recorded. Also, record any part of the FCA which fails to meet specifications or standards but is not an approved waiver/deviation.

B. Results of Team Review. List the deviations/waivers against the equipment/computer software being FCA'd that were reviewed.

Figure 3
Page 9 of 11

WAIVERS/DEVIATIONS

CONFIGURATION ITEM NO. _____ NOMENCLATURE _____

REFERENCE (Spec, STD, Etc.)	CCB OR MRB APPROVAL/DIRECTIVE	REQUIREMENT WAIVED	REMARKS

Figure 3
Page 10 of 11

SAMPLE CERTIFICATION ATTACHMENT

FORMAL QUALIFICATION REVIEW
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

Configuration Item No.: _____

_____

Formal Qualification Review. Qualification Test/Analysis results have been reviewed to verify that the actual performance of the configuration item complies with its development or requirements specification(s) and that sufficient test results are available to ensure the configuration item will perform in its system environment.

Attached is a list of the documents reviewed.

Check One

☐ Results reviewed satisfy FQR requirements and the configuration item is qualified for entry into the Government Inventory.

☐ Results reviewed are unsatisfactory/insufficient for FQR. FQR will be delayed until it is determined that sufficient information on the configuration items Qualification is available.

Signature(s) of FCA Team Member(s)

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Figure 3
Page 11 of 11

SAMPLE CERTIFICATION ATTACHMENT

SAMPLE PCA CHECKLIST

The following hardware, computer software, documentation shall be available, and the following tasks shall be accomplished at the PCA.

Hardware:

Computer Software:

Documentation:

		Yes	No
(1)	Approved final draft of the configuration item product specification.	____	____
(2)	A list delineating both approved and outstanding changes against the configuration item.	____	____
(3)	Complete shortage list.	____	____
(4)	Acceptance test procedures and associated test data.	____	____
(5)	Engineering Drawing Index.	____	____
(6)	Operating, maintenance, and illustrated parts breakdown manuals.	____	____
(7)	List of approved material review board actions on waivers.	____	____
(8)	Proposed DD Form 250, "Material Inspection and Receiving Report".	____	____
(9)	Approved nomenclature and nameplates.	____	____
(10)	Manuscript copy of all CSCI manuals.	____	____
(11)	Computer Software Version Description Document.	____	____
(12)	Current set of listings and updated design descriptions or other means of design portrayal for each CSCI.	____	____
(13)	FCA minutes for each configuration item.	____	____

Figure 4
Page 1 of 20

SAMPLE CERTIFICATION ATTACHMENT

SAMPLE PCA CHECKLIST (CONTINUED)

		Yes	No
Tasks:			
(1)	Define Product Baseline.	____	____
(2)	Specification Review and Validation.	____	____
(3)	Drawing review.	____	____
(4)	Review acceptance test procedures and results.	____	____
(5)	Review shortages and unincorporated design changes.	____	____
(6)	Review deviations/waivers.	____	____
(7)	Examine proposed DD 250.	____	____
(8)	Review contractor's Engineering Release and Change Control System.	____	____
(9)	Review system allocation document.	____	____
(10)	Review Software User's Manuals, Software Programmer's Manuals, Computer System Diagnostic Manual, Computer System Operator's Manual, and Firmware Support Manual.	____	____
(11)	Review CSCIs for the following:		
	(a) Top-level and lower-level Computer Software Component design descriptions or alternative design portrayals.	____	____
	(b) Top-level and lower-level Computer Software Component interface requirements.	____	____
	(c) Data base characteristics, storage allocation charts and timing and sequencing characteristics.	____	____
(12)	Review packaging plan and requirements.	____	____
(13)	Review status of Rights in Data.	____	____

Figure 4
Page 1a of 20

SAMPLE CERTIFICATION ATTACHMENT

PHYSICAL CONFIGURATION AUDIT (PCA)

FOR

CONFIGURATION ITEM NO.(s) _____

CONTRACT NO. _____

PRIME CONTRACTOR:

_____

_____

_____

APPROVED BY _____ (DESIGNEE)
CONTRACTOR

DATE _____

EQUIPMENT MANUFACTURERS:

_____

_____

_____

APPROVED BY _____ (DESIGNEE)
CONTRACTING AGENCY

DATE _____

Figure 4
Page 2 of 20

DEFINITION OF TERMS

COMMENT - A note explaining, illustrating, or criticizing the meaning of a writing. Items of this nature should be explored by the contractor and/or the Contracting Agency, but corrective action is NOT necessary to successfully accomplish a PCA.

