United States General Accounting Office

GAO

Report to the Chairman, Subcommittee on Transportation, Treasury and Independent Agencies, Committee on Appropriations, House of Representatives

August 2003

RECORDS MANAGEMENT

National Archives and Records Administration's Acquisition of Major System Faces Risks

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National Archives and Records Administration's Acquisition of Major System Faces Risks

Why GAO Did This Study

Increasingly, government records involve documents that are electronically created and stored. In support of its mission to manage and archive these records and ensure access to the "essential evidence" that they contain, the National Archives and Records Administration (NARA) is acquiring an advanced Electronic Records Archives (ERA). GAO was asked to determine, among other things, how the ERA program's system acquisition policies, plans, and practices conform to industry standards and how well NARA is meeting the ERA program's cost and schedule.

What GAO Recommends

To reduce the risks associated with NARA's efforts to design and acquire ERA, GAO recommends that the U.S. Archivist direct the NARA Chief Information Officer to take a range of actions, including revising key planning documents and developing a schedule that is based on a comprehensive work breakdown structure (including associated costs and other resources).

In comments on the draft report, the Archivist of the United States accepted our recommendations and provided an update on NARA's efforts to implement them. The Archivist also provided additional information on the ERA acquisition schedule.
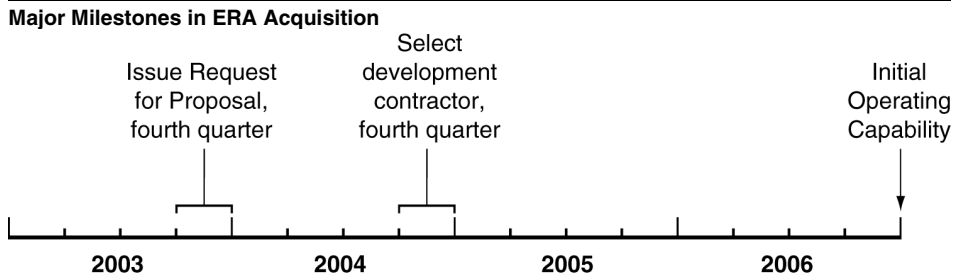
www.gao.gov/cgi-bin/getrpt?GAO-03-880.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Linda Koontz at (202) 512-6240 or koontzl@gao.gov.

What GAO Found

The ERA program's acquisition policies, plans, and practices do not consistently conform to industry standards. In developing the plans and policies to guide its acquisition of the ERA system, NARA elected to follow recognized industry standards set forth by the Institute of Electrical and Electronics Engineers (IEEE). However, key policy and planning documents are missing elements that are required by the standards. For example, one key document is the concept of operations, which should describe the characteristics of a proposed system from the users' viewpoint. The *ERA Concept of Operations* does not include several key elements required by the IEEE standard, including a complete description of the proposed system. Because these policy and planning documents form the basis of the acquisition, such shortcomings could result in serious long-term risks to the cost, schedule, and performance of the ERA program.

NARA cannot adequately track the cost and schedule of the ERA program. A comprehensive schedule with an appropriate work breakdown structure is a prerequisite to program tracking, as it allows managers to measure how well the program is achieving its cost and schedule goals. To achieve upcoming major milestones (some of which are shown in the figure), the program must successfully complete a complex series of tasks. However, the program schedule omits significant tasks and activities; for example, it does not include the process to reengineer the agency's life cycle business processes, which will be crucial to defining requirements. In addition, the schedule lacks a work breakdown structure, which would allow accurate estimates of the resources and time required for each work activity. If NARA cannot track how well the program is meeting cost and schedule, the risk is increased that funds may not be used efficiently or effectively, quality problems may limit the usefulness of the resulting system, and the system may not be delivered according to established milestones.

Major Milestones in ERA Acquisition

Issue Request for Proposal, fourth quarter

Select development contractor, fourth quarter

Initial Operating Capability

2003   2004   2005   2006

Source: NARA.

Contents

Abbreviations

ERA   Electronic Records Archives
IEEE   Institute of Electrical and Electronics Engineers
IT   information technology
NARA   National Archives and Records Administration

United States General Accounting Office
Washington, D.C. 20548

August 22, 2003

The Honorable Ernest J. Istook, Jr.
Chairman
Subcommittee on Transportation, Treasury and Independent Agencies
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

The National Archives and Records Administration (NARA) has initiated the Electronic Records Archives (ERA), a project to acquire a major information system to maintain and provide access to permanent federal records independent of the technological state of the art and the varieties of record formats. NARA's goal is for this system to preserve and provide access to any kind of electronic record, so that the agency can carry out its mission into the future. However, as we have reported previously,[1] acquiring a major information technology (IT) system like ERA is a significant challenge for a relatively small organization such as NARA, which has no previous experience in acquiring major information systems.

Our objectives were to determine

1. the status of NARA's efforts to establish organizational capabilities for acquiring major information systems,

2. how the ERA project's system acquisition policies, plans, and practices conform to industry standards, and

3. how well NARA is meeting the ERA project's cost and schedule goals.

To achieve these objectives, we reviewed agency information technology policies and practices, and we obtained and analyzed ERA program documents on system acquisition, project management, and cost and schedule. We evaluated ERA documents and practices by the standards selected by the program to guide the ERA acquisition, including specifically those of the Institute of Electrical and Electronics Engineers (IEEE). We also interviewed NARA information resources management and ERA

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[1]U.S. General Accounting Office, *Information Management: Challenges in Managing and Preserving Electronic Records*, GAO-02-586 (Washington, D.C.: June 17, 2002).

program officials. We performed our work from July 2002 to May 2003 in accordance with generally accepted government auditing standards.

On May 15, 2003, we provided your staff with a briefing on the results of our study, which included procurement-sensitive information. The slides from that briefing—with procurement-sensitive information removed—are included as appendix I to this report. The purpose of this report is to provide the published briefing slides to you and to officially transmit our recommendations to the Archivist of the United States.

