ELECTRONIC RECORDS ARCHIVES

ERA LIFECYCLE
(ELC v3.1)

(WBS #1.1.15.1)

for the

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

ELECTRONIC RECORDS ARCHIVES PROGRAM MANAGEMENT OFFICE (NARA ERA PMO)

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Prepared by:

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ERA LIFECYCLE (ELC)

Signature Page

Program Director,

I recommend approval of the ERA Lifecycle (ELC).

_____ _____

Carmen Colon, Date
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Approved,

_____ _____

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Document Change Control Sheet

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02/15/02	ERA.DC.ELC.1.0.DOC	Jon Valett Bob Nagle	Baseline ELC
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FINAL

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

LIST OF TABLES

1.0 Introduction

This Electronic Records Archive (ERA) Lifecycle (ELC) document presents the ERA system's lifecycle from inception through retirement. It defines, at a high-level, the Agreement, Enterprise, Project, and Technical processes implemented by the ERA Program Management Office (PMO) for the procurement of ERA products and services.

The ELC, through careful planning, follows the approach for Information Technology (IT) acquisition, development, and management established by the Paperwork Reduction Act (PRA), Clinger-Cohen Act (CCA), and Office of Management and Budget (OMB) Circular A-11. The National Archives and Records Administration (NARA) will utilize Commercial Off-The-Shelf (COTS) and Non-Developmental Item (NDI) products, where possible, to develop an ERA system. All lifecycle activities will be subject to continuous risk management as defined in the *ERA Risk Management Plan (RKM),* and continuous Quality Assurance (QA) and quality control activities as defined in the *ERA Quality Management Plan (QMP).*

1.1 Purpose

The purpose of the ELC is to define a set of lifecycle processes as may be used in the ERA program, and describe the activities and products of each process. Additionally, the ELC will describe the various relationships between the processes and activities and their relationships to the increment and release scheme devised to make the procurement more manageable and to accommodate more efficient control of both the product's technical content and the program's budget.

The intended audience for the ELC is the ERA PMO and its contractors. This document presents the ERA PMO vision of a lifecycle model that complies with NARA policies, Executive Directives, and Legislation governing the conduct of a major Information System acquisition while adhering to international standards and industry best practices. Due to the performance-based nature of the contracting strategy, it will be important for the ERA Development Contractors to identify process proposals that differ from those presented here. This document will then be revised to describe the mutually agreed to processes to be used in those areas of the procurement. Execution of the processes is managed according to the plans and procedures described in the *ERA Program Management Plan (PMP).*

1.2 ERA Program Overview

The Archivist of the United States established the ERA program as a major new initiative to address critical issues in the creation, management, and use of electronic records. As a program, ERA is composed of the policies, procedures, practices, and the necessary technology that will enable NARA to build the ERA system to receive, preserve, and provide access to electronic records. Electronic records are managed in the context of NARA's lifecycle approach to managing records. This approach places records management decisions and actions in a comprehensive and continuous discipline that extends from the design of systems in which records will be created and kept to their final disposition including, where appropriate, to permanent preservation in the National Archives of the United States (which includes

Presidential Libraries). Continuous and comprehensive records management applies to all records, not just electronic records. Hence, the ERA system will support NARA's end-to-end lifecycle management process for all records. Lifecycle records management processes typically involve information about records, rather than the records themselves.

NARA established the ERA PMO in response to the need for a comprehensive organization that was capable of managing a complex acquisition and development effort through the application of best practices. To guarantee efficiency and effectiveness, the ERA PMO expects all ERA program participants to:

- Maximize the leverage of both internal and external experts in order to provide subject-matter insight when reviewing program requirements, products, and plans;
- Work cooperatively within the ERA PMO and continually foster both internal and external communication;
- When needed, use product and process oriented Integrated Product Teams (IPTs) for task execution; and
- Use contractor support to help plan, manage, coordinate, and supplement the ERA PMO.

In general, the ERA system will ingest, preserve, and provide access to the electronic records of all three (3) Branches of the U.S. Government. ERA is envisioned as a comprehensive, systematic, and dynamic means for preserving any kind of electronic record, free from dependence on specific hardware and/or software. The system will automate much of the electronic record lifecycle process and make it easier to find and deliver electronic records in formats suited to customers' needs.

The electronic records capabilities of the ERA system will be used in NARA's records centers as well as the National Archives and Presidential Libraries. The system will also be used for donated materials.

1.3 Scope of the Document

The ELC document offers a telescopic view of the entire lifecycle of the ERA system along with a more robust treatment of the system development process. The scope and magnitude of the ERA program and envisioned system supports the use of ISO/IEC 15288:2002(E), *Systems engineering – System life cycle processes* (hereafter referred to as 15288), as a guide for establishing required tasks and deliverable products. The ERA PMO chooses 15288 for several reasons; principal among them are the four (4) described below:

- Use of ISO/IEC 15288:2002(E) complies fully with US Code requiring that Federal agencies discontinue the use of Government unique standards. (Further information regarding this requirement may be found in OMB Circular A-119, Revised, *Federal*

Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities, 10 February, 1998.)

- 15288, as it addresses lifecycle activities applying to the acquisition and development of an entire system, incorporates the activities described in ISO/IEC 12207:1995, *Information technology – Software life cycle processes* (previously, the more commonly used standard).
- The lifecycle activities of the NARA Systems Development Lifecycle constitute a subset of the full list of activities described in 15288 and is, therefore, accommodated. Thus, the lifecycle activities described in this document also comply with established NARA policies.
- The processes, activities and tasks described in 15288 are eminently suitable in their application to a program the size and complexity of the ERA.

Unless otherwise noted, the ELC follows all of the Agreement, Enterprise, Project, and Technical processes identified in 15288, and engages in the relevant activities and tasks. The ELC cites NARA's expected products and reviews at each major development milestone. However, this declaration does not exclude engagement with other activities and products cited in 15288.

The Agreement processes (Acquisition and Supply) are described in §4.1 of this document in general terms only. Details of the acquisition process, including operations and maintenance, and its lifecycle are identified in the *ERA Acquisition Strategy (AS)*. Details of the supply process are presented in the *ERA AS* and in the *Contractor Oversight and Tracking Plan (COTP)*. The ERA PMO and the supplier will agree jointly on the additional details of the supply process at contract award.

1.4 Definitions and Acronyms

The technical terms used in this plan are defined in Institute of Electrical and Electronics Engineers (IEEE) Std. 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology*. **Table 1-1, Acronyms List,** contains a list of acronyms used herein.

ACRONYM	DEFINITION
AoA	Analysis of Alternatives
AS	Acquisition Strategy
AT	Acceptance Test
BCA	Business Case Analysis
CCA	Clinger-Cohen Act
CDR	Critical Design Review
CM	Configuration Management
CMP	Configuration Management Plan
ConOps	Concept of Operations
COTP	Contractor Oversight and Tracking Plan
COTS	Commercial Off-The-Shelf
DoD	Department of Defense

ACRONYM	DEFINITION
ELC	ERA Lifecycle
ERA	Electronic Records Archives
FCA	Functional Configuration Audit
FOC	Full Operational Capability
IDD	Interface Design Description
IEC	International ElectroTechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IOC	Initial Operational Capability
IOT&E	Initial Operational Testing and Evaluation
IPT	Integrated Product Team
IRS	Interface Requirements Specification
ISO	International Organization for Standardization
IT	Information Technology
IV&V	Independent Verification and Validation
LAR	Load Analysis Report
MNS	Mission Needs Statement
MRR	Market Research Report
NARA	National Archives and Records Administration
NDI	Non-Developmental Item
OMB	Office of Management and Budget
ORR	Operational Readiness Review
OT&E	Operational Testing and Evaluation
PCA	Physical Configuration Audit
PD	Program Director
PDR	Preliminary Design Review
PMO	Program Management Office
PMP	Program Management Plan
PRA	Paperwork Reduction Act
PRS	Product Requirements Specification
QA	Quality Assurance
QM	Quality Management
QMP	Quality Management Plan
RD	Requirements Document
RFP	Request for Proposal
RKM	Risk Management Plan
SARAD	System Architecture and Requirements Allocation Description
SDD	System Design Document
SDR	System Design Review
SLP-DS	Source Selection Plan – Down Select
SyRS	System Requirements Specifications
SRR	System Requirements Review
TEP	Technical Review Process

ACRONYM	DEFINITION
TRR	Test Readiness Review
TSP	Testing Management Plan

Table 1-1: Acronyms

1.5 Reference Documents

The documents, industry standards, and references used to develop the ELC are described in the sections that follow.

1.5.1 ERA PMO Documents

The following ERA PMO documents were used in developing this document:

- Acquisition Strategy (AS), Version 4.0
- Business Cost Analysis (BCA), Version 2.0
- Communications Plan (CP), Version 2.1
- Concept of Operations (ConOps), Version 4.0
- Configuration Management Plan (CMP), Version 2.3
- Contractor Oversight and Tracking Plan (COTP), Version 1.1
- Mission Needs Statement (MNS), Version 1.2
- PMO Training Plan (TRP), Version 2.0
- Program Management Plan (PMP), Version 2.3
- Quality Management Plan (QMP), Version 2.4
- Requirements Document (RD), Version 3.0
- Risk Management Plan (RKM), Version 3.0
- Source Selection Plan – Down Select (SLP-DS), Version 1.0
- Technical Review Process (TEP), Version 1.0
- Testing Management Plan (TSP), Version 2.1

1.5.2 Industry Standards and References

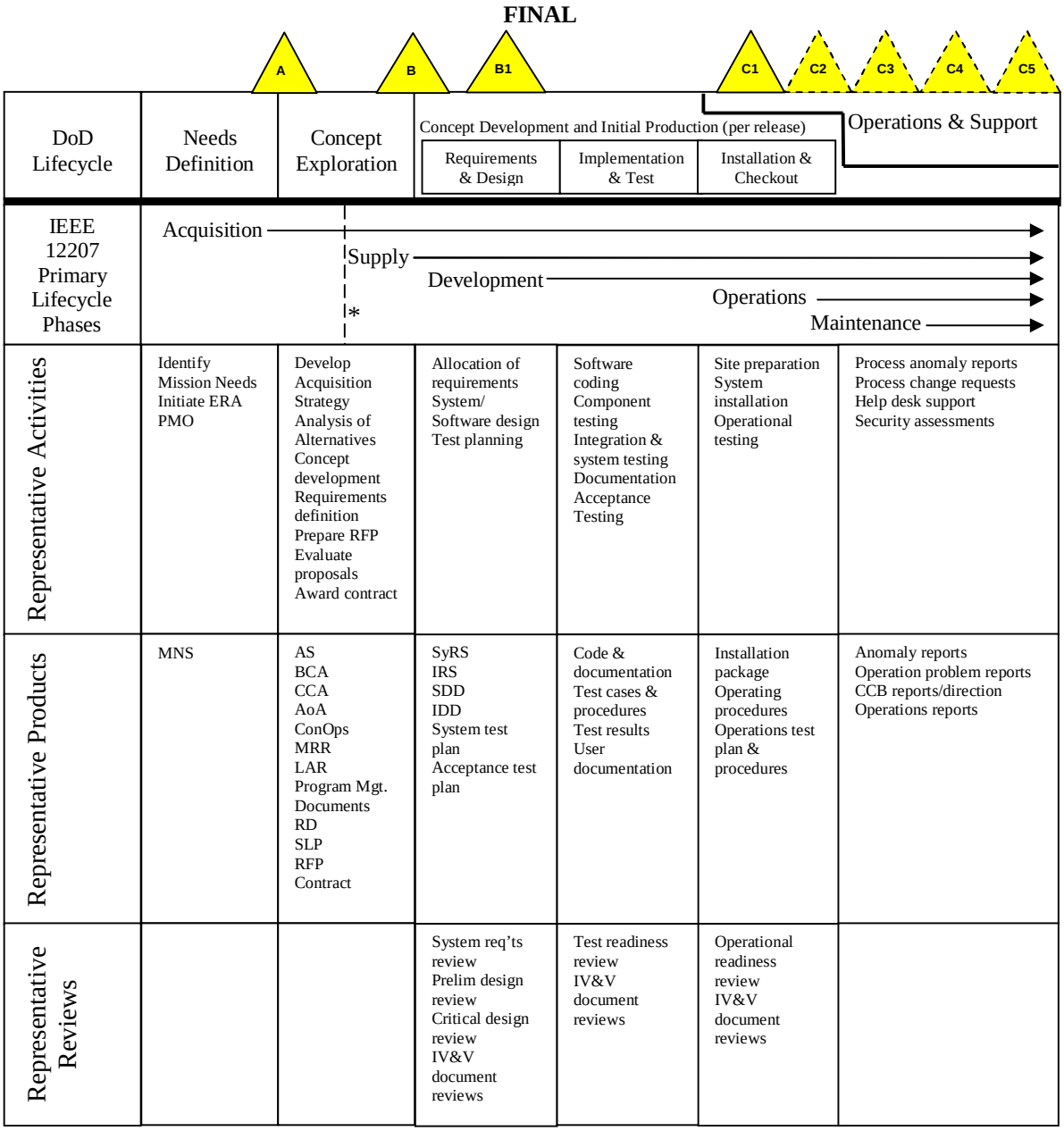
The following standards and references were used in the development of this document.

