W   September 25, 1998

TO: AO/Chief Information Officer

FROM: W/Assistant Inspector General for Auditing

SUBJECT: Final Report on the Audit of Information Technology
               Capital Planning and Investment Control
               (Assignment Number A-HA-98-006)
               Report Number IG-98-034

The subject final report is provided for your use. Please refer to the Executive Summary
for the overall audit results. Your comments on a draft of this report were responsive to
our recommendation. We request that you provide an estimated completion date for the
agreed-to corrective action.

If you have questions concerning the report, please contact Mr. David Gandrud, Program
Director, NASA Information Technology Program Audits, at (650) 604-2672, or
Mr. Ernest Willard, Program Manager, at (650) 604-2676. We appreciate the courtesies
extended to the audit staff. The report distribution is in Appendix C.

[original signed by]
Russell A. Rau

Enclosure

cc:
B/Chief Financial Officer
G/General Counsel
L/Associate Administrator for Legislative Affairs
JM/Director, Management Assessment Division

IG-98-034

AUDIT REPORT

INFORMATION TECHNOLOGY CAPITAL PLANNING AND INVESTMENT CONTROL

SEPTEMBER 25, 1998

OFFICE OF INSPECTOR GENERAL

National Aeronautics and
Space Administration

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ACRONYMS

CIO	Chief Information Officer
GAO	General Accounting Office
IT	Information Technology
NPD	NASA Policy Directive
NPG	NASA Procedures and Guidelines
OMB	Office of Management and Budget

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INFORMATION TECHNOLOGY CAPITAL PLANNING AND INVESTMENT CONTROL

EXECUTIVE SUMMARY

INTRODUCTION

In 1996, Congress enacted the Clinger-Cohen Act[1] to improve the management of Federal agencies' information technology (IT) resources. A key requirement of the Act calls for the head of each agency to develop and implement a process for maximizing the value of and assessing and managing the risks of IT acquisitions. According to the Act, this process shall provide for ". . . the selection of information technology investments to be made by the executive agency, the management of such investments, and the evaluation of the results of such investments . . ."

The Office of Management and Budget (OMB) and the General Accounting Office (GAO) have issued guidance describing the three phases of the IT capital planning and investment control process: (1) selection, (2) control, and (3) evaluation. We assessed the evaluation phase of NASA's IT investment process. The evaluation phase requires post-implementation reviews of major[2] new IT investments. OMB defines a post-implementation review as a diagnostic tool for evaluating the overall effectiveness of an agency's capital planning process.

We will issue our results on the selection and control phases at a later date.

OBJECTIVE

Our objective[3] was to determine whether NASA has developed and implemented an effective IT capital planning and investment control process.

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[1] Formerly the Information Technology Management Reform Act.

[2] NASA defines a major IT investment as ". . . an information technology investment that requires special management attention because of its importance to the Agency mission; or its high development, operating, or maintenance costs; or its high risk or high return; or its significant impact on the administration of Agency programs, finances, property or other resources. High cost is defined as development, acquisition, and operations or maintenance costs that exceed $5 million in 1 year or $20 million over the life of the asset or 5 years, whichever is less."

[3] See Appendix A for a detailed description of our objective, scope, and methodology.

RESULTS OF AUDIT	The NASA IT investment process does not satisfy Clinger-Cohen Act and OMB Circular A-130 ("Management of Federal Information Resources," February 1996) requirements for post-implementation reviews of major new IT investments. Without effective post-implementation reviews, NASA is not putting needed emphasis on evaluating fully operational systems and may not identify potential process improvements.
	While NASA has not made any major new IT investments operational since the Clinger-Cohen Act became effective in August 1996, the Agency is now developing eight major IT systems,[4] which will need post-implementation reviews when they become operational.
RECOMMENDATION AND MANAGEMENT'S RESPONSE	The report contains a recommendation aimed at ensuring that the Agency's process for evaluating IT investments is fully compliant with Clinger-Cohen Act and OMB Circular A-130 requirements. Management suggested changes to the draft recommendation which we made in the final report. While management maintained it had complied with the requirements for post-implementation reviews, it nonetheless concurred with the recommendation. The Chief Information Officer (CIO) has initiated action to revise the current program and project management process to highlight the requirements for post-implementation reviews of major IT investments.
EVALUATION OF MANAGEMENT'S RESPONSE	We maintain that the Agency had not satisfied the Clinger-Cohen Act and OMB Circular A-130 requirements for post-implementation reviews. However, the action being taken is responsive and should meet the requirements of the Clinger-Cohen Act and OMB Circular A-130 relative to post-implementation reviews.