In summary, our briefing made three points:

- To establish its capabilities for acquiring major information systems, NARA has made progress in implementing the key management areas of IT investment management, enterprise architecture, and IT security. However, these capabilities are not yet completely established, and NARA has more work to do to implement our prior recommendations in this area.[2] Specifically, while NARA continues to develop an enterprise architecture, it does not plan to complete its target architecture[3] in time to influence the ERA system definition and requirements. Furthermore, while NARA has completed some elements of an information security program, several key areas have not yet been addressed, such as (1) individual system security plans and (2) security certification and accreditation of its information systems.[4] Without strong IT management capabilities, NARA increases its risk of failing to achieve

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[2]U.S. General Accounting Office, *Information Management: Challenges in Managing and Preserving Electronic Records*, GAO-02-586 (Washington, D.C.: June 17, 2002).

[3]A target architecture is one aspect of an overall enterprise architecture. An enterprise architecture describes (in useful models, diagrams, and narrative) the mode of operation for an enterprise, such as an agency or mission area. It provides a perspective on enterprise operations both for the current ("as is") operating environment and for the target ("to be") environment. More specifically, the target environment is the business and technology environment that is planned to result from aligning technology investments with the strategic goals of the enterprise (including requisite changes to the operations, organization, and management of both the automated and manual processes of the enterprise). An enterprise architecture also includes a transition plan for sequencing from the current to the target environment.

[4]Under OMB policy, responsible federal officials are required to make a security determination (called accreditation) to authorize placing IT systems into operation. In order for these officials to make sound, risk-based decisions, a security evaluation (known as certification) of the IT system is needed.

cost, schedule, and performance objectives for its information systems, including ERA.

- The ERA program has developed policies, plans, and practices to guide and manage its acquisition of the ERA system. In many cases, however, these do not conform to the chosen standards or to applicable federal acquisition guidance. In developing its plans and policies, NARA elected to follow recognized industry standards set forth by IEEE. However, key policy and planning documents are missing elements that are required by the standards. For example, one key document is the concept of operations, which should describe the characteristics of a proposed system from the users' viewpoint. The *ERA Concept of Operations* does not include several key elements required by the IEEE standard, including a complete description of the proposed systems. In addition, key ERA staff positions are unfilled, including positions that NARA determined are needed to carry out system acquisition tasks. Without adequate policy and planning documents—which form the basis of the acquisition—and adequate staff to carry out these policies and plans, NARA increases the long-term risks to the acquisition.

- Finally, NARA cannot adequately track the cost and schedule of the ERA project because the schedule does not include all program tasks and lacks a work breakdown structure.[5] In addition, NARA has not used earned value management—a performance-based technique that allows managers to track the budget against the schedule—to track the ERA cost and schedule programwide. Without the ability to track cost and schedule effectively, NARA increases the risk that ERA funds will not be used efficiently or effectively, quality problems will limit the usefulness of the ERA system, and the ERA system will not be delivered according to established milestones.

In light of the challenges NARA faces in acquiring ERA, NARA will face significant difficulties unless it addresses the weaknesses described above.

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[5]A work breakdown structure provides descriptions of all work activities for a given project that are detailed enough to expose risk factors and allow accurate estimates of resource requirements and schedule duration for each work activity. Each major work activity should include standard elements such as assigned personnel, resource budgets, estimated task duration, and dependencies among work activities. An adequate work breakdown structure is a prerequisite to program tracking, allowing managers to measure how well a program is achieving its cost and schedule goals.

Recommendations for Executive Action

To reduce the risks associated with NARA's efforts to design and acquire the Electronic Records Archives, we recommend that the U.S. Archivist direct the NARA Chief Information Officer to address weaknesses in the acquisition policies, plans, and practices by

- revising the *ERA Life Cycle* document and associated procedures and practices to conform to IEEE standards;

- revising the *ERA Concept of Operations* to conform to IEEE standards, including a complete description of the current and proposed systems;

- revising the *ERA Acquisition Strategy* to conform to IEEE standards and the Federal Acquisition Regulation;

- revising the *ERA Risk Management Plan* to provide processes and procedures specific to the ERA program;

- revising the *ERA Quality Assurance Plan* to conform to appropriate industry standards, establishing a vigorous, independent ERA quality assessment process, and providing the staffing resources necessary to ensure that quality assessment duties are performed effectively; and

- filling key vacant ERA positions.

Further, we recommend that the U.S. Archivist direct the NARA Chief Information Officer to immediately address weaknesses in tracking cost and schedule by

- developing an ERA schedule that is based on a comprehensive work breakdown structure (including associated costs and other resources) and establishes dependencies between successor and predecessor tasks; and

- using earned value management to capture and monitor progress for the entire ERA program.

Agency Comments

In providing written comments on a draft of this report (which are reprinted in app. II), the Archivist of the United States indicated that NARA is acting to implement our recommendations and provided an update on the status of the agency's efforts to do so. In addition, the Archivist

provided a clarification regarding the ERA acquisition schedule, stating that there will be two to three releases for each of the increments in the schedule.

We are sending copies of this report to the Chairmen and Ranking Minority Members of the Subcommittee on Transportation, Treasury and Independent Agencies, House Committee on Appropriations; the Subcommittee on Transportation, Treasury and General Government, Senate Committee on Appropriations; the Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census, House Committee on Government Reform; and the Subcommittee on Oversight of Government Management, the Federal Workforce and the District of Columbia, the Senate Committee on Governmental Affairs. We are also sending copies to the Archivist of the United States. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at www.gao.gov.

Should you have any question on matters contained in this report, please contact me at (202) 512-6240 or by E-mail at koontzl@gao.gov. Other key contributors to this report were Timothy Case, Barbara Collier, Mirko Dolak, and Elena Epps.

Sincerely yours,

Linda D. Koontz
Director, Information Management Issues

National Archives and Records Administration's Acquisition of Electronic Records Archives

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National Archives and Records Administration's Acquisition of Electronic Records Archives

Briefing for the Staff of the

Subcommittee on Transportation,

Treasury and Independent Agencies

House Appropriations Committee

May 15, 2003

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Outline of Briefing

Introduction

Objectives, Scope, and Methodology

Results in Brief

Background

Results

- IT Organizational Capabilities

- Systems Acquisition Policies, Plans, and Practices

- Cost and Schedule

Conclusions

Recommendations

Agency Comments

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Introduction

The mission of the National Archives and Records Administration (NARA) is to ensure "ready access to essential evidence" for the public, the President, the Congress, and the Courts. NARA is responsible for oversight of records management and archiving, which increasingly involves dealing with documents that are electronically created and stored. Accordingly, NARA is acquiring an advanced Electronic Records Archives (ERA) system.