DISCREPANCY - A not explaining, illustrating, or criticizing the difference between writings. A note showing the variance between what exists and what is acceptable. Items of this nature shall be rectified by the contractor prior to successful accomplishments of a PCA.

SCOPE/PURPOSE

A Physical Configuration Audit (PCA) was conducted on the following end items of equipment/computer software:

CONFIGURATION ITEM	NOMENCLATURE	PART NUMBER	SERIAL NO.	NSN

The purpose of the PCA was to ensure accuracy of the identifying documentation and to establish a product baseline.

The establishment of a product baseline for equipment/computer software is not to be construed as meeting Contracting Agency requirements for delivery by the contractor of an operational system meeting approved acceptance criteria.

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 1
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

_____

_____

Product baseline. The following documents of the issue and date shown comprise the product baseline for the listed equipment(s)/ computer software:

SPEC NO.	ASSEMBLY TOP DRAWING NO.	ISSUE	EQPT./COMP. SOFTWARE NOMENCLATURE	CONFIGURATION ITEM NO.

Signature(s) of PCA Team Member(s)

** _____	_____
* _____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**Team Chairperson
*Sub-Team Chairperson

Figure 4
Page 5 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 2
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

_____

_____

Specification Review and Validation. Specifications have been reviewed and validated to assure that they adequately define the configuration item and the necessary testing, mobility/transportability, and packaging requirements.

Check One

☐ The Type C Specifications are complete and adequately define the configuration item. They shall, therefore, constitute the product baseline. See Attachment __ for comments.

☐ The Type C Specifications are unacceptable. Attached is a list of discrepancies.

Signature(s) of PCA Team Member(s)

* _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Sub-Team Chairperson

Figure 4
Page 6 of 20

A. Specification Review and Validation Instructions. The detailed specifications listed in paragraph B. Below shall be reviewed for compliance with the applicable requirements. Each Specification shall serve as the basic document for configuration control of the subject configuration items. The information contained within the specifications shall be audited at the PCA.

B. Review and Validation Results:

1. Specifications Reviewed and Validated

SPEC NO.	PART NO.	DATE	EQPT./COMP. SOFTWARE NOMENCLATURE	CONFIGURATION ITEM NO.

2. Specifications Reviewed and Disapproved: (Provide attachment for causes.)

Figure 4
Page 7 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 3
(Equipment)

Contract: _____ Date _____

Contractor: _____

_____

_____

Drawing Review. Drawings have been compared with the equipment to ensure that the latest drawing change letter has been incorporated into the equipment, that part numbers agree with the drawings, and that the drawings are complete and accurately describe the equipment.

Attachment __ is a list of the drawings reviewed.

Check One

☐ The drawings are complete and accurately describe the equipment. See attachment __ for comments.

☐ Attachment __ is a list of discrepancies.

Signature(s) of PCA Team Members(s)

* _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

*Sub-Team Chairperson

Figure 4
Page 8 of 20

A. Drawing Review Results. The following drawings were reviewed by the PCA drawing reviewing sub-teams:

DOCUMENT NUMBER	DOCUMENT TITLE

Figure 4
Page 9 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 4
(Equipment)

Contract: _____ Date _____

Contractor: _____

_____

_____

Acceptance Test Procedures and Results. The acceptance test results have been reviewed to ensure that testing is adequate, properly done, and certified.

Attachment __ is a list of the documents reviewed.

Check One

☐ Procedures and results reviewed satisfy the requirements and are accepted. See Attachment __ for comments.

☐ Attachment __ is a list of discrepancies.

Signature(s) of PCA Team Member(s)

* _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

*Sub-Team Chairperson

Figure 4
Page 10 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 5
(For Equipment/Computer Software)

Contract _____ Date _____

Contractor: _____

_____

_____

Review of Shortages and Unincorporated Design Changes. The shortages and unincorporated design changes listed on the proposed DD Form 250, "Material Inspection and Receiving Report", and other records have been reviewed.

Check One

There are no shortages or unincorporated design changes.

Attachment __ is a list of shortages and/or unincorporated design changes, and the recommended corrective action required.

Signature(s) of PCA Team Member(s)

* _____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Sub-Team Chairperson

Figure 4
Page 11 of 20

A. Review of Shortages and Unicorporated Design Changes. All shortages and unicorporated design changes listed on the proposed DD Form 250, "Material Inspection and Receiving Report", shall be reviewed by the Contracting Agency or their designated representatives for a determination of what changes should be accomplished in the field and what changes should be accomplished at the contractor's facility. The Contracting Agency shall also determine if the reported shortages and unincorporated changes are complete.