- ISO/IEC 15288:2002(E), *Systems engineering – System life cycle processes*
- IEEE Std. 1220-1998, *IEEE Standard for Application and Management of the Systems Engineering Process*
- IEEE/EIA 12207.0-1996, *Industry Implementation of International Standard ISO/IEC 12207:1995, (ISO/IEC 12207) Standard for Information Technology - Software Life Cycle Processes*
- IEEE/EIA 12207.1-1997, *Industry Implementation of International Standard ISO/IEC 12207:1995, (ISO/IEC 12207) Standard for Information Technology – Software life cycle processes – Life cycle data*

- IEEE/EIA 12207.2-1997, *Industry Implementation of International Standard ISO/IEC 12207:1995, (ISO/IEC 12207) Standard for Information Technology - Software Life Cycle Processes - Implementation Considerations*
- IEEE Std. 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology*
- IEEE Std. 1233-1998, *IEEE Guide for Developing System Requirements Specifications*
- IEEE Std. 1028-1997, *IEEE Standard for Software Reviews.*

2.0 ERA Lifecycle Processes

Initial planning for the ERA lifecycle was based on a model and terminology schema that was widely used for major acquisitions in the Department of Defense (DoD) and mapping was provided to the IEEE/EIA adaptation of the international standard specifying software lifecycle processes (ISO/IEC 12207:1995). Use of the IEEE/EIA standard lifecycle model (with tailoring for application at the system-level) insured agency compliance with the provisions of the National Technology Transfer and Advancement Act of 1995, that require federal agencies to discontinue the use of Government unique standards. The ERA procurement stipulates that the Development Contractor propose and use consensus based standards for their development process. Any modifications or changes to this ELC will continue to adhere to this principle. The initial planning model is represented in **Figure 2-1, The ERA Lifecycle**, below:



* There is overlap between the Acquisition and Supply phases during Concept Exploration.

Figure 2-1: The ERA Lifecycle

Recently, the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) issued a standard that specifies a system-level lifecycle model. The new standard (ISO/IEC 15288:2002(E)) "…applies to the full lifecycle of systems, including conception, development, production, utilization, support and retirement of systems, and to the acquisition and supply of systems, whether performed internally or externally to an organization. The lifecycle processes of this International Standard can be applied concurrently, iteratively and recursively to a system and its elements."[1]

[1] ISO/IEC 15288:2002(E), *Systems Engineering – System life cycle processes,* §1.2

The system lifecycle processes are described, within the standard, in four process groups. They are: Agreement processes; Enterprise processes; Project processes; and, Technical processes. The Agreement, Enterprise and Project Processes are management and control oriented and are generally described in §4.0 of this document using the terminology presented in 15288 with some modifications. This section of the ELC describes the activities for the Technical processes as they are to be implemented by the ERA program.

3.0 The ERA Technical Processes

The Technical Processes are used to define the users' requirements and transform them into a usable product, to use the product, to sustain the provision of those services and to dispose of the product when it is retired from service. In this document, the Technical Processes will be described in the context of the increments and releases planned for the implementation of the ERA System. The Technical Processes are:

1. Stakeholder Requirements Definition Process.
2. Requirements Analysis Process.
3. Architectural Design Process.
4. Implementation Process.
5. Integration Process.
6. Verification Process.
7. Transition Process.
8. Validation Process.
9. Operation Process.
10. Maintenance Process.
11. Disposal Process

The projects that will be described are:

1. Systems Analysis and Design
2. Systems Development, Increments 1 through 5
3. Operations and Support

Note: The use of the term "Projects" comes from/is defined by the (ISO/IEC 15288:2002(E)) standard. For purposes of this document the term "projects" in this context is the equivalent of the term "phase" as in lifecycle phases.

3.1 Stakeholder Requirements Definition Process

The first of the Technical Processes is the Stakeholder Requirements Definition Process. During this process the stakeholders' requirement-driven view of the desired services is transformed into a technical view of a required product that could deliver those services.

The standard describes twelve activities for this process. They are:

1. Identify the individual stakeholders or stakeholder classes who have a legitimate interest in the system throughout its lifecycle.
2. Elicit stakeholder requirements.
3. Define the constraints on a system solution that are unavoidable consequences of existing agreements, management decisions and technical decisions.
4. Define a representative set of activity sequences to identify all required services that correspond to anticipated operational support scenarios and environments.
5. Identify the interaction between users and the system.
    a. Physical, mental, and learned capabilities;
    b. Work place, environment and facilities, including other equipment in the context of use;
    c. Normal, unusual, and emergency conditions;
    d. Operator and user recruitment, training and culture.
6. Specify health, safety, security, environment and other stakeholder requirements and functions that relate to critical qualities.
7. Analyze the complete set of elicited requirements.
8. Resolve requirements problems.
9. Feed back the analyzed requirements to applicable stakeholders to ensure that the needs and expectations have been adequately captured and expressed.
10. Establish with stakeholders that their requirements are expressed correctly.
11. Record the stakeholder requirements in a form suitable for requirements management through the lifecycle and beyond.
12. Maintain stakeholder requirements traceability to the sources of stakeholder need.

Activities 1 and 2 were accomplished by the ERA PMO and resulted in the formation of Integrated Product Teams (IPT)s with representatives from the user community. The Mission Needs Statement (MNS), user requirements, NARA coordinated Use Case analysis, Business Case Analysis (BCA), and Concept of Operations (ConOps) satisfy activities 3 through 6. The formal User Conferences, production of the Requirements Document (RD), and the refinement of the requirements and insertion into an automated tracking and control system met the requirements for the remaining activities 7 through 12.

3.2 Systems Analysis and Design Phase

The ERA Systems Analysis and Design Phase begins with the selection of two (2) supplier contractors who will be performing requirements analysis and system design tasks. The main products of this phase are the System Requirements Specification (SyRS), the System Architecture and Requirements Allocation Description (SARAD) and the selection of a single supplier contractor to continue with the development and implementation of the ERA system.

The Systems Analysis and Design Phase is broken into three (3) processes: the Requirements Analysis Process; the Architectural Design Process; and, the Down-select Process as shown in **Figure3-1, Systems Analysis and Design**.

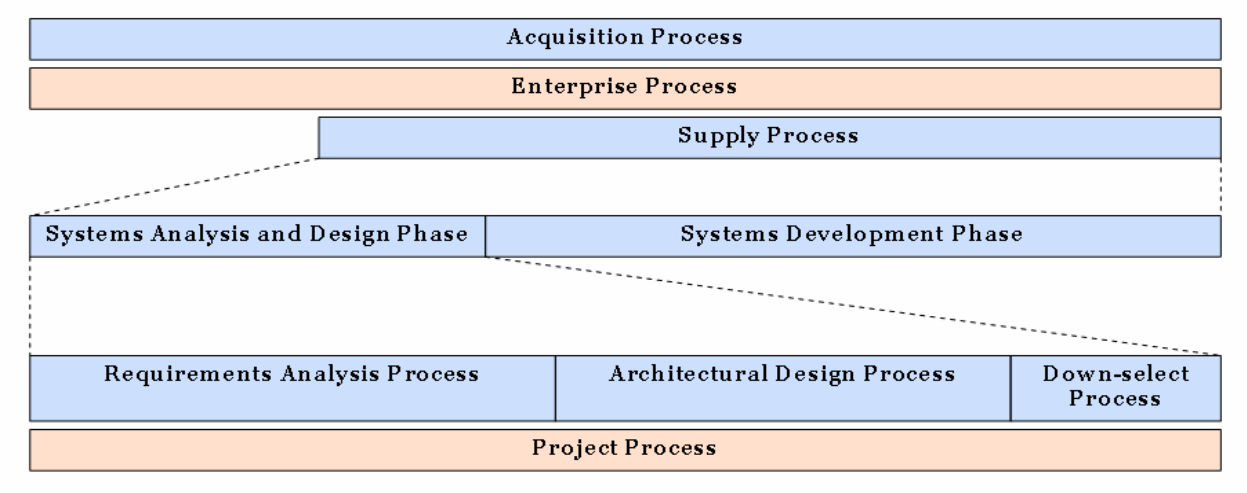


Figure 3-1: Systems Analysis and Design

3.2.1 Requirements Analysis Process

The purpose of the Requirements Analysis Process is to transform the stakeholder, requirement-driven view of desired services into a technical view of a required product that could deliver those services. This process builds a representation of a future system that will meet the stakeholder requirements without implying a specific implementation. The resulting, measurable system requirements will specify the system characteristics and their magnitude in order to satisfy the stakeholder requirements.

The activities performed in support of the purpose described above are:

1. Define the functional boundary of the system in terms of the behavior and properties to be provided.
2. Define each function that the system is required to perform, how well the system, including its operators, is required to perform that function, the conditions under which the system is to be capable of performing the function, the conditions under which the system is to commence performing that function and the conditions under which the system is to cease performing that function.
3. Define necessary implementation constraints that are introduced by stakeholder requirements or are unavoidable solution limitations.
4. Define technical and quality in use measures that enable the assessment of technical achievement.
5. Specify system requirements and functions, as justified by risk identification or criticality of the system, that relate to critical qualities, such as health, safety, security, reliability, availability and supportability.

6. Analyze the integrity of the system requirements to ensure that each requirement, pairs of requirements or sets of requirements possess overall integrity.
7. Demonstrate traceability between the system requirements and the stakeholder requirements.
8. Maintain throughout the system lifecycle the set of system requirements together with the associated rationale, decisions and assumptions.

Each of the two (2) supplier contractors will perform these activities and document them in a SyRS that meets the format and content requirements of IEEE Std. 1233-1998. The ERA PMO will review each contractor's efforts (including the SyRS and supporting documents) via a System Requirements Review (SRR) conducted in accordance with the process specified in the *ERA Technical Review Process (TEP)* document, the ERA QMP, and IEEE Std. 1028-1997 as tailored for application at the system level. The results of the reviews and analysis will be used as inputs to the Down-select Process described in **Section 3.2.3** of this document.

3.2.2 Architectural Design Process

The purpose of the Architectural Design Process is to synthesize a solution that satisfies the system requirements. This process encapsulates and defines areas of solution expressed as a set of separate problems of manageable, conceptual and, ultimately, realizable proportions.[2]

To meet this objective, the standard establishes the following goals for the process:

1. Establishment of an architectural design baseline;
2. Specification of an implementable set of system element descriptions that satisfy the requirements for the system;
3. Incorporation of interface requirements into the architectural design solution;
4. Establishment of traceability of architectural design to system requirements;
5. Definition of a basis for verifying the system elements; and,
6. Establishment of a basis for the integration of system elements.