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[4] The major new IT systems are: (1) Earth Observing System Data and Information System, (2) Integrated Financial Management Project, (3) Space Station Training Facility, (4) Mission Control Center, (5) Modification of the Integrated Planning System, (6) Checkout and Launch Control System, (7) Shuttle Data Center, and (8) Enhanced Huntsville Operations Support Center. NASA's fiscal year 1999 through 2003 Information Technology Implementation Plan shows the total budget for these eight systems at $1.528 billion.

INTRODUCTION

Federal Requirements

The Clinger-Cohen Act of 1996 requires agencies to implement organization-wide processes to help ensure that major IT projects are (1) implemented at acceptable costs, (2) delivered within reasonable time frames, and (3) produce significant improvements in mission performance.

Federal guidance specifies a three-phased management approach for selecting, controlling, and evaluating IT projects. During the selection phase, management should choose the best portfolio of IT project investments using standard selection decision criteria. During the control phase, management should monitor projects in development against cost, schedule, and performance expectations. If a project is over cost, late, or failing to meet mission expectations, then management should promptly take mitigating steps to address the deficiencies. The evaluation phase should occur after a project has been fully developed and implemented. During the evaluation phase, management is required to perform post-implementation reviews[5] of the project to assess actual versus expected results and to revise the overall investment management process based on the lessons learned.

NASA Policies and Guidelines

NASA has developed new policies, procedures, and guidelines to help satisfy the requirements of the Clinger-Cohen Act and to improve its IT investment management process. For example, the Agency issued NASA Policy Directive (NPD) 2800.1, _Managing Information Technology_, which establishes the requirement to ". . . plan for, acquire, manage, and use IT to accomplish NASA's missions and programs efficiently, effectively, and securely." Also, the Agency revised NASA Procedures and Guidelines (NPG) 7120.5A, _NASA Program and Project Management Processes and Requirements_, to require that IT be

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[5] OMB defines a post-implementation review as a diagnostic tool for evaluating the overall effectiveness of an agency's capital planning process.

"distinguished as a program/project investment that is planned for, budgeted, managed, and evaluated in terms of its return on investment."

The Agency is developing eight major new IT systems (as identified in the Executive Summary, footnote 4) that will need post-implementation reviews when they become operational.

FINDING AND RECOMMENDATION

NASA's POST-IMPLEMENTATION REVIEW PROCESS

The NASA IT investment process does not satisfy Clinger-Cohen Act and OMB Circular A-130 requirements for post-implementation reviews of major new IT investments. Instead, the Agency has decided to rely on its existing program and project management process for evaluating IT investments. Without effective post-implementation reviews, NASA is not focusing on fully operational systems and may not identify "lessons learned" that could be used to improve the overall IT investment process.

NASA's Project Evaluation Process

NPG 7120.5A requires that Agency programs and projects undergo an evaluation process and independent reviews. NASA's evaluation process ". . . consists of the planning and conducting of reviews and assessments during the formulation and implementation . . ." of programs and projects.

NASA may perform several independent reviews of IT investments, such as Non-Advocate Reviews, Independent Annual Reviews, Independent Assessments, and External Independent Readiness Reviews. However those reviews do not focus on evaluating fully implemented, operational IT systems, but rather assess whether to proceed with, modify, or terminate a program or project. Furthermore, the Agency's existing reviews place emphasis on the selection and control phases of the IT investment process and are not designed to produce improvements in the overall IT capital planning and investment control process.