B. Results. List the shortages and unincorporated design changes that were reviewed in compliance with requirements.

Figure 4
Page 12 of

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 6
(For Equipment/Computer Software)

Contract: Date _____

Contractor: _____

_____

_____

Review Deviations/Waivers. A review of all deviations/waivers to military specifications and standards that have been approved. The purpose is to determine the extent to which the equipment(s)/computer software undergoing PCA vary from applicable specifications and standards and to form a basis for satisfactory compliance with these specifications and standards.

In accordance with this paragraph, all applicable deviations/waivers have been reviewed with the following results:

Check One.

The equipment(s)/computer software listed on Certification Sheet No. 1 of this report complies with all applicable specifications and standards. See Attachment __ for comments.

Attachment __ is a list of discrepancies and/or comments.

Signature(s) of PCA Team Member(s)

* _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Sub-Team Chairperson

Figure 4
Page 13 of 20

A. Deviation/Waiver Review Team Instruction. All approved waivers and deviations to military specifications and standards shall be reviewed and recorded. Also, record any part of the PCA which fails to meet specifications or standards but is not an approved waiver/deviation.

B. Results of Team Review. List the deviations/waivers against the equipment/computer software being PCA's that were reviewed.

Figure 4
Page 14 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 7
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

_____

_____

Examination of the Proposed DD 250. The DD Form 250 has been examined to ensure that it adequately defines the equipment/computer software and that unaccomplished tasks are inlcuded as deficiencies.

Check One

☐ The DD Form 250 adequately defines the equipment/computer software and all unaccomplished tasks are included as deficiencies.

☐ Attachment __ is a list of discrepancies and/or comments.

Signature(s) of PCA Team Member(s)

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Sub-Team Chairperson

Figure 4
Page 15 of 20

A. Examination of the Proposed DD Form 250. The proposed DD Form 250 shall be examined for completeness and an accurate definition of the equipment/computer software. Unaccomplished tasks, shortages, and certain specified discrepancies uncovered at the PCA shall be included in the DD Form 250. If the equipment/computer software is to be shipped from the plant, the Program Office representative will recommend to the CAO that the DD Form 250 be executed in accordance with the terms of the contract.

B. Results. Include a statement that the proposed DD Form 250 was examined and was recommended.

Figure 4
Page 16 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 8
(For Equipment/Computer Software)

Contract: _____ Date _____

Contractor: _____

_____

_____

Review of Contractor's Engineering Release and Change Control System. The contractor's engineering release system and change control procedures have been reviewed to ensure that they are adequate to properly control the processing and formal release of engineering changes.

Check One

The contractor's engineering release system and change control procedures are adequate for the processing and formal release of engineering changes. See Attachment __ for comments.

Attachment __ is a list of deficiencies.

Signature(s) of PCA Team Member(s)

* _____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Sub-Team Chairperson

Figure 4
Page 17 of 20

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 9
(For Equipment/Computer Software)

Contract: _____ Date: _____

Contractor: _____

_____

_____

System Allocation Document Review. The following System Allocation book form drawings have been reviewed and validated to ensure that they adequately identify, and are compatible with, the shipping instructions.

Check One

☐ The System Allocation Document is complete and adequately defines the equipment/computer software scheduled for each location.

☐ The System Allocation Document is unacceptable. Attached is a list of discrepancies.

☐ This task is not required by contract.

Signature(s) of PCA Team Member(s)

* _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

*Sub-Team Chairperson

Figure 4
Page 18 of 20

A. System Allocation Document Instructions:

1. The System Allocation Documents, both Part I and Part II, applicable to the contract shall be reviewed to determine their accuracy and insure that they adequately describe the equipment/computer software.

2. The following information shall be recorded:

Part I.

a. System employment and configuration.
b. Specification reference.
c. Location.
d. Mission Equipment.
   Configuration Item Number
   Short Title
   Part Number
   Serial Number
e. Installed equipment/computer software.
   Configuration Item Number
   Short Title
   Part Number
   Serial Number
f. Drawing Title and Number
g. Number of sheets
h. Issue Number.

Part II.

a. Location.
b. Specification Number
c. Equipment/computer software nomenclature.
d. Configuration Item Quantity.
e. Assembly Drawing Number

3. Insure that the System Allocation Documents are compatible wi the priorities and shipping instructions.

B. System Allocation Document Review Results. The following System Allocation Documents were reviewed by the PCA Reviewing Sub-Team:

DOCUMENT NUMBER	DOCUMENT TITLE

PHYSICAL CONFIGURATION AUDIT

CERTIFICATION SHEET NO. 10
(Equipment)

Contract: _____ Date _____

Contractor: _____

_____

1. Review of Logistics Support Plan for Pre-operational Support. The Logistics Support Plan for Pre-operational Support has been reviewed to ensure that it is adequate to support the acquisition phase and is compatible with the operational phase maintenance concept and support requirements.