- NARA's goals are for this system to preserve and provide access to any kind of electronic record, free from dependency on any specific hardware or software, so that the agency can carry out its mission into the future.

- According to NARA, the ERA system will be a distributed system, allowing storage and management of massive record collections at a variety of installations, with accessibility provided via the Internet.

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Introduction

In June 2002, we issued a report that assessed the ERA program and NARA's key organizational capabilities for acquiring a major information system.[1] As we noted in that report, acquiring a major information technology (IT) system such as ERA is a significant challenge for a relatively small organization like NARA, whose IT management capabilities are relatively limited. NARA has no previous experience in acquiring major information systems.

In our 2002 report we recommended that the Archivist

- revise the ERA project schedule so that it reflected estimates of the amount of work and resources required to complete each task, and schedule enough time for NARA to complete essential planning tasks, and

- strengthen IT management capabilities by

    (1) implementing an IT investment management process,

    (2) developing an enterprise architecture, and

    (3) improving information security.

[1] U.S. General Accounting Office, *Information Management: Challenges in Managing and Preserving Electronic Records*, GAO-02-586 (Washington, D.C.: June 17, 2002).

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Objectives, Scope, and Methodology

Objectives

As agreed with the Subcommittee on Transportation, Treasury and Independent Agencies, House Appropriations Committee, our work focused on three objectives:

- What is the status of NARA's efforts to establish organizational capabilities for acquiring major information systems?

- How do the ERA project's system acquisition policies, plans, and practices conform to industry standards?

- How well is NARA meeting the ERA project's cost and schedule goals?

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Objectives, Scope, and Methodology

Scope and Methodology

To accomplish our objectives, we

- obtained and evaluated policies and conducted interviews to determine the status of NARA's efforts to establish organizational capabilities in IT investment management, enterprise architecture, and IT security;

- analyzed ERA system acquisition and project management documents, including the *Acquisition Strategy, Life Cycle,* and *Concept of Operations.*

- analyzed the project's cost and schedule documents;

- analyzed ERA risk management, program assessment, and verification and validation reports; and

- interviewed NARA information resource management and ERA program officials and contractor staff to understand the scope and contents of project documents and plans and to clarify information in supporting documentation.

In our review of the ERA program's policies, plans, and practices, we evaluated the implementation of life cycle processes against the Institute of Electrical and Electronics Engineers (IEEE) standards selected by the program to guide the ERA acquisition, as well as applicable federal acquisition regulations and guidance.

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Objectives, Scope, and Methodology

We also reviewed NARA's efforts to staff the ERA acquisition program.

We have requested the revised life cycle cost estimates for the ERA system, but these have not yet been provided. Consequently, we are currently unable to assess the current estimated life cycle costs and benefits of the proposed system.

We performed our work from July 2002 to May 2003 in accordance with generally accepted government auditing standards.

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Results in Brief: Objective 1
Information Technology Management

NARA has made some progress in establishing capabilities for acquiring major information systems, but key IT organizational capabilities are not yet completely established. NARA is still working to establish its information technology investment management, enterprise architecture, and information security capabilities:

- NARA has strengthened its information technology investment management.

- NARA is continuing to develop an enterprise architecture, but it does not plan to complete its target architecture in time to influence the ERA system definition and requirements.

- NARA completed some elements of an information security program, but several key areas have not yet been addressed, such as individual system security plans and certification and accreditation of its information systems.

Without strong IT organizational capabilities in place, the risk is increased that NARA will not be able to achieve cost, schedule, and performance objectives for information systems, including ERA.

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Results in Brief: Objective 2
Systems Acquisition

The ERA program has developed policies, plans, and practices to guide and manage its acquisition of the ERA system, and has elected to follow Institute of Electrical and Electronics Engineers (IEEE) standards in this effort. The ERA program intends to apply these standards to the development of the plans and policies that will guide the practices to be followed in acquiring the ERA system. However, in many cases, its policies, plans, and practices do not conform to the chosen standards or to applicable federal acquisition guidance. For example:

- Key policy and planning documents (such as the *ERA Risk Management Plan, Quality Assurance Plan,* and *Acquisition Strategy*) are missing elements that are required by the standards and federal acquisition guidance.

Such shortcomings in ERA policies, plans, and practices could result in serious long-term risks to the cost, schedule, and performance of the ERA program.

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Results in Brief: Objective 3
Tracking Cost and Schedule

NARA is unable to objectively track the cost and schedule of the ERA project. The ERA schedule does not include all program tasks and lacks a work breakdown structure.

If NARA cannot track how well the ERA program is meeting cost and schedule, the likelihood is increased that ERA funds will not be used efficiently or effectively, quality problems will limit the usefulness of the ERA system, and the ERA system will not be delivered according to established milestones.

To reduce the risks associated with NARA's efforts to design and acquire the Electronic Records Archive, we are making several recommendations to the U.S. Archivist.

In oral comments on a draft of this briefing, NARA generally agreed with our findings, conclusions, and recommendations.

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Background
Acquisition Strategy

Developing the ERA Acquisition Strategy

NARA envisions ERA to be a major information system with the ability to authentically preserve and provide access to massive volumes of all types and formats of electronic records, free from dependency on any specific hardware or software. The system may be based on persistent object preservation, a method of accommodating a variety of file formats that is the subject of research sponsored by NARA and other organizations. A leading candidate for capturing the necessary information is the Extensible Markup Language (XML), which provides a means for "tagging" (annotating) information in a meaningful fashion that can be readily interpreted by disparate computer systems.[3]

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[3] For more information on XML, see our earlier report: U.S. General Accounting Office, *Electronic Government: Challenges to Effective Adoption of the Extensible Markup Language*, GAO-02-327 (Washington, D.C.: Apr. 5, 2002).