The standard names several activities to be performed to satisfy the purpose and goals of this process. They are:

1. Define appropriate logical architectural designs.
2. Partition the system functions identified in requirements analysis and allocate them to elements of system architecture. Generate derived requirements as needed for allocations.
3. Analyze the resulting architectural design to establish design criteria for each element.
4. Determine which system elements are allocated to operators.
    a. Limitations of human capabilities;

[2] Additional detail on the synthesis process may be found in IEEE Std 1220-1998, §6.5

b. Human actions critical to safety and how consequences of error are addresses; and,

c. Integration of human performance into systems and their operation.

5. Evaluate alternative design solutions, modeling them to a level of detail that permits comparison against the specifications expressed in the system requirements and the performance, costs, time scales and risks expressed in the stakeholder requirements. This includes:

   a. Assessing and communicating the emergence of adverse system properties resulting from the interaction of candidate system elements or from changes in a system element;

   b. Ensuring that the constraints of enabling systems are taken into account in the design; and,

   c. Performing effectiveness assessments, trade-off analyses and risk analyses that lead toward realizing a feasible, effective, stable and optimized design.

6. Define and document the interfaces between system elements and at the system boundary with external systems.

7. Specify the selected physical design solution as an architectural design baseline in terms of its functions, performance, behavior, interfaces and unavoidable implementation constraints.

8. Record the architectural design information.

9. Maintain mutual traceability between architectural design and system requirements.

Each of the supplier contractors will document their solutions in a System Architecture and Requirements Allocation Description (SARAD) and the ERA PMO will analyze each SARAD and supporting documents. The SARADs will be produced in a format that complies with IEEE/EIA 12207.1-1997 or as specified by mutual agreement. The architectural design and the PMO review will be presented at a System Design Review (SDR) in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. The results of the reviews and analyses will be used as inputs to the Down-select Process described in **Section 3.2.3** of this document.

3.2.3 Down-select Process

The purpose of the Down-select Process is to select one of the two supplier contractors to continue with the development and implementation of the ERA system. The ERA PMO will produce a Source Selection Plan – Down Select (SLP-DS) plan that will detail the criteria and activities of the Down-select Process.

The basic activities of the Down-select Process are:

1. Perform an analysis of the outputs from the supplier contractors, the verification results reports and documented action item or problem resolution activities from the SRRs and SDRs, and any other artifacts related to the activities of the Requirements Analysis Process and the Architectural Design Process.

2. Select the contractor which presents the best value to the Government, taking into consideration its technical solution, its ability to develop and implement that solution, and its costs.
3. Document the selection process, decision and rationale.
4. Communicate the final selection to all concerned parties.

Selection of a single architectural solution and supplier contractor will mark the end of the Systems Analysis and Design Phase of ERA and the beginning of the Systems Development Phase.

3.3 Systems Development Phase

The Systems Development Phase is broken into five (5) increments. The first increment is broken into three (3) releases and the second through fifth increments are broken into, at least, two (2) releases. Each increment results in delivery of an operational component of the ERA system that will be referred to, here, as a product.[3] The first product (Increment 1) will define the Initial Operational Capability (IOC) of the ERA System. Each successive product will add functionality to ERA and deployment and integration of the fifth product will define the Full Operational Capability (FOC) of the ERA System.

The Systems Development Phase will begin with analysis of the system design and selection of functional requirements (derived from the SyRS) to be allocated to each of the five (5) increments as shown in **Figure 3-2, Systems Development**.

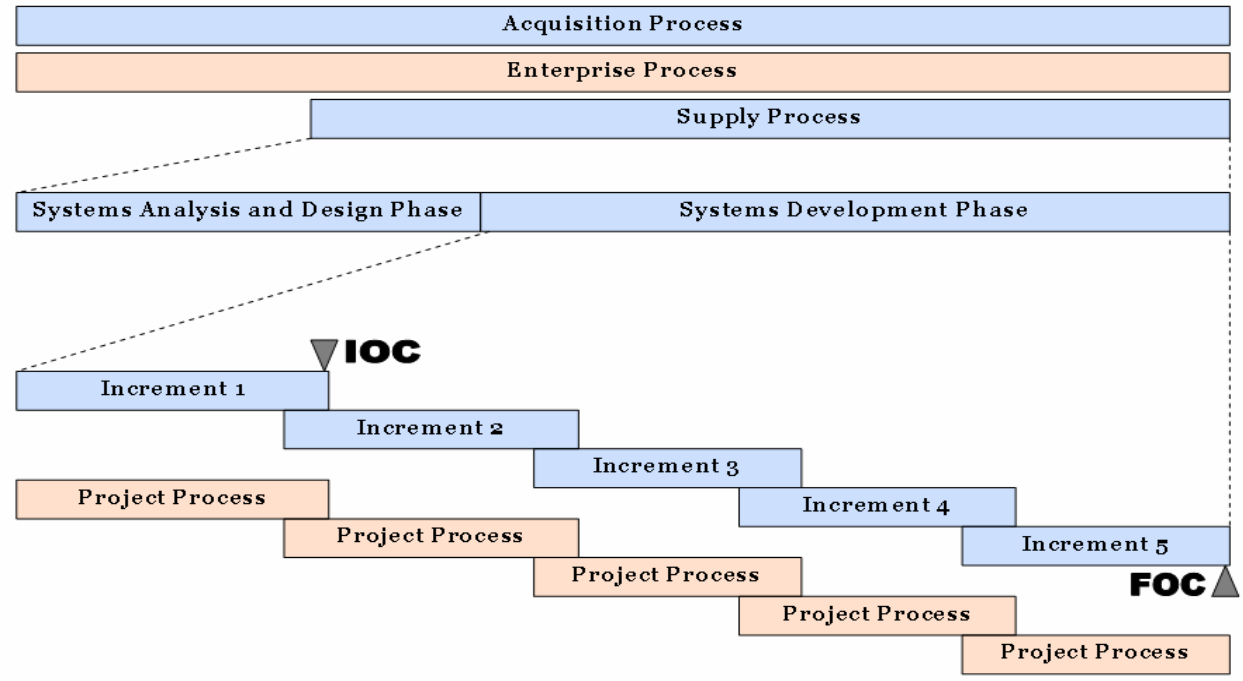


Figure 3-2: Systems Development

[3] It would be helpful here for the reader to refer to the hierarchy of elements in a system in IEEE Std 1220-1998, §1.4.

3.3.1 Increment 1

The first Increment of the Systems Development Phase will result in the delivery of a product representing the IOC of the ERA System. Implementation of this increment will be divided into three releases that will be integrated to form the final product. The processes established for the ERA Increment 1 are as follows:

1. Requirements Analysis Process
2. Architectural Design Process
3. Implementation Process
    a. Release 1
        i. Preliminary Design Process
        ii. Detailed Design Process
        iii. Fabrication and Assembly Process
        iv. Integration Process
        v. Verification Process
        vi. Transition Process
        vii. Validation Process
    b. Release 2
        i. Preliminary Design Process
        ii. Detailed Design Process
        iii. Fabrication and Assembly Process
        iv. Integration Process
        v. Verification Process
        vi. Transition Process
        vii. Validation Process
    c. Release 3
        i. Preliminary Design Process
        ii. Detailed Design Process
        iii. Fabrication and Assembly Process
4. Increment Integration Process
5. Increment Verification Process
6. Increment Transition Process
7. Increment Validation Process
8. Operation Process

9. Maintenance Process

3.3.1.1 Requirements Analysis Process

The purpose of the Requirements Analysis Process for Increment 1 is to assemble the system requirements allocated to the first increment and translate them into a complete set defining the technical view of the product that can deliver the services envisioned for the ERA System IOC.

The activities performed for this process are as follows:

1. Define the functional boundary of the product in terms of the behavior and properties to be provided.
2. Define each function that the product is required to perform, how well the product, including its operators, is required to perform that function, the conditions under which the product is to be capable of performing the function, the conditions under which the product is to commence performing that function and the conditions under which the product is to cease performing that function.
3. Define necessary implementation constraints that are introduced by system requirements or are unavoidable solution limitations.
4. Define technical and quality in use measures that enable the assessment of technical achievement.
5. Specify product requirements and functions, as justified by risk identification or criticality of the product, that relate to critical qualities, such as health, safety, security, reliability, availability and supportability.
6. Analyze the integrity of the product requirements to ensure that each requirement, pairs of requirements or sets of requirements possess overall integrity.
7. Demonstrate traceability between the product requirements and the system requirements.
8. Maintain throughout the system lifecycle the set of product requirements together with the associated rationale, decisions and assumptions.

The output from this process is a Product Requirements Specification (PRS) that meets the format and content requirements of a SyRS as specified in IEEE Std. 1233-1998. The ERA PMO will review the supplier contractor's efforts (including the PRS and supporting documents) via a Product Requirements Review conducted in accordance with the SRR process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the product level.

The Requirements Analysis Process will close upon the successful completion of a Product Requirements Review and a formal Program Director (PD) decision[4] to proceed to the next process.

[4] See the Decision-making Process described in §4.3.4 of this document

3.3.1.2 Architectural Design Process

The purpose of the Architectural Design Process at the increment level is to synthesize a solution that satisfies the product requirements. This process encapsulates and defines areas of solution expressed as a set of separate problems of manageable, conceptual and, ultimately, realizable proportions.

The activities performed to satisfy the purpose of this process are:

1. Define appropriate logical architectural designs.
2. Partition the product functions identified in the requirements analysis and allocate them to product elements (subsystems, assemblies, etc) and to each of three releases for implementation. Generate derived requirements as needed for allocations.
3. Analyze the resulting architectural design to establish design criteria for each element.
4. Determine which product elements are allocated to operators.
5. Evaluate alternative design solutions, modeling them to a level of detail that permits comparison against the specifications expressed in the product requirements and the performance, costs, time scales and risks expressed in the stakeholder and system requirements. This includes:
    a. Assessing and communicating the emergence of adverse properties resulting from the interaction of candidate product elements or from changes in a system or product element;
    b. Ensuring that the constraints of enabling systems are taken into account in the design; and,
    c. Performing effectiveness assessments, trade-off analyses and risk analyses that lead toward realizing a feasible, effective, stable and optimized design.
6. Define and document the interfaces between product elements and at the product boundary with other products within the system.
7. Specify the selected physical design solution as an architectural design baseline in terms of its functions, performance, behavior, interfaces and unavoidable implementation constraints.
8. Record the architectural design information.
9. Maintain mutual traceability between architectural design and product requirements.

The supplier contractor will document their solutions in a Product Architectural Design Description produced in a format that complies with IEEE/EIA 12207.1-1997 or as specified by mutual agreement. The supplier contractor will also produce complete System External Interface Specifications applicable to the ERA operational system at IOC, complete Subsystem Interface Specifications, preliminary Subsystem Specifications and preliminary Human/System Interface Specifications. The product architectural design and the various complete and preliminary specifications will be presented at a Product Design Review in accordance with the process specified in the *ERA TEP* document for an SDR, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Product Architectural Design Process will close upon the successful completion of a Product Design Review and a formal PD decision to proceed to the next process.

3.3.1.3 Implementation Process

The purpose of the Implementation Process is to produce a specified system element, in this case the ERA Increment 1 Product. Specified behavior, interfaces and implementation constraints are transformed into fabrication actions that create the ERA Increment 1 Product. The Increment 1 implementation is partitioned into three (3) releases as defined in the Increment 1 Product Architectural Design Process. The principal activities of the Implementation Process are:

1. Generate an implementation strategy.
2. Identify the constraints that the implementation strategy and implementation technology impose on the design solution.
3. Realize or adapt system elements using the implementation enabling systems and specified materials according to the defined implementation procedures for hardware fabrication, software creation and/or operator training.
4. Record evidence that the system element meets supplier agreements, legislation and organizational policy.
5. Package the system element and store as appropriate.

3.3.1.3.1 Release 1

Increment 1 implementation is divided into three (3) releases as shown in **Figure 3-3, Increment 1 Release 1**. The activities of the first release are described in the following sections.