Post-Implementation Reviews Are Required by OMB Circular A-130

The Clinger-Cohen Act, Section 5122(b), requires that an Executive agency's IT acquisition process provide for the evaluation of the results of information technology investments. OMB Circular A-130, part 9.b.1.(d), states that agencies shall, "Conduct post-implementation reviews of information systems to validate estimated benefits and *document effective management practices for broader use."* [Emphasis added]

Additional OMB Guidance	In addition to Circular A-130, OMB has issued other guidance that focuses on the need for post-implementation reviews as part of the IT evaluation phase. In November 1995, prior to enactment of the Clinger-Cohen Act, OMB issued *Evaluating Information Technology Investments: A Practical Guide* (the Guide). OMB wrote the Guide with assistance from GAO to describe the critical success elements and key phases that should be part of an effective IT investment process. The Guide states that the three phases of the investment process occur in a continuous cycle of selection, control, and evaluation. The evaluation phase is conducted after a system has been implemented and is an overall assessment of the system's success or failure. The evaluation phase includes post-implementation reviews that identify "lessons learned" and help senior management develop better decision criteria for use during the investment selection phase.
	In July 1997, OMB issued the *Capital Programming Guide* that further elaborates on the need for post-implementation reviews. The objective of these reviews is to ensure continual improvement of an agency's capital planning process based on lessons learned, thereby minimizing the risk of repeating past mistakes. The 1997 guide states that agencies should have mechanisms in place to use the lessons learned from a post-implementation review to update the selection phase decision criteria.
GAO Has Also Issued Guidance	GAO has also issued guidance addressing the IT evaluation phase and post-implementation reviews. In February 1997, GAO issued *Assessing Risks and Returns: A Guide for Evaluating Federal Agencies' IT Decision-making*. The GAO guide states that key elements of the IT investment evaluation phase include (1) conducting post-implementation reviews using a standard methodology and (2) applying lessons learned to improve the selection and control phases. The guide states:

> "Once a project has reached a final end point (e.g., the project is fully implemented, the project has been canceled, etc.), a post-implementation review (or

post-investment review) should be conducted. This review will usually occur about 3 to 12 months after a project has reached its final end point and should be conducted by a group other than the project development team to ensure that it is conducted independently and objectively."

A GAO official told us that this type of review is the hallmark of quality-oriented organizations.

NASA Management Considers Its Existing Evaluation Process Adequate

NASA management maintains that the existing program and project evaluation process satisfies the requirements of the Clinger-Cohen Act and OMB Circular A-130. In a written response to our inquiries regarding this issue, NASA CIO officials stated that the Agency has established a program and project evaluation process to provide an independent assessment of the continuing ability of a program or project to meet its technical and programmatic commitments. "The outcome of the evaluation process is a set of conclusions regarding the ability to meet commitments and recommendations for proceeding with, modifying, or terminating the program or project."

NASA's existing evaluation process differs from that required by the Clinger-Cohen Act and Circular A-130 in two ways. First, NASA has focused on assessing systems in the selection and control phases of the IT investment process rather than on assessing fully operational systems. Second, the Agency's existing evaluation process results in conclusions regarding one specific program or project whereas a post-implementation review should result in improvements in the overall capital planning and investment control process.

NASA has not yet been required to apply the requisite post-implementation review process because none of its major new IT investments have become operational after the Clinger-Cohen Act became effective in August 1996. However, the Agency is developing eight major new IT systems[6] and, therefore, will need post-implementation reviews when these systems become operational.

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[6] See footnote 4.

DRAFT RECOMMENDATION WAS REVISED	In response to management's informal comments on the draft report, we revised the recommendation. The revised recommendation differs from the draft recommendation in two key respects. First, the draft recommendation focused on the need for the Agency to establish a post-implementation review process. The revised recommendation recognizes that an IT evaluation process exists, but should be improved to address the requirements related to post-implementation reviews. Second, the draft recommendation made the CIO fully responsible for corrective action. The revised recommendation recognizes that the CIO must obtain agreement and cooperation from other Agency officials to institute effective improvements in the IT capital planning and investment control process.
RECOMMENDATION	The NASA CIO should coordinate with cognizant Agency officials to revise NASA's current program and project evaluation process to emphasize transferring lessons learned from fully operational IT systems to new system investments. Lessons learned should include opportunities to minimize risk and to improve the overall IT capital planning and investment control process.
MANAGEMENT'S RESPONSE	Concur. While management stated that it had complied with the requirements for post-implementation reviews, it nonetheless concurred with the recommendation. Also, management agreed that clarification of the current processes was needed to highlight the requirements for post-implementation reviews of major IT investments. The CIO will submit a change proposal to NPG 7120.5A *(NASA Program and Project Management Processes and Requirements)* and has begun to coordinate with cognizant officials to effect this change. The complete text of management's comments is in Appendix B.
EVALUATION OF MANAGEMENT'S RESPONSE	We maintain that the Agency had not satisfied the Clinger-Cohen Act and OMB Circular A-130 requirements for post-implementation reviews. However, the action being taken is responsive to the recommendation and should meet the requirements of the Clinger-Cohen Act and OMB Circular A-130 relative to post-implementation reviews.