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Background
Acquisition Strategy

However, as pointed out in our earlier report,[4] the solution to the electronic records archiving challenge has yet to be developed. No electronic archive system exists that is comparable in complexity or scale to NARA's vision.[5] Further, some key technologies associated with electronic document archiving and storage are not yet available commercially. As a result, ERA is technically and managerially complex and challenging, requiring the development of an advanced architecture for the conversion and preservation of electronic records.

To guide its acquisition of the ERA system, the ERA program has adopted IEEE standards for software life cycle processes.[6] The standards establish a common framework for the acquisition of software products and services, defines processes and tasks that are to be tailored and applied during the acquisition of a system, and identifies specific guidance applicable to the acquisition process. One standard identifies five primary processes: acquisition, supply, development, operations, and maintenance.

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[4] U.S. General Accounting Office, *Information Management: Challenges in Managing and Preserving Electronic Records*, GAO-02-586 (Washington, D.C.: June 17, 2002).

[5] NARA officials believe that many relevant hardware and software components are available in the marketplace, and that potential integrators have both an understanding of NARA's needs and appropriate strategies for addressing them.

[6] The Institute of Electrical and Electronics Engineers, *12207.0 Standard for Information Technology—Software Life Cycle Processes; 12207.1 Standard for Information Technology—Software Life Cycle Processes—Life Cycle Data;* and *12207.2 Standard for Information Technology—Software Life Cycle Processes—Implementation Considerations.*

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Background
Acquisition Strategy

The ERA program is currently in the acquisition life cycle process. It plans to take the following acquisition approach:

- define the ERA concept,

- develop ERA requirements,

- release a draft and final Request for Proposal,

- award two contracts for a design competition, and

- based on the results of the competition, select a single contractor who will develop the ERA system in five increments, beginning in January 2005.
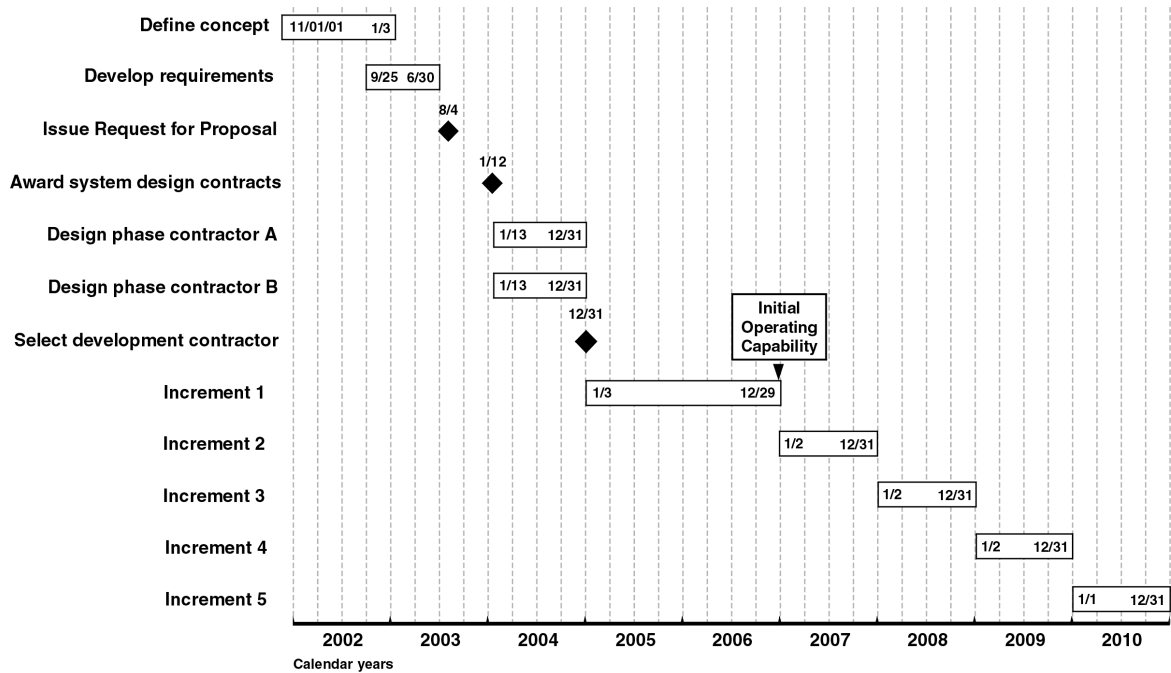
ERA also needs to follow applicable federal acquisition requirements for major information systems. Specifically, it was required to submit to OMB an evaluation of alternatives to be considered and to develop life cycle cost and benefit estimates of the proposed ERA system.

According to the acquisition schedule, shown on the following slide, development of the first increment will take 2 years to complete and will encompass key ERA capabilities related to the records management process, while subsequent increments will add additional functionality and record types.

The expected completion date for the development of the ERA system is December 2010.

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Background
Acquisition Strategy

ERA Acquisition Schedule

Define concept	11/01/01 1/3									
Develop requirements	9/25 6/30									
Issue Request for Proposal	8/4 ◆									
Award system design contracts	1/12 ◆									
Design phase contractor A	1/13 12/31									
Design phase contractor B	1/13 12/31									
Select development contractor	12/31 ◆									
Increment 1	1/3 12/29		Initial Operating Capability							
Increment 2	1/2 12/31									
Increment 3	1/2 12/31									
Increment 4	1/2 12/31									
Increment 5	1/1 12/31									

2002   2003   2004   2005   2006   2007   2008   2009   2010

Calendar years

Source: NARA.

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Background
Other NARA Initiatives

Other NARA Initiatives Related to Electronic Records

Besides the ERA acquisition, NARA's strategy for archiving electronic records includes, among other things, three other initiatives:

- Expanding the capability of its current systems for archiving electronic records by accommodating additional electronic record formats and volumes.

- Through the Records Management Initiatives, revising NARA's records disposition policies and processes, including reengineering of NARA's life cycle management of records.

- Through the Electronic Records Management initiative, providing the guidance and tools that agencies need to manage their records in electronic form, including policy guidance on new electronic record formats accepted by NARA.

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Background
Technical Assessments

National Academy of Sciences Assessment of ERA

NARA has funded two independent assessments of ERA by the National Academy of Sciences.