Check One

☐ The contractor's Logistic Plan for pre-operational support will fulfill the acquisition phase requirements and is compatible with operational phase needs.

☐ Attachment __ is a list of deficiencies.

. Review of Long Lead Time Items and Provisioned Items Processed to PCA. Long Lead Time items released and items provisioned, prior to PCA have been reviewed to ensure that obsolete items resulting from pre-PCA design changes are purged from the system. Where basic items may be upgraded by rework or modification these actions have been verified as accomplished or in process based upon design change notice.

Check One

☐ Long lead time items and provisioned items processed, prior to PCA, are all of current configuration at time of PCA or are in work.

☐ Attachment __ is a list of deficiencies.

Signature(s) of PCA Team Member(s)

* _____ _____

_____ _____

_____ _____

_____ _____

*Sub-Team Chairperson

Figure 4
Page 20 of 20

100. Application Guide for Tailoring MIL-STD-1521

100.1 Scope

This appendix sets forth guidance for the cost effective application of the requirements of this standard when this standard is contractually invoked during the acquisition process. This appendix serves as guidance for the activity responsible for the preparation of contract requirements and does not form a part of the contract.

100.2 Purpose

The guidelines contained herein implement the Department of Defense Directive 4120.21, Specification and Standards Application, which requires all DOD components to apply selectively and tailor military specifications and standards prior to their contractual imposition and:

a. Eliminate inapplicable and unnecessary requirements.

b. Provide for adding/modifying necessary technical review and audit factors not included in MIL-STD-1521.

c. Eliminate redundancy and inconsistency with other contract specifications and standards.

100.3 Objective

The objective of this guide is to establish the applications and limitations of tailoring MIL-STD-1521. MIL-STD-1521 is not a stand-alone document. It is dependent upon the work effort specified in the contractual requirements (e.g., SOW, etc.) The tailoring of specifications should take place in all phases of military procurement, but is especially applicable to the initial stages of solicitation package preparation and contract negotiation. Depending upon the type of end-item(s) under procurement, the reviews and audits outlined by MIL-STD-1521 may or may not be required for all programs.

100.4 Considerations for Tailoring

100.4.1 Relationship to the Statement of work

The Program Manager must keep in mind that technical reviews provide visibility into the contractor's implementation of the work effort required under the terms of the SOW and the contract to assure timely and effective attention to the technical interpretation of contract requirements. The key to tailoring MIL-STD-1521 is to match the MIL-STD-1521 requirements against the details of the applicable SOW/Contractual task requirements. It will become immediately obvious that MIL-STD-1521 may contain

technical review factors that are not applicable to the contract under consideration. (For example, if a contract does not include computer software, all references to the review of Computer Software materials in MIL-STD-1521 will not apply.) When MIL-STD-1521 is used, then a task containing the applicable requirements will be specified in the SOW. Review factors not set forth in MIL-STD-1521 but considered necessary because of the nature of the particular program should be added in the SOW. By carefully going through this evaluative process the technical review and audit requirements will become program specific rather than an all purpose document to be continually negotiated during contract performance.

100.4.2 Elimination of Redundancy and Ambiguity

While MIL-STD-1521 is the broad program document for technical reviews and audits, other standards in existence also require technical reviews or audits. For example, MIL-STDs for reliability, maintainability, system engineering and others can require reviews and/or audits. Review of these aspects of the design would also be required under MIL-STD-1521; therefore, if such standards are contractually stipulated together with MIL-STD-1521, the SOW should include a provision to show how and whether the technical review requirements of these other standards can be combined with technical reviews/audits in MIL-STD-1521. Combining reviews does not nullify other MIL-STD(s), "Plans", etc, which contain requirements for reviews/audits. The contract should require the minimal integrated, comprehensive technical design review effort that will provide the desired visibility and assurance of contract compliance.

100.4.3 Contractor Participation in Tailoring

When requiring a particular review or audit, it is important that the topics to be reviewed are aligned to the program requirements. Therefore, the offeror should be given an opportunity to recommend changes and identify topics/items he considers appropriate. The program office should request, in the instructions for proposal preparation, that the offeror recommend the MIL-STD-1521 topics/items and their related details to be covered at the various reviews or audits required by the SOW. This will allow the offeror to tailor the topics/items and details by additions and deletions for the particular review/audit. In addition, it must be recognized that effecive tailoring requires several points of review. The requirement, however, for the review/audit must be finalized prior to contract award.