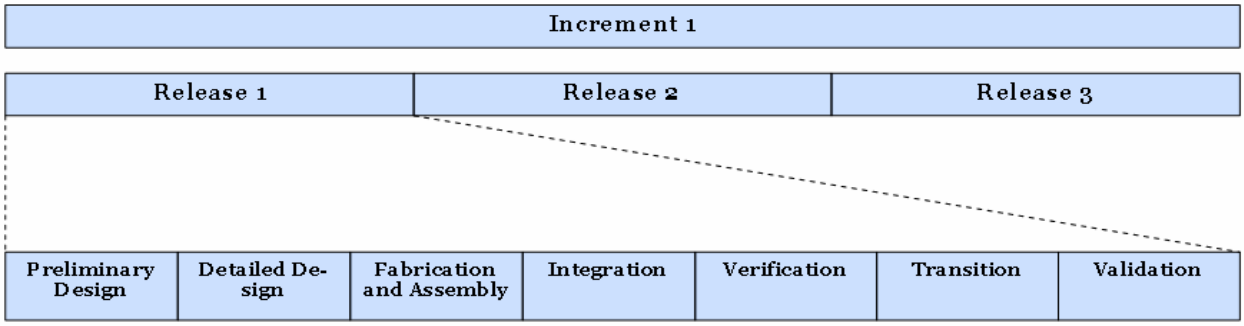


Figure 3-3: Increment 1 Release 1

3.3.1.3.1.1 Preliminary Design Process

In the Preliminary Design Process, subsystem design is initiated and subsystem functions are decomposed into lower-level functions. The principle activities of the Preliminary Design Process are:

1. Identify assemblies and assembly interfaces.
2. Identify components and component interfaces.

3. Mitigate subsystem risks.
4. Assess component risks.
5. Design for lifecycle quality factors.
6. Complete preliminary drawings for each subsystem.
7. Identify human/system interface issues.
8. Revise engineering and technical plans for detailed design.

The preliminary design is documented in the completed Subsystem and Assembly Specifications, completed Component Interface Specifications, and Preliminary Component Specifications. The completed and preliminary specifications are presented at Preliminary Design Reviews (PDRs) conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. PDRs, in a large system implementation effort, are normally conducted for each subsystem. The specifications produced in this process, together with updates to specifications previously delivered, establish the final "design to" baseline and the preliminary "build to" baseline.

The Increment 1 Release 1 Preliminary Design Process will close upon the successful completion of all Preliminary Design Reviews and a formal PD decision to proceed to the next process.

3.3.1.3.1.2 Detailed Design Process

In the Detailed Design Process, subsystem design is completed down to the lowest component level and a component specification and build-to component baseline is established for each. The principle activities of the Detailed Design Process are:

1. Complete component definition (for hardware and software).
2. Resolve component risks.
3. Design in lifecycle quality factors.
4. Identify human/system interface issues.
5. Prepare an integrated data package.
6. Revise engineering and technical plans for fabrication, assembly, integration and test.

The detailed design is documented in the completed specifications. The integrated data packages[5] are presented at Critical Design Reviews (CDRs) conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. CDRs, in a large system implementation effort, are normally conducted for each subsystem and may be conducted at the component level for exceptionally complex components. The specifications and integrated data packages produced in this process, together with updates to previously delivered specifications, establish the final "build to" baseline.

[5] Guidance on the content of an integrated data package may be found in IEEE Std 1220-1998, §4.7

The Increment 1 Release 1 Detailed Design Process will close upon the successful completion of all Critical Design Reviews and a formal PD decision to proceed to the next process.

3.3.1.3.1.3 Fabrication and Assembly Process

The goal of the Fabrication and Assembly Process is to fabricate original components according to the design specifications and in accordance with approved organizational practices, and to assemble the fabricated, customized and unmodified commercial components into the Release 1 delivery. This process includes unit testing of the components in accordance with an agreed process. The process is described in more detail in the **Unit Testing** section of the *ERA Testing Management Plan (TSP)*.

3.3.1.3.1.4 Integration Process

The goal of the Increment 1 Release 1 Integration Process is to assemble the subsystems produced in Release 1 into a product that is consistent with the Increment 1 Product Architectural Design, Release 1 Partition. The principal activities of the Increment 1 Release 1 Integration Process are:

1. Define an assembly sequence and strategy that minimizes product integration risks.
2. Identify the constraints on the design arising from the integration strategy.
3. Obtain integration enabling systems and specified materials according to the defined integration procedures.
4. Obtain product elements in accordance with agreed schedules.
5. Assure that the product elements have been verified against acceptance criteria specified in an agreement.
6. Integrate the product elements in accordance with applicable interface control descriptions and defined assembly procedures, using the specified integration facilities.
7. Record integration information.

Integration testing is conducted during the integration process and is documented in accordance with an agreed process.

3.3.1.3.1.5 Verification Process

The purpose of the Increment 1 Release 1 Verification Process is to confirm that the specified design requirements are fulfilled by the Increment 1 Release 1 delivery. The Verification Process activities are:

1. Define the strategy for verifying the systems throughout the lifecycle.
2. Identify and communicate potential constraints on design decisions.
3. Ensure that the enabling system for verification is available and associated facilities, equipment and operators are prepared to conduct the verification.

4. Conduct verification to demonstrate compliance to the specified design requirements.
5. Make available verification data on the system.
6. Analyze, record and report verification, discrepancy and corrective action information.

At the beginning of the Verification Process, a Test Readiness Review (TRR) for System Test is conducted in accordance with the *ERA TEP* and the *ERA TSP*. After successful completion of the TRR, and upon a PD decision to proceed, formal system testing of the Increment 1 Release 1 delivery is conducted and documented.

Upon successful completion of the formal system testing, problem resolution, fix and retest operations, a Functional Configuration Audit (FCA) is conducted in accordance with the process specified in the *ERA Configuration Management Plan (CMP)*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 1 Release 1 Verification Process will close upon the successful completion of the FCA and a formal PD decision to proceed to the next process.

3.3.1.3.1.6 Transition Process

The purpose of the Increment 1 Release 1 Transition Process is to begin the transition of the delivery to PMO Configuration Control and to verify that the delivered product matches its documentation. The activities performed during the Transition Process are:

1. Prepare a transition strategy.
2. Prepare the site of operation in accordance with installation requirements.
3. Deliver the system for installation at the correct location and time.
4. Install the system in its operational location and interfaced to its environment according to its system specification (the Release 1 partition of the Increment 1 Product Specification).
5. Demonstrate proper operation of the system.
6. Activate the system.
7. Demonstrate the installed system is capable of delivering the required services.
8. Record the installation data, including the operational configuration, anomalies detected, actions taken and lessons learned.

For Increment 1 Release 1 the Transition Process begins with delivery and installation of the Increment 1 Release 1 delivery into the operational environment or simulated operational environment. Next, an Installation Test is conducted to demonstrate that the installed product operates as demonstrated during the System Test conducted in the Verification Process. The Transition Process ends with a Physical Configuration Audit (PCA) conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 1 Release 1 Transition Process will close upon the successful completion of the PCA and a formal PD decision to proceed to the next process.

3.3.1.3.1.7 Validation Process

The purpose of the Increment 1 Release 1 Validation Process is to provide objective evidence that the services provided by the Increment 1 Release 1 delivery comply with stakeholders' requirements. The activities of this process are:

1. Define the strategy for validating the services in the operational environment and achieving stakeholder satisfaction.
2. Prepare a validation plan.
3. Ensure that any operators, enabling system for validation and associated facilities are ready in order to conduct validation.
4. Conduct validation to demonstrate conformance of services to stakeholder requirements.
5. Make available validation data on the system according to legal, regulatory or product sector requirements.
6. As appropriate to agreement terms or organizational objectives, conduct validation to isolate that part of the system giving rise to a non-conformance.
7. Analyze, record and report validation data according to criteria defined in the validation strategy.

The Increment 1 Release 1 Validation Process includes Acceptance Testing and Increment 1 Release 1 Acceptance.

To initiate this process, the ERA PMO will conduct formal Acceptance Testing in accordance with the process specified in the *ERA TSP*. Upon successful completion of the Acceptance Test (AT), after resolution of problems to the satisfaction of the acquisition agency, and after favorable analysis of delivered documentation and audit results, NARA will accept the Increment 1 Release 1 delivery. The Acceptance Criteria will be documented in the *ERA TSP* and the Acceptance Process is documented in the *ERA AS*.

3.3.1.3.2 Release 2

Release 2 is envisioned to build on the infrastructure and business capabilities established in Increment 1 Release 1 as shown in **Figure 3-4, Increment 1 Release 2**. The following paragraphs specify the Release 2 activities.

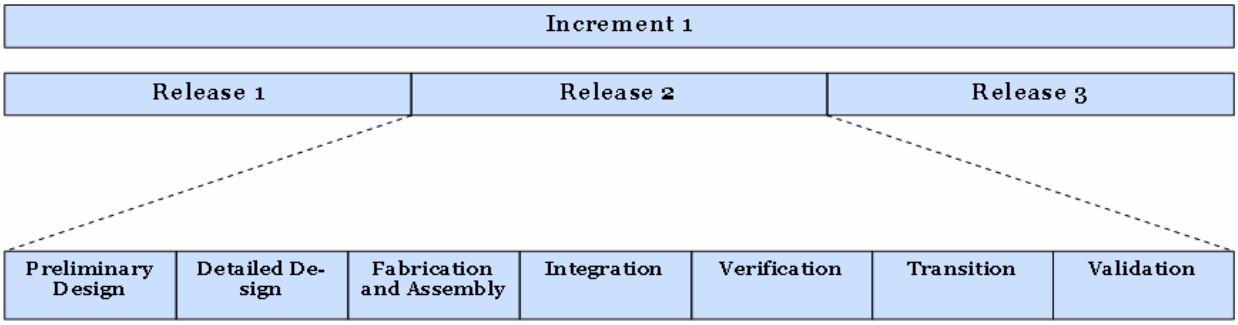


Figure 3-4: Increment 1 Release 2

3.3.1.3.2.1 Preliminary Design Process

In the Preliminary Design Process, subsystem design is initiated and subsystem functions are decomposed into lower-level functions.

Some of the activities of Release 2 may require production of change pages for specifications that were produced during the Release 1 process. The preliminary design is documented in the completed Subsystem and Assembly Specifications, completed Component Interface Specifications, and Preliminary Component Specifications. The completed and preliminary specifications are presented at PDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. PDRs, in a large system implementation effort, are normally conducted for each subsystem. The specifications produced in this process, together with updates to specifications previously delivered, establish the final "design to" baseline and the preliminary "build to" baseline.

The Increment 1 Release 2 Preliminary Design Process will close upon the successful completion of all Preliminary Design Reviews and a formal PD decision to proceed to the next process.

3.3.1.3.2.2 Detailed Design Process

In the Detailed Design Process, subsystem design is completed down to the lowest component level and a component specification and build-to component baseline is established for each component.

The detailed design is documented in the completed specifications or in change pages to previously completed specifications. The integrated data packages and/or change pages to previously produced documents/drawings are presented at CDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. CDRs, in a large system implementation effort, are normally conducted for each subsystem and may be conducted at the component level for exceptionally complex components. The specifications and integrated data packages produced in this process, together with updates to previously delivered specifications, establish the final "build to" baseline.

The Increment 1 Release 2 Detailed Design Process will close upon the successful completion of all Critical Design Reviews and a formal PD decision to proceed to the next process.

3.3.1.3.2.3 Fabrication and Assembly Process

The goal of the Fabrication and Assembly Process is to fabricate original components according to the design specifications and in accordance with approved organizational practices, and to assemble the fabricated, customized and unmodified commercial components into the Release 2 delivery. This process includes unit testing of the components in accordance with an agreed process.

3.3.1.3.2.4 Integration Process

The goal of the Increment 1 Release 2 Integration Process is to assemble the subsystems produced in Release 2 into a delivery that is consistent with the Increment 1 Product Architectural Design, Release 2 Partition.

Integration testing is conducted by the development contractor during the integration process and will be documented in accordance with an agreed process. The *ERA TSP* will be updated to include a reference to the Development Contractor testing process.

3.3.1.3.2.5 Verification Process

The purpose of the Increment 1 Release 2 Verification Process is to confirm that the specified design requirements are fulfilled by the Increment 1 Release 2 delivery.