The first assessment, due in May 2003, is to assess the viability of an advanced architecture for file format conversion and encapsulation being researched by the National Partnership for Advanced Computational Infrastructure.

The second assessment is to

- identify and evaluate alternative methods for digital preservation of records,

- examine the operational use of the Internet for digital archiving,

- identify aspects of the preservation of electronic records that cannot be adequately addressed either by state-of-the art information technology or by technologies under development, and

- determine the feasibility of commercializing new ideas from research.

It is to be completed from 6 to 9 months after the first assessment.

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Background
ERA Program Management

ERA Program Management

The ERA program management office is responsible for the development of ERA policies, plans, guidance, and procedures.

- NARA hired a contractor, Integrated Computer Engineering (ICE), Inc.,[7] to assist in developing the capability to design, acquire, and manage the ERA system.

- ICE is responsible for developing many ERA acquisition documents and for validating and verifying that these documents conform to industry standards for content and structure.

The following slide shows the organizational chart for the program management office, showing government staff positions.[8]

[7] On January 15, 2002, American Systems Corporation (ASC) announced its acquisition of ICE, Inc. According to the ERA project manager, this change does not affect the status of NARA's contract with ICE, Inc.
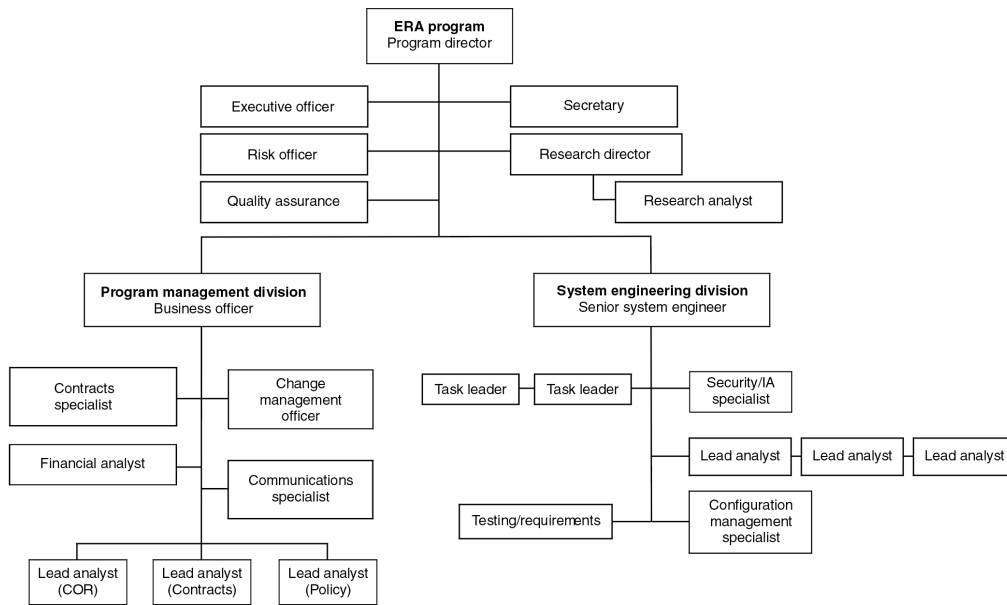
[8] According to NARA, it is considering organizational changes that are under review based on findings of its most recent assessment of the ERA program and other lessons learned.

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Background
ERA Program Management

ERA Program Organization Chart

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                            ERA program
                          Program director

      Executive officer                    Secretary

        Risk officer                    Research director

      Quality assurance                          Research analyst


  Program management division          System engineering division
       Business officer                   Senior system engineer


   Contracts        Change                                    Security/IA
   specialist     management    Task leader   Task leader     specialist
                    officer

  Financial analyst                                    Lead analyst   Lead analyst   Lead analyst
                  Communications
                    specialist
                                              Testing/requirements    Configuration
 Lead analyst  Lead analyst  Lead analyst                             management
   (COR)        (Contracts)    (Policy)                               specialist
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Source: NARA.

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Objective 1: IT Organizational Capabilities

In our earlier report, we recommended that the Archivist strengthen key IT organizational capabilities by

(1) implementing an IT investment management process,

(2) developing an enterprise architecture, and

(3) improving information security.

NARA has made some progress in strengthening its capabilities in these areas, but they are not yet completely established.

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Objective 1: IT Organizational Capabilities
IT Investment Management

IT Investment Management

An IT investment management process is an integrated approach to managing IT investments that provides for the continuous identification, selection, control, life cycle management, and evaluation of IT investments. The Clinger-Cohen Act and OMB guidance emphasize the need to have investment management processes and information to help ensure that IT projects are being implemented at acceptable costs and within reasonable and expected time frames and that they are contributing to tangible, observable improvements in mission performance (i.e., that projects are meeting the cost, schedule, and performance commitments upon which their approval was justified).

GAO's *Information Technology Investment Management* (ITIM) maturity framework[9] defines critical processes pertaining to IT investment management and oversight. Among other things these processes provide for establishing investment decision-making bodies responsible for selecting and controlling IT investments by (1) understanding, for example, each project's expected return on investment and associated costs, schedule, and performance commitments; (2) regularly determining each project's progress toward these expectations and commitments; and (3) taking corrective actions to address deviations.

[9] U.S. General Accounting Office, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity* (Exposure Draft), GAO/AIMD-10.1.23 (Washington, D.C.: May 2000).

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Objective 1: IT Organizational Capabilities
IT Investment Management

NARA has taken steps to strengthen its IT investment management processes. Among the actions it has completed are the following:

- NARA has established an IT investment review board, which receives monthly briefings on strategic projects covering schedule and risks.

- NARA has updated its directive addressing IT investment management.

- Initial versions of policy documentation have been completed for two of the three phases of IT investment management: control and evaluation.

- NARA has completed interim guidance for analyzing the life cycle benefits, costs, and risks of IT.

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Objective 1: IT Organizational Capabilities
Enterprise Architecture

Enterprise Architecture

An enterprise architecture provides a description—in useful models, diagrams, and narrative—of the mode of operation for an agency. It describes the agency in both

    (1) logical terms, such as interrelated business locations and users; and

    (2) technical terms, such as hardware, software, data, communications, and security attributes and standards.