100.4.4 Complexity

a. System/Segment/subsystem/configuration item complexity and type of program is central in determining both the need for and the number of such reviews. When developing a small

non-complex system some reviews may not be required, or, if required, may be limited in Scope. The tailoring procedures discussed earlier should result either in the exclusion of MIL-STD-1521 or in a tailored MIL-STD-1521 that reflects a limited scope technical review effort. Conversely, in a very complex development the review process will increase in levels and numbers of reviews.

b. In addition to the above, the degree of application is dependent upon the configuration item state of development (example, new design vs. commercially available) or the degree of any modifications, if involved. For example: a newly developed item may require the majority of the review topics/items and audits, while a commercially available configuration item with the appropriate documentation, i.e., verified test results, specifications, drawings, etc. may require reviews or audits limited to its application to the program and its interfaces. In the case of modified designs one must consider the degree and effect of the modifications. Reviews and audits may be limited to the modifications and their interfaces.

100.5 Scheduling of Technical Reviews and Audits

The schedule for Technical Reviews and Audits is extremely important. If they are conducted too early, the item for review will not be adequately defined. Conversely, if the review is too late, the program commitments could have been made erroneously, and correction will be both difficult and costly. For planning purposes, a good method for scheduling technical reviews is to relate them to the documentation requirements. For example, schedule a PDR after the hardware Development Specification or Software Top Level Design Document and Software Test Plan are available, since the essence of the PDR is to assess the contractor's approach to meeting these requirements of these documents. Scheduling of audits are dependent not only on documentation availability but also on hardware/software availability, and the completion of the acceptance qualification tests. Table 1 contains a list of the primary documentation associated with each review or audit and the estimated time phasing:

TABLE 1
SCHEDULING TECHNICAL REVIEWS AND AUDITS

Review	Time Phase	Primary Documentation
SRR	Usually accomplished in the Concept Exploration phase. However, may be used in other phases when the	Various analysis and trade study reports used to develop the system/segment

Review	Time Phase	Primary Documentation
	Concept Exploration phase is not accomplished.	requirements for the specification.
SDR	Usually in the Demonstration and Validation phase.	System/Segment Specification, preliminary Operational Concept Document, preliminary Software Requirements and Interface Requirements Specifications, analyses, trade studies, Drawings Level I DOD-D-1000.
SSR	Usually early in Full Scale Development	Software Requirements Specification, Interface Requirements Specifications, Operational Concept Document.
PDR	Usually accomplished in the Demonstration and Validation and/or Full Scale Development Phase	Development, Type B Performance Specification, Drawings Level I DOD-D-1000, Software Top Level Design Document, Software Test Plan, preliminary Computer Resources Integrated Support Document, preliminary Computer System Operator's Manual, preliminary Software User's Manual, preliminary Computer System Diagnostic Manual.
CDR	Usually accomplished in the Full Scale Development phase	Draft Product, Type C Specification, and referenced documentation, Drawings Level I or II DOD-D-1000, Software Detailed Design Document, Interface Design Document(s), Data Base Design Document(s),

Review	Time Phase	Primary Documentation
		Software Test Description, Computer Resources Integrated Support Document, Software Programmer's Manual, Firmware Support Manual, Informal Test Descriptions/Test Procedures, Software Development File(s).
TRR	Usually accomplished in the Full Scale Development phase	Software Test Procedure, Informal software test results (of development tests).
FCA	Usually accomplished at end of Full Scale Development	Test plans, test descriptions, test procedures, Software Test Reports, Computer System Operator's Manual, Software User's Manual, Computer System Diagnostic Manual.
PCA	Usually accomplished early in the initial production when the developing contractor is preselected as the production contractor. However, may be accomplished at the end of Full Scale Development when the developing contractor is not preselected as the production contractor. And the PCA is repeated with each subsequent contractor or break in production.	Final Part II Specification/Type C Product Specifications and referenced documents and drawings. Drawings Level II or III DOD-D-1000. Software Product Specification, Version Description Document.

Although the time frame for reviews and audits is suggested above, they may vary depending on the particular program. The schedule for each review or audit may be requested from the offeror as part of his proposal, or as part of the system engineering management plan (which can be part of the proposal).

110. Production Readiness Review (PRR)

110.1 For specific guidance, see AFSCR 84-2, Production Readiness Review.

Custodian:
Air Force - 13

Preparing Activity:
Air Force - 13

Review Activity:
Air Force - 10,11,80,85

(Project CMAN-0-006)

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