At the beginning of the Verification Process, a TRR for System Test is conducted in accordance with the *ERA TEP* and *ERA TSP*. After successful completion of the TRR, and upon a PD decision to proceed, formal system testing of the Increment 1 Release 2 delivery is conducted and documented.

Upon successful completion of the formal system testing, problem resolution, fix and retest operations, a FCA is conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 1 Release 2 Verification Process will close upon the successful completion of the FCA and a formal PD decision to proceed to the next process.

3.3.1.3.2.6 Transition Process

The purpose of the Increment 1 Release 2 Transition Process is to begin the transition of the delivery to PMO Configuration Control and to verify that the delivered product matches its documentation.

For Increment 1 Release 2 the Transition Process begins with delivery and integration and installation of the Increment 1 Release 2 delivery into the operational environment or simulated operational environment containing the Release 1 delivery. Next, an Installation Test is conducted to demonstrate that the installed product operates as demonstrated during the System Test conducted in the Verification Process and that there has been no regression of unmodified Release 1 functionality. The Transition Process ends with a PCA conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 1 Release 2 Transition Process will close upon the successful completion of the PCA and a formal PD decision to proceed to the next process.

3.3.1.3.2.7 Validation Process

The purpose of the Increment 1 Release 2 Validation Process is to provide objective evidence that the services provided by the integrated Increment 1 Release 1 and 2 deliveries comply with stakeholders' requirements.

The Increment 1 Release 2 Validation Process includes Acceptance Testing and Increment 1 Release 2 Acceptance.

To initiate this process, the ERA PMO will conduct formal Acceptance Testing in accordance with the process specified in the *ERA TSP*. Upon successful completion of the AT, after resolution of problems to the satisfaction of the acquisition agency, and after favorable analysis of delivered documentation and audit results, NARA will accept the Increment 1 Release 2 delivery. The Acceptance Criteria will be documented in the *ERA TSP* and the Acceptance Process is documented in the *ERA AS*.

3.3.1.3.3 Release 3

Release 3 builds on Releases 1 and 2 and forms the ERA IOC system when complete as shown in **Figure 3-5, Increment 1 Release 3 and IOC**. The following paragraphs specify the Release 3 activities.

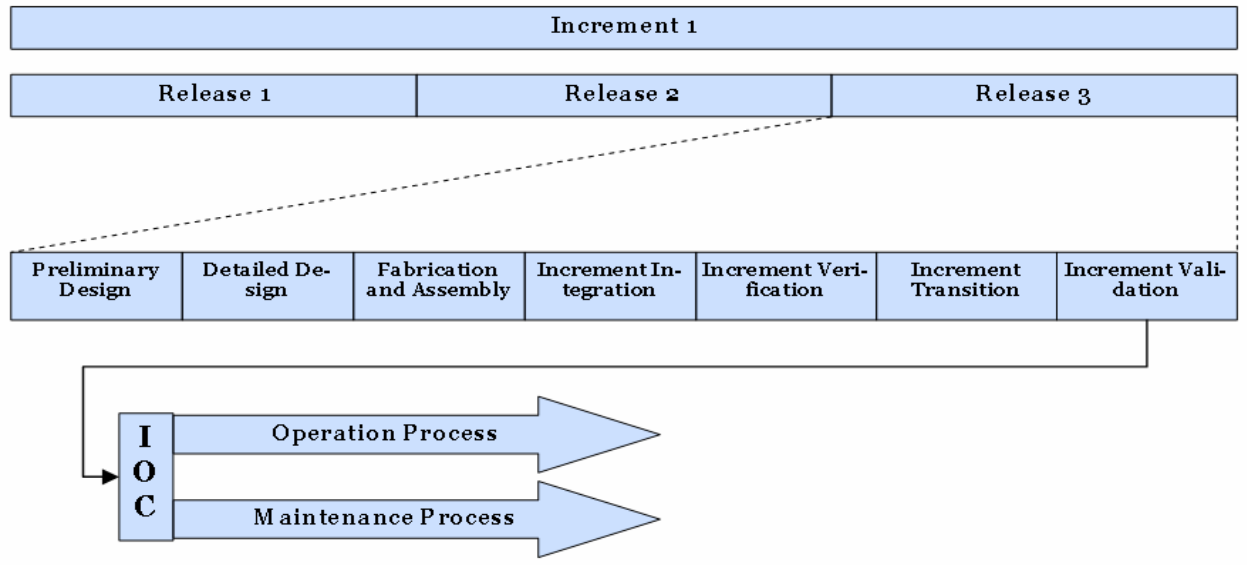


Figure 3-5: Increment 1 Release 3 and IOC

3.3.1.3.3.1 Preliminary Design Process

In the Preliminary Design Process, subsystem design is initiated and subsystem functions are decomposed into lower-level functions.

Some of the activities of Release 3 may require production of change pages for specifications that were produced during the Release 1 & 2 processes. The preliminary design is documented in the completed Subsystem and Assembly Specifications, completed Component Interface

Specifications, and Preliminary Component Specifications. The completed and preliminary specifications are presented at PDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. PDRs, in a large system implementation effort, are normally conducted for each subsystem. The specifications produced in this process, together with updates to specifications previously delivered, establish the final "design to" baseline and the preliminary "build to" baseline.

The Increment 1 Release 3 Preliminary Design Process will close upon the successful completion of all Preliminary Design Reviews and a formal PD decision to proceed to the next process.

3.3.1.3.3.2 Detailed Design Process

In the Detailed Design Process, subsystem design is completed down to the lowest component level and a component specification and build-to component baseline is established for each.

The detailed design is documented in the completed specifications or in change pages to previously completed specifications. The integrated data packages and/or change pages to previously produced documents/drawings are presented at CDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. CDRs, in a large system implementation effort, are normally conducted for each subsystem and may be conducted at the component level for exceptionally complex components. The specifications and integrated data packages produced in this process, together with updates to previously delivered specifications, establish the final "build to" baseline.

The Increment 1 Release 3 Detailed Design Process will close upon the successful completion of all Critical Design Reviews and a formal PD decision to proceed to the next process.

3.3.1.3.3.3 Fabrication and Assembly Process

The goal of the Fabrication and Assembly Process is to fabricate original components according to the design specifications and in accordance with approved organizational practices, and to assemble the fabricated, customized and unmodified commercial components into the Release 3 delivery. This process includes unit testing of the components in accordance with an agreed process.

3.3.1.4 Increment Integration Process

The goal of the Increment 1 Integration Process is to assemble the subsystems produced in Releases 3 with the result of the previous integration of Releases 1 and 2 into a product that is consistent with the Increment 1 Product Architectural Design.

Integration testing is conducted during the integration process and is documented in accordance with the process described in the *ERA TSP*.

3.3.1.5 Increment Verification Process

The purpose of the Increment 1 Verification Process is to confirm that the specified design requirements are fulfilled by the Increment 1 product.

At the beginning of the Verification Process, the TRR for System Test is conducted in accordance with the *ERA TEP* and *ERA TSP*. After successful completion of the TRR and upon a PD decision to proceed, formal system testing of the integrated Release 1, 2 & 3 subsystems operating as the Increment 1 product is conducted and documented.

Upon successful completion of the formal system testing, problem resolution, fix and retest operations, a FCA is conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 1 Verification Process will close upon the successful completion of the FCA and a formal PD decision to proceed to the next process.

3.3.1.6 Increment Transition Process

The purpose of the Increment 1 Transition Process is to establish the IOC, providing services as specified by stakeholder requirements.

For Increment 1 the Transition Process begins with delivery and installation of the Increment 1 Product in the operational environment. Next, an Installation Test is conducted to demonstrate that the installed product operates as demonstrated during the System Test conducted in the Verification Process. The Transition Process ends with a PCA conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 1 Transition Process will close upon the successful completion of the PCA and a formal PD decision to proceed to the next process.

3.3.1.7 Increment Validation Process

The purpose of the Validation Process is to provide objective evidence that the services provided by a system when in use comply with stakeholders' requirements.

The Increment 1 Validation Process includes Acceptance Testing, Product Acceptance and Initial Operational Testing & Evaluation (IOT&E).

To initiate this process, the ERA PMO will conduct formal Acceptance Testing in accordance with the process specified in the *ERA TSP*. Upon successful completion of the AT, after resolution of problems to the satisfaction of the acquisition agency, and after favorable analysis of delivered documentation and audit results, NARA will accept the Increment 1 Product. The Acceptance Criteria will be documented in the *ERA TSP* and the Acceptance Process is documented in the *ERA AS*. Prior to start of operations, the user community is responsible for conducting IOT&E to validate, at a high level, that the product is ready for operational use.

3.3.1.8 Operation Process

According to *ISO/IEC 15288:2002*, the purpose of the Operation Process is to use the system in order to deliver its services. Details of the Operation Process will be specified in this document in a later update.

3.3.1.9 Maintenance Process

According to *ISO/IEC 15288:2002*, the purpose of the Maintenance Process is to sustain the capability of the system to provide a service. Details of the Maintenance Process will be specified in this document in a later update.

3.3.2 Increment 2

The second Increment of the Systems Development Phase will result in the delivery of a product adding functionality to the IOC of the ERA System. Implementation of this increment will be divided into two (2) releases that will be integrated to form the final product. Increment 2 may start after successful completion of the Increment 1 Release 3 Fabrication and Assembly Process. The processes established for the ERA Increment 2 are as follows:

1. Requirements Analysis Process
2. Architectural Design Process
3. Implementation Process
    a. Release 1
        i. Preliminary Design Process
        ii. Detailed Design Process
        iii. Fabrication and Assembly Process
        iv. Integration Process
        v. Verification Process
        vi. Transition Process
        vii. Validation Process
    b. Release 2
        i. Preliminary Design Process
        ii. Detailed Design Process
        iii. Fabrication and Assembly Process
4. Increment Integration Process
5. Increment Verification Process
6. Increment Transition Process
7. Increment Validation Process

8. Operation Process
9. Maintenance Process

3.3.2.1 Requirements Analysis Process

The purpose of the Requirements Analysis Process for Increment 2 is to assemble the system requirements allocated to the first and second increments and translate them into a complete set defining the technical view of the product that can deliver the services envisioned for the integrated ERA Increment 1 and 2 products.

The output from this process is a PRS that meets the format and content requirements of a SyRS as specified in IEEE Std. 1233-1998 (or change pages to the Increment 1 PRS). The ERA PMO will review the supplier contractor's efforts (including the PRS and supporting documents) via a Product Requirements Review conducted in accordance with the SRR process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the product level.

The Requirements Analysis Process will close upon the successful completion of a Product Requirements Review and a formal PD decision to proceed to the next process.

3.3.2.2 Architectural Design Process

The purpose of the Increment 2 Architectural Design Process is to synthesize a solution that satisfies the combined Increment 1 and 2 product requirements. This process encapsulates and defines areas of solution expressed as a set of separate problems of manageable, conceptual and, ultimately, realizable proportions.

The supplier contractor will document their solutions in an integrated Increment 1 and 2 Product Architectural Design Description produced in a format that complies with IEEE/EIA 12207.1-1997 or as specified by mutual agreement. The supplier contractor will also produce complete System External Interface Specifications applicable to the ERA operational system at IOC plus Increment 2, complete Subsystem Interface Specifications, preliminary Subsystem Specifications and preliminary Human/System Interface Specifications. The product architectural design and the various complete and preliminary specifications will be presented at a Product Design Review in accordance with the process specified in the *ERA TEP* document for an SDR, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 2 Architectural Design Process will close upon the successful completion of a Product Design Review and a formal PD decision to proceed to the next process.

3.3.2.3 Implementation Process

The purpose of the Implementation Process is to produce a specified system element, in this case the ERA Increment 2 Product. Specified behavior, interfaces and implementation constraints are transformed into fabrication actions that create the ERA Increment 2 Product. The Increment 2 implementation is partitioned into two (2) releases as defined in the Increment 2 Product Architectural Design Process.

3.3.2.3.1 Release 1

Increment 2 implementation is divided into two (2) releases as shown in **Figure 3-6, Increment 2 Release 1**. The activities of the first release are described in the following sections.