An enterprise architecture provides these perspectives both for the "as is" environment (baseline) and for the "to be" environment (target). It also consists of technical reference model and technical standards used by the agency, as well as a plan to transition from the baseline to the target environment.

NARA has ongoing efforts to complete an enterprise architecture, which are expected to continue over the next 2 years. It developed initial versions of its enterprise architecture, including a baseline and target architecture, a technical reference model, and standards profile. According to NARA's Chief Technology Officer, while this initial effort provided a basis for an architecture, it was not complete and NARA is continuing to develop a more comprehensive version.

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Objective 1: IT Organizational Capabilities
Enterprise Architecture

Beginning in July 2003, NARA plans to address a number of activities associated with its enterprise architecture, including

- procuring and installing software tools to manage the development of its enterprise architecture,

- continuing to refine data management processes and definitions, and

- establishing an information security architecture.

NARA has not completed the definition of its "to be" architecture, which will provide a framework for defining the ERA system's requirements. The ERA program currently plans to complete the definition of requirements by the end of June 2003.

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Objective 1: IT Organizational Capabilities
Information Security

Information Security

Federal legislation and guidance for information security require organizations, among other things, to establish an information security program, including the following activities:

- Develop information security policy and procedures.

- Develop system security plans for networks, facilities, and systems or groups of information systems.

- Perform risk assessments.

- Determine the sensitivity and criticality of systems.

- Establish certification and accreditation programs for information systems.

As a result of security assessments conducted by NARA and its Inspector General, the Archivist declared NARA's information security a material weakness in fiscal year 2000; it remains a material weakness.

In response to the recommendations in our earlier report, NARA has taken steps to establish an information security program. In fiscal year 2002, NARA

- completed an information security policy and security control handbooks,

- addressed several information security vulnerabilities, and

- conducted a limited vulnerability assessment and risk analysis of NARA's network.

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Objective 1: IT Organizational Capabilities
Information Security

However, NARA's IT security program is incomplete in several areas, including the following:

- Security plans for all NARA systems have not been developed.

- NARA has not implemented a security risk assessment program.

- It has not determined the sensitivity and criticality of systems.

NARA indicated that in fiscal year 2003, it plans to

- complete certification and accreditation of 41 IT systems, and

- address outstanding security risks and remove security as a material weakness.

Nevertheless, without a fully established information security program, the risk to the planned ERA system and its archived data is increased.

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Objective 2: Systems Acquisition
Policies, Plans, and Practices

To guide its acquisition of the ERA system, the program has adopted an IEEE standard for software life cycle processes (IEEE 12207 and associated standards). These standards were expected to be used in developing the life cycle plan and processes that the program is following to acquire the ERA system:

- developing the *ERA Life Cycle* document,

- defining a concept of operations,

- developing requirements,

- creating an acquisition strategy,

- performing risk management,

- performing configuration management, and

- conducting quality assurance.

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Objective 2: Systems Acquisition
ERA Life Cycle

ERA Life Cycle

The *ERA Life Cycle* document describes the life cycle of the ERA system from conceptualization of ideas through retirement, as well as processes for acquiring and supplying software products and services for the ERA system.

However, the *ERA Life Cycle* document does not meet all applicable IEEE standards:

- It states that it was tailored to the IEEE 12207 standards but fails to identify which elements were excluded or modified.

- It does not document key activities, such as the processes, activities, and tasks needed for contract preparation, including all tasks associated with development of the Request for Proposal.

- It does not show the proposed approach, including the design competition and the incremental approach.

Without a complete, well-documented life cycle that meets applicable standards, NARA and the ERA program are impeded in their ability to manage and track key acquisition processes and activities.

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Objective 2: Systems Acquisition
Concept of Operations

Concept of Operations

According to IEEE standards, the Concept of Operations is a user-oriented document that describes the characteristics of a proposed system from the users' viewpoint. The document becomes the framework for all subsequent activities leading to system deployment. The IEEE standard describes key elements that should be included in this document, including major system components, interfaces to external systems, and performance characteristics such as speed, throughput, and volume.

The *ERA Concept of Operations* describes the high-level operational characteristics of the ERA system from the viewpoint of the users, developer, and other stakeholders. The *Concept* provides justification for the proposed system, identifies classes of ERA users, and describes operational scenarios. It does not include several key elements required by the IEEE standard, including

- a complete description of the proposed system,

- the system's modes of operation under different circumstances (for example, regular, degraded, emergency, backup, etc).

The ERA program is planning to update its *Concept of Operations* to address these elements by August 18, 2003.

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Objective 2: Systems Acquisition
ERA Requirements

ERA Requirements

Requirements provide the blueprint that system developers and program managers use to design, develop, and acquire a system. It is critical that requirements be carefully defined and that they flow directly from the organization's concept of operations (how the organization's day-to-day operations are or will be carried out to meet mission needs).

ERA requirements are currently being defined; NARA expects them to be completed by June 30, 2003.

Accordingly, we did not review them for their conformance to industry standards.

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Objective 2: Systems Acquisition
Acquisition Strategy

Acquisition Strategy

An acquisition strategy is a description of how an organization plans to acquire a system. It establishes the framework by which detailed acquisition planning and program execution will be accomplished and communicated to key stakeholders. For ERA, the acquisition strategy should conform to IEEE standards and must conform to the Federal Acquisition Regulation (FAR) for acquisition planning.

The *ERA Acquisition Strategy* does not fully conform to applicable standards, according to an assessment by the ERA program:

- It does not satisfy all FAR requirements: 28 of 39 content requirements are not satisfied, including the identification of acquisition risks, the description of the ERA cost model and life cycle costs, and the establishment of detailed milestones for the acquisition process.

- It does not meet all IEEE standards: 15 of 32 content requirements are not satisfied, including the establishment and implementation of an acquisition planning strategy, standards for the preparation of contract requirements, and criteria for the selection of a qualified supplier.

Unless it adheres to these standards and requirements, NARA increases the risk that its strategy will not be clearly understood by key stakeholders.