OBJECTIVE, SCOPE, AND METHODOLOGY

OBJECTIVE

Our objective was to determine whether NASA has developed and implemented an effective IT capital planning and investment control process.

SCOPE AND METHODOLOGY

To meet this objective, we have conducted our audit work to separately assess the three phases of NASA's IT investment control process: (1) selection, (2) control, and (3) evaluation. This report presents our conclusions on the Agency's evaluation phase only. We will issue our results on the selection and control phases at a later date.

We limited the scope of our audit to determining whether NASA has complied with Section 5122, *Capital Planning and Investment Control,* of the Clinger-Cohen Act of 1996 and with related guidance issued by OMB and GAO.

To assess NASA's IT evaluation phase, we reviewed the applicable requirements of the Clinger-Cohen Act, OMB Circular A-130, and other OMB and GAO guidance pertaining to IT evaluations and post-implementation reviews. We compared those requirements and guidance to the policies and procedures that NASA has established to manage its IT investments.

We interviewed the NASA CIO and personnel assigned to the CIO's office. We evaluated the CIO's written response to our March 1998 inquiry regarding NASA's post-implementation review process.

Also, we discussed the IT evaluation phase with a cognizant GAO official during April 1998 to obtain his perspective on the purpose and expected outcome of post-implementation reviews.

FIELD WORK

We performed field work from December 1997 through May 1998 at NASA Headquarters, Ames Research Center, Goddard Space Flight Center, Johnson Space Center, Kennedy Space Center, and Marshall Space Flight Center. We performed the audit in accordance with generally accepted Government auditing standards.

MANAGEMENT'S RESPONSE

National Aeronautics and
Space Administration
Office of the Administrator
Washington, DC 20546-0001

SEP 1 7 1998

TO: W/Inspector General

FROM: AO/Chief Information Officer

SUBJECT: Draft Report on the Audit of Information Technology Capital Planning
            (Assignment Number A-HA-98-006)

Thank you for the opportunity to review and comment of the subject draft report.

We do not agree with the report's premise that NASA's Information Technology (IT)
investment process does not comply with the Clinger-Cohen Act and the Office of
Management and Budget Circular A-130 requirements for post-implementation review of
major IT investments. NASA's program and project management processes, described in
NASA Procedures and Guidelines (NPG) 7120.5A, and other practices, currently address
the requirements; albeit, clarification may be appropriate.

Neither citation requires a separate process for IT investments—in fact, these citations do
not identify explicit requirements and encourage tailoring to optimize such processes to the
specific needs of each agency. We believe that NASA IT investments must be treated
similarly to the programs the investments support and we have spent considerable effort to
integrate the IT investment planning, budgeting, and control processes into the comparable
mainstream NASA processes. This Office has implemented performance metrics to assess
post-implementation performance; we are currently collecting metrics for two CIO Function
Leadership Initiatives (FSI's)—NACC and NISN, and will do the same for the remaining
FSI's (ODIN and CoSMO) when it makes sense to do so.

After discussions with you, we agree that clarification of the current processes to highlight
these requirements may be in order and, therefore, we agree with the thrust of the report's
single recommendation. We have begun a dialogue with the Office of the Chief Engineer to
garner support for a change to NPG 7120.5A to effect your suggestion. They appear
supportive of a more formal review of lessons learned and the impact on the overall process
for program management. We will submit a change proposal to NPG 7120.5A at the earliest
opportunity.

If you have any questions about this response, please call Don Andreotta on 358-1367.

Lee B. Holcomb

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Congressional Member

The Honorable Pete Sessions, U.S. House of Representatives

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