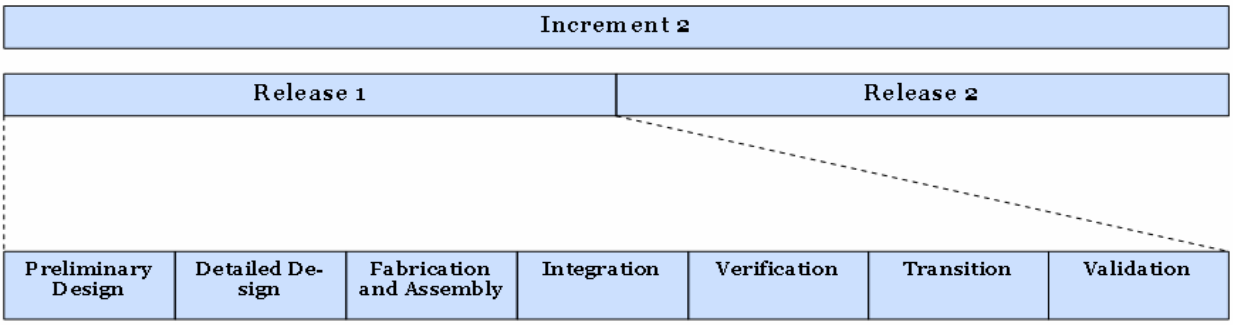


Figure 3-6: Increment 2 Release 1

3.3.2.3.1.1 Preliminary Design Process

In the Preliminary Design Process, subsystem design is initiated and subsystem functions are decomposed into lower-level functions.

The preliminary design is documented in the completed Subsystem and Assembly Specifications, completed Component Interface Specifications, and Preliminary Component Specifications or in change pages to previously produced specifications. The completed and preliminary specifications and change pages are presented at PDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. PDRs, in a large system implementation effort, are normally conducted for each subsystem. The specifications produced in this process, together with updates to specifications previously delivered, establish the final "design to" baseline and the preliminary "build to" baseline.

The Increment 2 Release 1 Preliminary Design Process will close upon the successful completion of all Preliminary Design Reviews and a formal PD decision to proceed to the next process.

3.3.2.3.1.2 Detailed Design Process

In the Detailed Design Process, subsystem design is completed down to the lowest component level and a component specification and build-to component baseline is established for each.

The detailed design is documented in the completed specifications and change pages to previously produced specifications. The integrated data packages and change pages are presented at CDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. CDRs, in a large system implementation effort, are normally conducted for each subsystem and may be conducted at the component level for exceptionally complex components.

The specifications and integrated data packages produced in this process, together with updates to previously delivered specifications establish the final "build to" baseline.

The Increment 2 Release 1 Detailed Design Process will close upon the successful completion of all Critical Design Reviews and a formal PD decision to proceed to the next process.

3.3.2.3.1.3 Fabrication and Assembly Process

The goal of the Fabrication and Assembly Process is to fabricate original components according to the design specifications and in accordance with approved organizational practices, and to assemble the fabricated, customized and unmodified commercial components into the Release 1 delivery. This process includes unit testing of the components in accordance with an agreed process.

3.3.2.3.1.4 Integration Process

The goal of the Increment 2 Release 1 Integration Process is to assemble the subsystems produced in Release 1 into a delivery that is consistent with the Increment 2 Product Architectural Design, Release 1 Partition.

Integration testing is conducted during the integration process and is documented in accordance with an agreed process.

3.3.2.3.1.5 Verification Process

The purpose of the Increment 2 Release 1 Verification Process is to confirm that the specified design requirements are fulfilled by the Increment 2 Release 1 delivery.

At the beginning of the Verification Process, a TRR for System Test is conducted in accordance with the *ERA TEP* and *ERA TSP*. After successful completion of the TRR and upon a PD decision to proceed, formal system testing of the Increment 2 Release 1 delivery is conducted and documented.

Upon successful completion of the formal system testing, problem resolution, fix and retest operations, a FCA is conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 2 Release 1 Verification Process will close upon the successful completion of the FCA and a formal PD decision to proceed to the next process.

3.3.2.3.1.6 Transition Process

The purpose of the Increment 2 Release 1 Transition Process is to begin the transition of the delivery to PMO Configuration Control and to verify that the delivered product matches its documentation.

For Increment 2 Release 1 the Transition Process begins with delivery and integration and installation of the Increment 2 Release 1 delivery into the operational environment or simulated operational environment containing the Increment 1 delivery. Next, an Installation Test is

conducted to demonstrate that the installed product operates as demonstrated during the System Test conducted in the Verification Process and that there has been no regression of unmodified Release 1 functionality. The Transition Process ends with a PCA conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 2 Release 1 Transition Process will close upon the successful completion of the PCA and a formal PD decision to proceed to the next process.

3.3.2.3.1.7 Validation Process

The purpose of the Increment 2 Release 1 Validation Process is to provide objective evidence that the services provided by the integrated Increment 1 and Increment 2 Release 1 deliveries comply with stakeholders' requirements.

The Increment 2 Release 1 Validation Process includes Acceptance Testing and Increment 2 Release 1 Acceptance.

To initiate this process, the ERA PMO will conduct formal Acceptance Testing in accordance with the process specified in the *ERA TSP*. Upon successful completion of the AT, after resolution of problems to the satisfaction of the acquisition agency, and after favorable analysis of delivered documentation and audit results, NARA will accept the Increment 2 Release 1 delivery. The Acceptance Criteria will be documented in the *ERA TSP* and the Acceptance Process is documented in the *ERA AS*.

3.3.2.3.2 Release 2

Release 2 builds on Release 1and forms the O&M process when complete as shown in **Figure 3-7, Increment 2 Release 2 and O&M**. The following paragraphs specify the Release 2 activities.

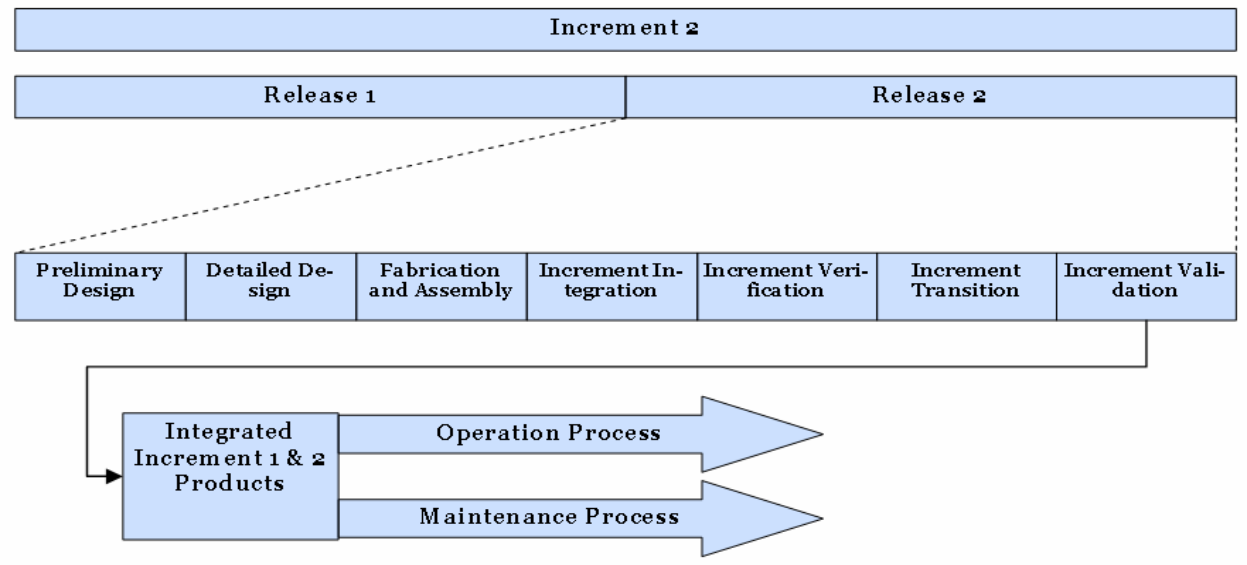


Figure 3-7: Increment 2 Release 2 and O&M

3.3.2.3.2.1 Preliminary Design Process

In the Preliminary Design Process, subsystem design is initiated and subsystem functions are decomposed into lower-level functions.

Some of the activities of Release 2 will involve production of change pages for specifications that were produced during the Release 1 process and in the previous Increment. The preliminary design is documented in the completed Subsystem and Assembly Specifications, completed Component Interface Specifications, and Preliminary Component Specifications. The completed and preliminary specifications and specification change pages are presented at PDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. PDRs, in a large system implementation effort, are normally conducted for each subsystem. The specifications produced in this process, together with updates to specifications previously delivered, establish the final "design to" baseline and the preliminary "build to" baseline.

The Increment 2 Release 2 Preliminary Design Process will close upon the successful completion of all Preliminary Design Reviews and a formal PD decision to proceed to the next process.

3.3.2.3.2.2 Detailed Design Process

In the Detailed Design Process, subsystem design is completed down to the lowest component level and a component specification and build-to component baseline is established for each.

The detailed design is documented in the completed specifications or in change pages to previously completed specifications. The integrated data packages and/or change pages to previously produced documents/drawings are presented at CDRs conducted in accordance with the process specified in the *ERA TEP* document, the *ERA QMP*, and IEEE Std. 1028-1997 as tailored for application at the system level. CDRs, in a large system implementation effort, are normally conducted for each subsystem and may be conducted at the component level for exceptionally complex components. The specifications and integrated data packages produced in this process, together with updates to previously delivered specifications establish the final "build to" baseline.

The Increment 2 Release 2 Detailed Design Process will close upon the successful completion of all Critical Design Reviews and a formal PD decision to proceed to the next process.

3.3.2.3.2.3 Fabrication and Assembly Process

The goal of the Fabrication and Assembly Process is to fabricate original components according to the design specifications and in accordance with approved organizational practices, and to assemble the fabricated, customized and unmodified commercial components into the Release 2 delivery. This process includes unit testing of the components in accordance with an agreed process.

3.3.2.4 Increment Integration Process

The goal of the Increment 2 Integration Process is to assemble the subsystems produced in Increments 1 and 2 into a product that is consistent with the integrated Increment 1 and 2 Product Architectural Design.

Integration testing is conducted during the integration process and is documented in accordance with an agreed process.

3.3.2.5 Increment Verification Process

The purpose of the Increment 2 Verification Process is to confirm that the specified design requirements are fulfilled by the integrated Increment 1 and 2 products.

At the beginning of the Verification Process, the TRR for System Test is conducted in accordance with the *ERA TEP* and *ERA TSP*. After successful completion of the TRR and upon a PD decision to proceed, formal system testing of the integrated Increment 1 and 2 product is conducted and documented.

Upon successful completion of the formal system testing, problem resolution, fix and retest operations, a FCA is conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 2 Verification Process will close upon the successful completion of the FCA and a formal PD decision to proceed to the next process.

3.3.2.6 Increment Transition Process

The purpose of the Increment 2 Transition Process is to establish an operational capability, consisting of the combined functions defined for the Increment 1 and 2 products, providing services as specified by stakeholder requirements.

For Increment 2 the Transition Process begins with delivery, installation and integration of the Increment 2 Product in the operational environment containing the Increment 1 Product. Next, an Installation Test is conducted to demonstrate that the installed product operates as demonstrated during the System Test conducted in the Verification Process without regression of unmodified Increment functionality. The Transition Process ends with a PCA conducted in accordance with the process specified in the *ERA CMP*, and IEEE Std. 1028-1997 as tailored for application at the system level.

The Increment 2 Transition Process will close upon the successful completion of the PCA and a formal PD decision to proceed to the next process.

3.3.2.7 Increment Validation Process

The purpose of the Validation Process is to provide objective evidence that the services provided by a system when in use comply with stakeholders' requirements.

The Increment 2 Validation Process includes Acceptance Testing, Product Acceptance and Operational Testing & Evaluation (OT&E).