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Objective 2: Systems Acquisition
Risk Management

Risk Management

In acquisition, risk management is a process for identifying potential problems before they occur and adjusting the acquisition to mitigate problems and to decrease the chance of their occurring. Risk management includes developing a project risk management plan; identifying and prioritizing potential problems; implementing risk mitigation strategies, as required; and tracking and reporting progress against the plans.

NARA has developed an *ERA Risk Management Plan*. However, the ERA program has not fully established a risk management process to comply with IEEE requirements:

- In the *ERA Risk Management Plan,* the risk planning policy is incomplete. For example, the plan does not discuss how resources are to be made available to treat risks or how risks are to be communicated to and reviewed by stakeholders.

- The plan is written at a high level of generality and has not been defined specifically for the ERA program. For example, procedures for risk identification and risk analysis are not specific to the ERA program.

In the absence of a fully established risk management process, NARA may miss opportunities to avoid or mitigate predictable risks in its ERA acquisition.

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Objective 2: Systems Acquisition
Configuration Management

Configuration Management Plan

The *ERA Configuration Management Plan*, based on the IEEE standard, is intended to establish and maintain the integrity and control of the products of the ERA program through its life cycle. The IEEE standard for software configuration plans describes classes of information that should be included in the plan. These include identifying

- who is responsible for accomplishing planned activities,

- what configuration management project activities are to be performed,

- when, in relation to other project activities, the activities are to be scheduled, and

- what tools and human resources are required for executing the plan.

A verification and validation assessment of the *Configuration Management Plan* by ERA contractors found that while the plan did not satisfy all of the above IEEE requirements, the amount of information included in the plan was appropriate for the point in the acquisition process at which it was written.

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Objective 2: Systems Acquisition
Quality Assurance

Quality Assurance

In IT acquisition, quality assurance describes processes for providing independent assessment of the requirements and processes for developing and producing a system or software. Quality assurance includes developing a quality assurance plan, determining applicable processes and product standards to be followed, and conducting reviews to ensure that the product and process standards are followed. Quality assessments should take place throughout the life cycle of an acquisition.

The ERA program has developed the *ERA Quality Assurance Plan*, which references IEEE standards for software quality assurance. However, elements required by the standard are absent. For example, the plan

- does not include ERA documentation to be reviewed,

- lacks criteria by which to assess documentation,

- does not specify quality assurance tasks to be performed, and

- lacks estimates of resources to be expended.

Without a fully established quality assurance plan, the ERA program is at risk of generating products that do not meet requirements.

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Objective 2: Systems Acquisition
Policies, Plans, and Practices

In addition to the life cycle processes described by IEEE standards, ERA is subject to federal acquisition requirements.[10] Among other things, these call for

- an evaluation of alternatives to be considered and

- the development of life cycle cost and benefit estimates of proposed systems.

Also associated with the ERA acquisition process are NARA's efforts to staff the ERA acquisition program.

[10] Office of Management and Budget Circular A-109, *Major System Acquisitions*; OMB Circular A-11, *Preparing and Submitting Budget Estimates*.

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Objective 2: Systems Acquisition
ERA Staffing

ERA Staffing

NARA has made progress in staffing the ERA program, but staffing may pose a risk to ERA. NARA has determined that to carry out the acquisition tasks discussed earlier, it will need 46 staff: 24 government staff and 22 contractor staff. According to program officials, funding shortfalls have prevented them from hiring the needed ERA staff. Currently, all 22 contractor staff are onboard, but only 15 of the 24 projected ERA government staff have been hired.

Although we have not evaluated the appropriate staffing level, some staffing shortages are significant. Three key government positions—the business manager and contract and financial management specialists—are yet to be hired. In addition, staff for other key positions were only recently hired: the chief system engineer and the risk management and quality assurance specialists. All these positions are important to the quality and completeness of key program processes.

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Objective 3: Tracking Cost and Schedule

A project schedule with an appropriate work breakdown structure is a prerequisite to program tracking, allowing managers to measure how well the program is achieving its cost and schedule goals. The work breakdown structure should be detailed enough to expose all risk factors and allow accurate estimates of resource requirements and schedule duration for each work activity. Each major work activity should include standard elements such as assigned personnel, resource budgets, estimated task duration, and dependencies among work activities.

Work activities can be measured through performance-based techniques such as earned value management, which allows managers to track the budget against the schedule. "Earned value" may be used to determine if work is being done at a higher or lower cost/performance rate than was planned.

OMB requires the use of such techniques in the monitoring of the cost, schedule, and performance of system acquisition projects.[14]

[14] Office of Management and Budget Circular A-11.

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Objective 3: Tracking Cost and Schedule

In our 2002 report, we recommended that the ERA project schedule be revised to reflect estimates of the amount of work and resources required to complete each task, and that NARA schedule enough time to complete essential planning tasks.

While the ERA program has developed a more detailed project schedule that includes standard elements, NARA has not yet fully carried out our recommendation, as these elements are not yet complete:

- The project schedule omits significant tasks and activities, including
    - the process to reengineer the agency's life cycle business processes, upon which ERA requirements are being developed, and
    - the activity by ERA contractors to verify and validate ERA project management and acquisition documentation for conformance to industry standards.

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Objective 3: Tracking Cost and Schedule

NARA has indicated that it plans to use earned value management to assess performance programwide, but this plan has not yet been implemented.

- In the absence of a program schedule that includes all program tasks and a work breakdown structure with associated costs, the ERA program cannot use earned value management to track ERA cost and schedule.

The lack of earned value management impairs NARA's ability to track and meet future project milestones.

The ERA program is in an early phase of acquisition planning and has not yet been required to meet many significant milestones. To date, NARA has met a major ERA milestone—the definition of the ERA concept.

Meeting major milestones will become more important and more challenging in later phases of the acquisition.

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Conclusions

In acquiring ERA, NARA faces significant challenges. ERA will be a major information system; NARA has no previous experience in acquiring major information systems. Further, no comparable electronic archive system is now in existence, in terms of either complexity or scale. Finally, technology necessary to address some key requirements of ERA is not commercially available and will have to be developed.