To initiate this process, the ERA PMO will conduct formal Acceptance Testing in accordance with the process specified in the *ERA TSP*. Upon successful completion of the AT, after resolution of problems to the satisfaction of the acquisition agency, and after favorable analysis of delivered documentation and audit results, NARA will accept the Increment 2 Product. The Acceptance Criteria will be documented in the *ERA TSP* and the Acceptance Process is documented in the *ERA AS*. Prior to start of operations for the Integrated Increment 1 and 2 Products, the user community is responsible for conducting OT&E to validate, at a high level, that the product is ready for operational use.

3.3.2.8 Operation Process

According to *ISO/IEC 15288:2002*, the purpose of the Operation Process is to use the system in order to deliver its services. Details of the Operation Process will be specified in this document in a later update.

3.3.2.9 Maintenance Process

According to *ISO/IEC 15288:2002*, the purpose of the Maintenance Process is to use the system in order to deliver its services. Details of the Maintenance Process will be specified in this document in a later update.

3.3.3 Increments 3 through 5

The Increment 3 through 5 processes will be similar to those conducted for Increment 2.

4.0 Management and Control Processes

The Agreement, Enterprise and Project processes, described in the ISO/IEC standard, are primarily made up of the planning, management and control activities of the system lifecycle. This section describes these processes in general terms and relates them to the activities of the ERA PMO. Those activities are already completed, in process or planned and correspond to the Acquisition and Supply Primary Lifecycle Processes, the Supporting Lifecycle Processes and the Organizational Lifecycle Processes described in ISO/IEC 12207:1995.

4.1 Agreement Processes

The Agreement Processes provide the means for conducting a project in which the result is a product or service that is delivered to the acquirer or for establishing agreement with organizational entities. The process consists of the following:

- The Acquisition Process – used by organizations for acquiring products or services; and,
- The Supply Process – used by organizations for supplying products or services.

4.1.1 Acquisition Process

The purpose of the Acquisition Process is to obtain a product or service in accordance with the acquirer's requirements. Specific details of the Acquisition Process defined for the ERA program are contained in the *ERA PMP, ERA AS* and the *ERA COTP*. The general goals of an acquisition process are to:

- Establish a strategy for the acquisition.
- Select a supplier.
- Maintain communication with the supplier.
- Declare a justification for the selection.
- Establish an agreement to acquire a product or service according to defined acceptance criteria.
- Accept a product or service that complies with the agreement.
- Render payment or other consideration.

These goals are achieved through the performance of the following activities:

- Establish a plan for how the acquisition will be conducted.
- Prepare a request for the supply of a product or service.
- Communicate the request for the supply of a product or service to identified suppliers.
- Select a supplier.
- Negotiate an agreement with the supplier.

- Assess the execution of the agreement.
- Confirm that the delivered product or service complies with the agreement.
- Make payment or provide other agreed consideration to the supplier for the product or service rendered.

4.1.2 Supply Process

The purpose of the Supply Process is to provide an acquirer with a product or service that meets agreed requirements. Specific details of the Supply Process for the ERA program may be found in the *ERA COTP, ERA AS,* and in contractor supplied program management documentation. The goals of the Supply Process are to:

- Identify an acquirer for a product or service.
- Make a response to the acquirer's request.
- Establish an agreement to supply a product or service according to defined acceptance criteria.
- Maintain communication with the acquirer.
- Supply a product or service conforming to the agreement according to agreed delivery procedures.
- Transfer responsibility for the acquired product or service as directed by the agreement.
- Receive payment or other agreed consideration.

The activities of this process are:

- Determine the existence and identity of an acquirer who has, or who represents a party or parties having, a need for a product or service.
- Evaluate a request for the supply of a product or service to determine feasibility and how to respond.
- Prepare a response that satisfies the solicitation.
- Negotiate an agreement with the acquirer.
- Execute the agreement according to the Supplier's established project plans and in accordance with the agreement.
- Assess the execution of the agreement.
- Deliver the product or service in accordance with the agreement criteria.
- Accept and acknowledge payment or other agreed consideration.
- Transfer responsibility for the product or service to the acquirer, or other party, as directed by the agreement.

4.2 Enterprise Processes

The Enterprise Processes manage NARA's capability to acquire and the supplier contractor's capability to supply products or services through the initiation, support and control of projects. They provide the resources and infrastructure necessary to support projects and ensure the satisfaction of the ERA program objectives and established agreements.

Though current convention would normally reserve use of the term "Enterprise" to define the totality of the NARA IT program, it is used in this document to encompass the ERA Program as a whole. This is done to facilitate application of the specific sub-processes related to the management of an Enterprise, as defined in ISO/IEC 15288:2002(E), to equivalent management activities that are undertaken at the ERA program level. Specific information describing ERA Program execution of these sub-processes is found in several ERA program-level documents that will be cited in each of the sub-process descriptions. Additional detail describing ERA Program activities will be added in the next version release (4.0) of this document.

The ERA acquisition begins with a Requirements Analysis and System Definition activity followed by implementation and delivery in five increments. Each increment delivers an operational product with an IOC established by the product delivered for the first increment. The products delivered with each subsequent increment will result in enhancement of the operational capability of each previous increment, culminating in a FOC with the Increment 5 delivery that fulfills all of the ERA program objectives. The incremental acquisition is illustrated in **Figure 4-1, The ERA Incremental Acquisition**.

The Enterprise Processes consist of the following:

- Enterprise Environment Management Process;
- Investment Management Process;
- System Lifecycle Processes Management Process;
- Resource Management Process; and,
- Quality Management (QM) Process

4.2.1 Enterprise Environment Management Process

The principal objectives of the Enterprise Environment Management Process are to:

- Provide the policies and procedures for the strategic management of the system lifecycles.
- Define accountability and authority for system lifecycle management.
- Provide a policy for the improvement of system lifecycle processes.

The activities defined to meet the objectives named above are:

- Establish plans for each business area.
- Prepare system lifecycle policies and procedures that implement the requirements of the system lifecycle standard and are consistent enterprise strategic and business area plans.

- Define, integrate, and communicate the roles, responsibilities and authorities to facilitate implementation of system lifecycle processes and the strategic management of system lifecycles.
- Define the criteria that control progression through the system lifecycle.
- Conduct periodic reviews of the system lifecycle model used by each project.
- Communicate to the projects the policies and procedures adopted by the enterprise that implement the lifecycle model chosen by the enterprise.

Detailed information related to the conduct of these activities may be found in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

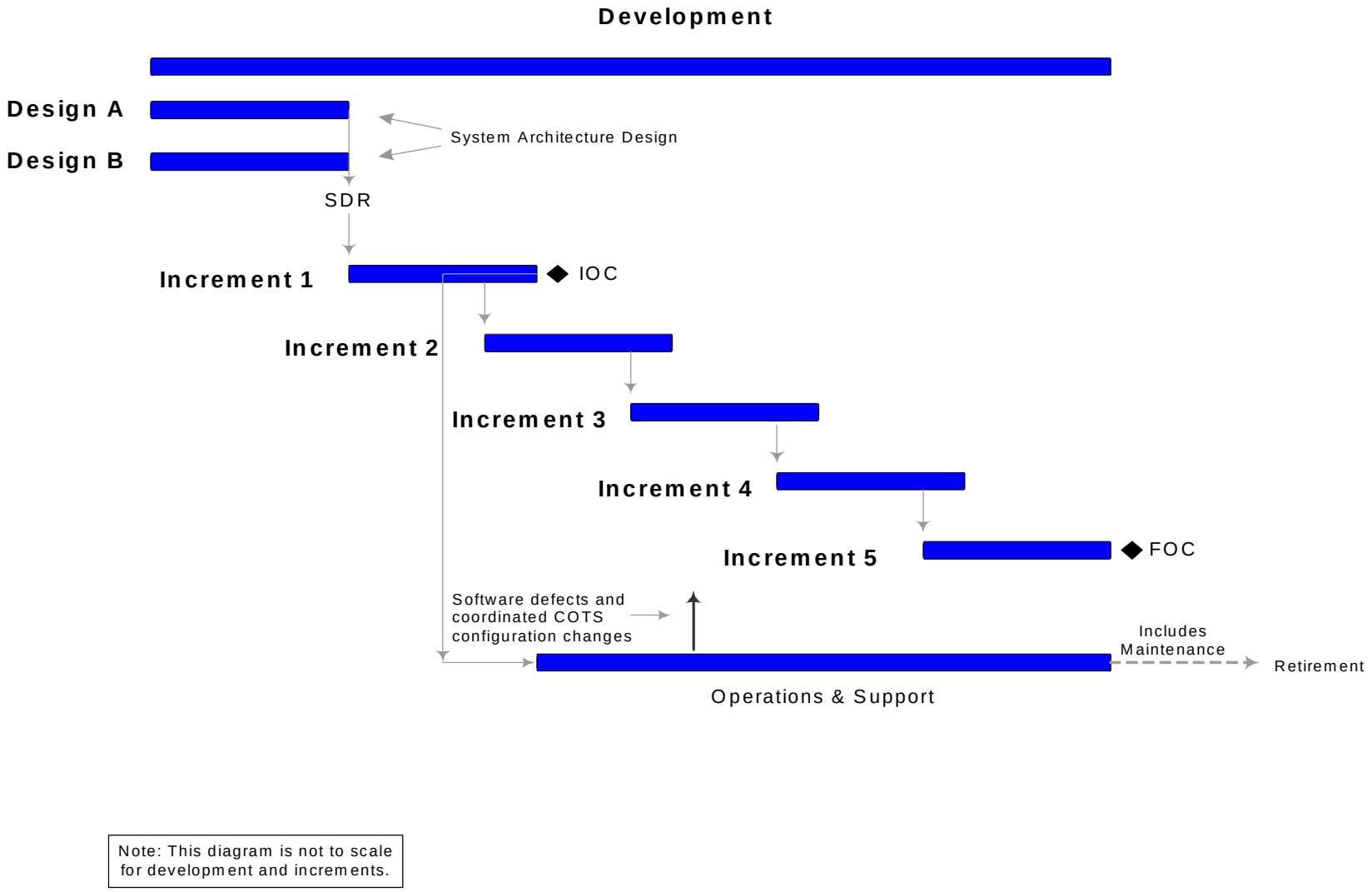


Figure 4-1: The ERA Incremental Acquisition

4.2.2 Investment Management Process

The principal objectives of the Investment Management Process are to:

- Identify and allocate resources and budgets.
- Define project management accountabilities and authorities.
- Sustain the projects that meet agreement, stakeholder and organizational requirements.
- Redirect or terminate the projects that do not meet agreement, stakeholder or organizational requirements.

The activities defined to meet the objectives are:

- Define projects, accountabilities and authorities.
- Identify the expected outcomes of the projects.
- Allocate resources for the achievement of project objectives.
- Identify any multi-project interfaces that must be managed or supported by the project. This includes the use of enabling systems used by more than one project and the use of common system elements by more than one project.
- Specify the project reporting requirements and review milestones that will govern the execution of the project.
- Authorize the project to commence execution of approved project plans, including the technical plans.
- Evaluate ongoing projects to confirm that:
    - Projects are making progress towards achieving established goals;
    - Projects are complying with project directives;
    - Projects are being conducted according to system lifecycle plans and procedures; and,
    - Projects remain viable, as indicated by, for example, continuing need for the service, practicable product implementation, and acceptable investment benefits.
- Act to continue or redirect projects that are satisfactorily progressing or can be expected to progress satisfactorily by appropriate redirection.
- Act to cancel or suspend projects whose disadvantages or risks to the organization outweigh the benefits of continued investments, where agreements permit this.

Within the ERA program, several projects will be implemented. The first project is currently defined as Systems Analysis & Design. During this project, two supplier contractors will produce a System Requirements Specification (SyRS) and a System Architecture and Requirements Allocation Description (SARAD). The SyRS documents will be subjects of separate System Requirements Reviews (SRR)s and the SARAD documents will be subjects of separate System Design Reviews (SDR)s. The project output will be the selection of a single

supplier contractor to continue with the development and implementation of the ERA system. Subsequently, the ERA increments will be treated as separate projects, each delivering an operational product.

Detailed information related to the conduct of these activities may be found in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

4.2.3 System Lifecycle Processes Management Process

The objectives of the System Lifecycle Processes Management Process are to:

- Define system lifecycle processes for use by the organization.
- Define the policy to apply the system lifecycle processes.
- Define the policy to adapt system lifecycle processes to meet the needs of individual projects.
- Define the measures used to evaluate the application of the system lifecycle processes.
- Undertake improvements to the definition and application of system lifecycle processes.

The activities performed to meet the objectives of the System Lifecycle Processes Management Process are:

- Establish standard sets of system lifecycle processes for applicable system lifecycle stages.
- Establish acceptable tailoring and application policies and procedures, with approval requirements.
- Identify methods and tools that support system lifecycle process execution.
- Establish measures wherever possible that determine performance of the implemented standard processes.
- Monitor process execution, store and analyze process measures, and identify trends with respect to enterprise criteria.
- Identify opportunities for improvement of standard system lifecycle process implementation.
- Improve processes, methods and tools as determined.

Detailed information related to the conduct of these activities may be found in this document and in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

4.2.4 Resource Management Process

A successful implementation of the Resource Management Process meets the following objectives:

- Necessary resources, materials and services are provided to projects.
- Skills of personnel are maintained or enhanced.
- Conflicts in multi-project resource demands are resolved.

The Resource Management Process activities are to:

- Determine and provide the resource infrastructure support needed to implement the requirements of the organizations lifecycle model and provide project support.
- Obtain resources other than personnel necessary to staff ongoing projects.
- Maintain and manage the pool of personnel necessary to staff ongoing projects.
- Motivate staff, e.g. through career development and reward mechanisms.
- Control multi-project management interfaces to resolve schedule conflicts:
    - Of capacity in organizational infrastructure and supporting services and resources among ongoing projects; and,
    - From project personnel being over-committed.

Detailed information related to the conduct of these activities may be found in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

4.2.5 Quality Management (QM) Process

The objectives of the QM Process are to:

- Define organizational QM policies and procedures.
- Define organizational QM goals and objectives.
- Define accountability and authority for QM.
- Monitor the status of customer satisfaction.
- Take appropriate action when quality goals are not achieved.

To accomplish these goals, the following activities are performed:

- Establish QM policies, standards and procedures.
- Define responsibilities and authority for implementation of QM.
- Assess and report customer satisfaction.
- Conduct periodic reviews of project quality plans.
- Monitor the status of quality improvements on products and services.

Detailed information related to the conduct of these activities may be found in the *ERA QMP* and in contractor supplied quality management documentation. Additional detail will be added in the Version 4.0 release of this document.

4.3 Project Processes

NARA will manage the implementation of the ERA program in a series of six (6) projects. The first project is defined to begin with the selection of two (2) supplier contractors who will each produce a SyRS as well as a documented system design and requirements allocation schema. On the basis of a comparison of the products submitted by both contractors, NARA will select a single supplier contractor to continue with the implementation. Thus, the output of the first project will be the selection of the supplier/contractor. As is the case of the Enterprise process, the application of the term "Project" in this context was done to facilitate the mapping of these sub-processes to strategic components of the ERA acquisition.

NARA will then proceed with an incremental implementation of the ERA system. Each increment will result in the delivery of an operational capability. The output of Increment 1 (the second project) will provide an IOC. Increment 2 will deliver an operational product with new capabilities as well as capability enhancements for the Increment 1 product. And so on, through delivery of Increment 5 which, when integrated with the system built through the previous increments, will present a FOC that meets all of the functional requirements of the ERA System.

The Project Processes are used to establish and evolve project plans, to assess actual achievement and progress against the plans and to control execution of the project through to fulfillment. The Project Processes may be tailored to fit the special needs of the ERA Program's down-select process and the individual increments. They will be presented in this document as generally applicable to all ERA projects. Detail will be presented in this document for establishment of the Technical Processes as applied for each project. The Project Processes consist of the following:

- Project Planning Process;
- Project Assessment Process:
- Project Control Process;
- Decision-making Process;
- Risk Management Process:
- Configuration Management (CM) Process; and,
- Information Management Process.

4.3.1 Project Planning Process

The purpose of the Project Planning Process is to produce and communicate effective and workable project plans. The objectives of this process are to:

- Make project plans available.
- Define roles, responsibilities and authorities.
- Formally request the resources and services necessary to achieve the project objectives.
- Define project performance measures.

- Direct project staff in accordance with the project plans.

The activities required for meeting these objectives are as follows:

- Identify the project objectives and constraints.
- Define the project scope.
- Establish a work breakdown structure based on the evolving system architecture.
- Define and maintain a project schedule based on project objectives and work estimates.
- Define project achievement criteria for the lifecycle stage decision gates, delivery dates and major dependencies on external inputs or outputs.
- Define the project costs and plan a budget.
- Establish the structure of authorities and responsibilities for project work.
- Define the infrastructure and services required by the project.
- Plan the acquisition of materials, goods and enabling system services supplied from outside the project.
- Generate and communicate a plan for technical management of the project, including reviews.
- Define the project measures to be generated and the associated data to be collected, validated and analyzed.
- Generate a project quality plan.

Detailed information related to the conduct of these activities may be found in contractor supplied project management plans and in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

4.3.2 Project Assessment Process

The purpose of the Project Assessment Process is to determine the status of the project. Successful implementation of this process will insure that:

- Project performance measures or assessment results are available.
- Adequacy of roles, responsibilities and authorities is assessed.
- Adequacy of resources and services necessary to achieve the project is assessed.
- Adequacy of resources and services necessary to achieve the project is assessed.
- Deviations in project performance indicators are analyzed.
- Concerned parties are informed of project status.

The activities that are performed in this process are:

- Assess project status against appropriate plans to determine actual and projected cost, schedule and quality variations.

- Perform QA in accordance with project plans.
- Assess the effectiveness of project team structure, roles and responsibilities.
- Assess the adequacy and availability of the project's supporting infrastructure.
- Assess project progress using measured achievement and milestone completion.
- Conduct required management and technical reviews, audits and inspections to determine readiness to proceed to the next stage of the system lifecycle or project milestone.
- Monitor critical processes and new technologies.
- Analyze data and measures to identify deviations or variations from planned values or status and make appropriate recommendations for corrections.
- Provide periodic status reports and required deviation reports as designated in the agreement, policies and procedures.

Detailed information related to the conduct of these activities may be found in contractor supplied project management plans and in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

4.3.3 Project Control Process

The purpose of the Project Control Process is to direct project plan execution and ensure that the project performs according to the plans and schedules, within project budgets and it satisfies technical objectives. This includes redirecting the project activities, as appropriate, to correct identified deviations and variations from other project management or technical processes.

The objectives of the Project Control Process are to:

- Define and direct corrective action when project achievement is not meeting planned targets.
- Initiate project re-planning when project objectives or constraints have changed, or when planning assumptions are shown to be invalid.
- Authorize project action to progress (or not) from one scheduled milestone or event to the next.
- Achieve project objectives.

The following are the specific Process Control Process activities:

- Manage project requirements and changes to requirements in accordance with the project plans.
- Initiate the corrective actions needed to achieve the goals and outputs of project tasks that have deviated outside acceptable or defined limits.
- Initiate preventive actions, as appropriate, to ensure achievement of the goals and outputs of the project.
- Initiate problem resolution actions to correct non-conformances.

- Evolve with time the scope, definition and the related breakdown of the work to be carried out by the project in response to the corrective action decisions taken and the estimated changes they introduce.
- Initiate change actions when there is a contractual change to cost, time or quality due to the impact of an acquirer or supplier request.
- Act to correct defective provision of acquired goods and services through constructive interaction with the supplier.
- Authorize the project to proceed toward the next milestone or event if justified.

Detailed information related to the conduct of these activities may be found in contractor supplied project management plans and in the *ERA PMP*, its appendixes, and subordinate documents. Additional detail will be added in the Version 4.0 release of this document.

4.3.4 Decision-making Process

The purpose of the Decision-making Process is to select the most beneficial course of project action where alternatives exist. The goals of the process are to:

- Define a decision-making strategy.
- Define alternative courses of action.
- Select a preferred course of action.
- Capture and report the resolution, decision rationale and assumptions.

The activities of the Decision-making Process are:

- Define a decision-making strategy.
- Involve relevant parties in the decision-making in order to draw on experience and knowledge.
- Identify the circumstances and need for a decision.
- Select and prepare the decision-making strategy for each decision situation. Identify desired outcomes and measurable success criteria.
- Evaluate the balance of consequences of alternative actions, using the defined decision-making strategy, to arrive at an optimization of, or an improvement in, an identified decision situation.
- Record, track, evaluate and report decision outcomes to confirm that problems have been effectively resolved, adverse trends have been reversed and advantage has been taken of opportunities.
- Maintain records of problems and opportunities and their disposition, as stipulated in agreements or organizational procedures and in a manner that permits auditing and learning from experience.

4.3.5 Risk Management Process

The purpose of the Risk Management Process is to reduce the effects of uncertain events that may result in changes to quality, cost, schedule or technical characteristics. The goals of the process are to:

- Identify and categorize risks.
- Quantify the probabilities and consequence of risks.
- Specify a strategy to treat each risk.
- Make available and communicate risk status.
- Act upon risks that have become unacceptable.

To achieve the goals stated above the following activities are performed:

- Establish a systematic approach to risk identification, assessment and treatment.
- Identify and define the risks.
- Determine the probability associated with risk occurrence using the established risk criteria.
- Evaluate the risks in terms of their possible consequences using the established criteria.
- Prioritize the risks in terms of their probability and consequences.
- Determine the risk treatment strategies.
- Define a threshold of acceptability for each identified risk.
- Identify the risk treatment actions to follow if the threshold of acceptability is exceeded.
- Communicate the risk treatment actions and their status in accordance with the agreement, policies and procedures.
- Maintain a register of risk throughout the lifecycle.

Detailed information related to the conduct of these activities may be found in contractor supplied risk management plans and in the *ERA RKM*. Additional detail will be added in the Version 4.0 release of this document.

4.3.6 Configuration Management Process

The purpose of the CM Process is to establish and maintain the integrity of all identified outputs of a project or process and make them available to concerned parties. The goals of this process are to:

- Define a CM strategy.
- Define items requiring CM.
- Establish configuration baselines.

- Control changes to items under CM.
- Control the configuration of released items.
- Make the status of items under CM available throughout the lifecycle.

The following are the activities required to accomplish the goals named above:

- Define a CM strategy.
- Identify items that are subject to configuration control.
- Maintain information on configurations with an appropriate level of integrity and security.
- Ensure that changes to configuration baselines are properly identified, recorded, evaluated, approved, incorporated, and verified.

Detailed information related to the conduct of these activities may be found in contractor supplied configuration management plans and in the *ERA CMP*. Additional detail will be added in the Version 4.0 release of this document.

4.3.7 Information Management Process

The purpose of the Information Management Process is to provide relevant, timely, complete, valid, and, if required, confidential information to designated parties during and, as appropriate, after the system lifecycle. The goals of this process are to:

- Identify the information that is to be managed.
- Define the forms of information representations.
- Transform and dispose of information as required.
- Record the status of information.
- Insure that information is complete, current and valid.
- Insure that information is made available to designated parties.

The following are the activities performed to achieve those goals:

- Define the items of information that will be managed during the system lifecycle and, according to organizational policy or legislation, maintained for a defined period beyond.
- Designate authorities and responsibilities regarding the origination, generation, capture, archiving and disposal of items of information.
- Define the rights, obligations and commitments regarding the retention of, transmission of and access to information items.
- Define the content, semantics, formats and medium for the representation, retention, transmission and retrieval of information.
- Obtain the identified items of information.

- Maintain information items and their storage records according to integrity, security and privacy requirements.
- Define information maintenance actions.
- Retrieve and distribute information to designated parties as required by agreed schedules or defined circumstances.
- Provide official documentation as required.
- Archive designated information, in accordance with the audit and knowledge retention purposes.
- Dispose of unwanted, invalid or unverifiable information according to organizational policy, and security and privacy requirements.

Detailed information related to the conduct of these activities may be found in contractor supplied communications management plans and in the *ERA Communications Plan*. Additional detail will be added in the Version 4.0 release of this document.