In light of these challenges, NARA will face significant difficulties in its ERA acquisition unless it addresses

- its IT organizational capabilities;
- ERA system acquisition policies, plans, and practices; and
- its ability to control ERA's cost and schedule.

NARA has made progress implementing the key management areas of IT investment management, enterprise architecture, and IT security, but NARA has more work to do to implement our prior recommendations in this area.

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Conclusions

Without strong acquisition policies, plans, and practices, the risk is increased that the ERA system will fail to meet user expectations, will cost more than currently estimated, and will be delivered later than currently planned. Specifically, NARA and the ERA program have not

- followed the IEEE 12207 standards and associated guidance in defining and managing the ERA acquisition process,

- developed ERA acquisition processes and associated documentation in sufficient detail to allow program managers and NARA executives to manage and oversee the program, or

- implemented the defined acquisition processes and practices according to these documented policies and plans.

Further, NARA is unable to effectively track and assess the status of the ERA program because its program schedule does not include all program tasks and lacks a work breakdown structure.

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Recommendations

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To reduce the risks associated with NARA's efforts to design and acquire the Electronic Records Archives, we recommend that the U.S. Archivist direct the NARA Chief Information Officer to do the following:

- Address weaknesses in the acquisition policies, plans, and practices by

    - revising the *ERA Life Cycle* document and associated procedures and practices to conform to IEEE standards;

    - revising the *ERA Concept of Operations* to conform to IEEE standards, including a complete description of the current and proposed systems;

    - revising the *ERA Acquisition Strategy* to conform to IEEE standards and the Federal Acquisition Regulation;

    - revising the *ERA Risk Management Plan* to provide processes and procedures specific to the ERA program;

    - revising the *ERA Quality Assurance Plan* to conform to appropriate industry standards, establishing a vigorous, independent ERA quality assessment process, and providing the staffing resources necessary to ensure that quality assessment duties are performed effectively; and

    - filling key vacant ERA positions.

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Recommendations

- Immediately address weaknesses in tracking cost and schedule by

  - developing an ERA schedule that is based on a comprehensive work breakdown structure (including associated costs and other resources) and establishes dependencies between successor and predecessor tasks; and

  - Using earned value management to capture and monitor progress for the entire ERA program.

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Agency Comments

NARA provided us with oral comments on a draft of this briefing during a meeting held on April 24, 2003, attended by the Deputy Archivist, the ERA program manager, and other agency officials. These officials generally agreed with our findings, conclusions, and recommendations. They indicated that NARA is already addressing the weaknesses in ERA's acquisition policies, plans, and practices identified through a verification and validation activity. NARA officials also provided clarifications and additional technical comments, which we have incorporated into the briefing as appropriate.

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Comments from the National Archives and Records Administration

National Archives and Records Administration

8601 Adelphi Road
College Park, Maryland 20740-6001

JUL 2 3 2003

Ms. Linda D. Koontz
Director, Information Management Issues
General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Koontz:

Thank you for the opportunity to review and comment on the draft report entitled *Records Management: National Archives and Records Administration's Acquisition of Major System Faces Risks (GAO-03-880)*. For NARA to carry out its mission into the future we must be successful implementing the Electronic Records Archives (ERA) system. We appreciate your insight into the significant challenges that we face as a relatively small organization in acquiring major information systems.

NARA accepts the recommendations for executive action outlined in the report, and we are already moving to implement them. We would like to take this opportunity to update you on the status of those efforts.

Acquisition Policies, Plans, and Practices. We are conducting verification and validation reviews of all documents as they are updated to ensure they conform to Institute of Electrical and Electronics Engineers (IEEE) standards. The expected completion dates for the documents in the recommendations are:

- ERA Life Cycle: September 30, 2003 (this document will be incorporated into the Program Management Plan based on guidance from Circular A-119)
- ERA Concept of Operations: August 5, 2003
- ERA Acquisition Strategy: August 5, 2003
- ERA Risk Management Plan: September 2, 2003
- ERA Quality Assurance Plan: completed July 23, 2003 (now titled Quality Management Plan)

ERA Staffing. We are in the process of recruiting for the 10 remaining unfilled ERA positions. Provided we can attract quality candidates for these positions, we expect to have all positions filled by the end of the calendar year.

Schedule and Work Breakdown Structure. We have underway a large effort to develop detailed work breakdown structure and cost and schedule baselines for the program. We expect to have those baselines in place by September 2003.

NARA's web site is http://www.nara.gov

Earned Value Management. We are aligning our program control activities to comply with the ANSI-748A standard for earned value management mandated by OMB in the FY 2005 capital planning process. We are implementing a program-wide scheduling and earned value management analysis tool that will provide program control capabilities not currently available. The tool will be in place by January 2004.

We also have made progress since May on in a number of other areas covered in your report.

IT Investment Management. We are updating our policy for the third and final phase of IT investment management: *select.* The policy will be finalized in August 2003.
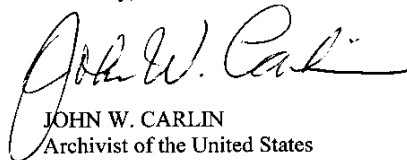
Enterprise Architecture. We are revising the Enterprise Architecture document that was delivered to OMB as part of our Exhibit 300 in September 2002. Version 2.0 will be completed by September 2003 and will be submitted as part of our Exhibit 300 for the FY 2005 budget request. This Enterprise Architecture supports all NARA IT programs including ERA.

IT Security Program. We are scheduled to complete the certification and accreditation of all IT systems by September 30, 2003. We are following the National Institute of Standards and Technology draft standard: *Guidelines for the Security Certification and Accreditation for Federal Information Technology Systems (800-37).* This effort will result in the development of individual risk assessments and security plans for each system. The risk assessments will provide input to the overall IT Security Risk Management Program.

Finally, we want to clarify one point made about the ERA acquisition schedule. The report indicates that the system will be developed in increments and the first increment will take two years to complete. Although this is a true statement, it is incomplete: there will be two to three releases for each increment.

Again, thank you for this opportunity, and we look forward to continuing to work with you throughout the ERA acquisition process.

Sincerely,

JOHN W. CARLIN
Archivist of the United States

United States
General Accounting Office
Washington, D.C. 20548-0001

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