



# *Audit Report*

**Office of Audit  
Information Systems Audit Division**

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## *Review of HUD's Efforts to Correct Year 2000 Problems*

*98-DP-166-0003*

*June 1, 1998*

June 1, 1998

MEMORANDUM FOR: Saul Ramirez, Acting Deputy Secretary, SD

FROM: Benjamin K. Hsiao, Director, Information Systems Audit Division, GAA

SUBJECT: Audit Report, Review of HUD's Efforts to Correct Year 2000 Problems

Attached is our first report on our review of HUD's efforts to correct Year 2000 problems. Our objective was to ensure that mission critical information systems will be made Year 2000 compliant in order to operate properly after January 1, 2000. This review focused specifically on management organization, change control, available resources, and contingency plans.

We found the Department had not followed a number of best practices in addressing the Year 2000 problems. HUD must immediately take several steps to minimize risk and impacts of system failures cause by the millennium date change. First, the Year 2000 project must be placed under the direction of an executive leadership as required by the February 4, 1998 Executive Order. This Order states that agency heads are now responsible for addressing the Year 2000 problem. Second, configuration management software must be adopted immediately to control software changes for HUD's mission critical systems. Finally, program areas in HUD must develop and test contingency plans for their operations in the event of system failures.

As discussed at the entrance conference, OIG's approach in reviewing Year 2000 activities is to issue interim reports before we finish the entire Year 2000 audit. Given the limited time left to complete Year 2000 remediation, we are requesting a formal response to this report's recommendations within 60 days on: (1) action taken; (2) the proposed action and date to be completed; or (3) why action is considered unnecessary.

Thank you for the assistance provided to us by your staff during the course of our first review. Should you have any questions, or require additional information, please call me at 708-3444, extension 149.

Attachment

# *Executive Summary*

On January 1, 2000, it is a real possibility that many of the Department of Housing and Urban Development's (HUD's) computer systems will malfunction or produce incorrect information simply because the century date has changed. The Year 2000 problem is rooted in the way dates are recorded and computed in automated information systems. For the past several years, programmers have typically used two digits to represent the year, such as "97" to represent 1997. However, starting in the Year 2000, the continued use of two digits will render the date indistinguishable from the year 1900, or 2001 from 1901. As a result of the ambiguity, HUD's system or application programs that use dates to perform calculations, comparisons, or sorting may generate incorrect results. Unless corrected, the impact of these failures will be widespread and costly to the Department.

HUD recognized the Year 2000 date problem two years ago and established a Year 2000 project in the Office of Information Technology (IT). Some progress has been made in HUD's effort to correct the Year 2000 date problem. Both the awareness and assessment phases of the project have been completed. In particular, the project office has identified all mission critical systems, prepared a Year 2000 readiness guide, and conducted a risk assessment. However, HUD has failed to take several "industry recognized" best practices to minimize the risk and impact of system failures caused by the Year 2000 date problems.

First and foremost, HUD needs to establish an agency-level program office to manage and coordinate Year 2000 activities rather than leaving the project management at two levels below the Office of Information Technology. The recently issued Executive Order on February 4, 1998, states that agency heads are now responsible for the Year 2000 problem. With the short time left, an executive level office is needed to ensure accurate and timely reporting of Year 2000 status and to make the hard decisions regarding business priorities and resource allocation. This office must assess the impact of using the same limited number of qualified personnel (HUD and Contractor employees) for both new system initiatives and the Year 2000 project.

Second, HUD must also immediately implement configuration management (CM) for its mission critical systems. CM is an industry accepted practice of controlling changes made to a system's software and associated documentation throughout the development and operational life of the system. Although IT had agreed over the past three years to implement CM, currently only two of the 75 mission critical applications are partially under the control of CM. Since there are millions of lines of code in HUD's systems, CM is crucial to manage the changes made to those systems. Without CM, HUD cannot readily track and test all of the fixes made to the date fields needing correction for Year 2000.

A third important step is developing contingency plans to ensure operational continuity in the event of equipment failures and software failures in the Year 2000. Until

recently, the Year 2000 Project has not focused on contingency planning for core mission business areas. Without adequate contingency planning, Year 2000 failures will render HUD unable to write new and/or maintain existing billions of dollars worth of Single and Multifamily insurance and long-term housing subsidy commitments. Further, a disruption to the subsidy processing system would become an additional hardship for more than three million families, whose Section 8 rent-subsidy checks would be delayed for an indeterminate period of time.

## **RESPONSE TO REPORT**

We provided the draft report to the Office of the Deputy Secretary on April 13, 1998. We received written comments on May 12, 1998. The Acting Deputy Secretary generally did not agree with the recommendations of our audit. The comments and our response are provided in Appendix 1.

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**Abbreviations:**

2020	2020 Management Plan - Reform Plan 2
CFO	Chief Financial Officer
CHUMS	Computerized Home Underwriting Management System
CIO	Chief Information Officer
CLAIMS	Single Family Insurance System - Claim Subsystem
CM	Configuration Management
EIS	Executive Information System
FHA	Federal Housing Administration
FMC	Financial Management Center
FSI	Financial Systems Integration
GAO	General Accounting Office
GNMA	Government National Mortgage Association
HUD	Department of Housing and Urban Development
HUDCAPS	HUD's Central Accounting and Program System
IT	Office of Information Technology
LOCCS	Line of Credit Control System
LRPH	Low Rent Public Housing Operating Subsidies Program
OIG	Office of Inspector General
OMB	Office of Management and Budget
PAS	Program Accounting System
SAMS	Single Family Asset Management System
SFIS	Single Family Insurance System
TIB	HUD's Technology Investment Board

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# *Introduction*

## **Background**

There *is* a crisis in information technology. It is big, unpredictable, and although it is not technically difficult to resolve, it is pervasive, costly, and threatens to disrupt HUD's business operations dramatically. Computations and evaluations may yield incorrect results with potentially devastating consequences to HUD. Hypothetically, the following situations could occur, if:

- ➔ One of the HUD disbursement systems terminated abnormally due to a Year 2000 miscalculation, no transactions would be produced to Treasury for payment;
- ➔ The Computerized Home Underwriting Management System (CHUMS) was unable to accept new customers from banks, HUD underwriting would not be possible;
- ➔ Insurance claims were miscalculated; HUD would incur responsibility for interest payments.

On or before January 1, 2000, it is a real possibility that many of HUD's computer systems may malfunction or produce incorrect information simply because the date has changed. The Year 2000 problem is rooted in the way dates are recorded and computed in automated information systems. For the past several years, programmers have typically used two digits to represent the year, such as "97" to represent 1997. However, starting in the Year 2000, the continued use of two digits will render the date indistinguishable from the year 1900, or 2001 from 1901. As a result of the ambiguity, HUD's system or application programs that use dates to perform calculations, comparisons, or sorting may generate incorrect results. Unless corrected, the impact of these failures will be widespread and costly to the Department.

In response to the Year 2000 problem, HUD's Office of Information Technology (IT) established the Team 2000 Project Office in June of 1996. The mission of Team 2000 is to ensure that HUD's application systems are Year 2000 compliant.

The enormous challenge involved in correcting these systems is primarily managerial and not technical. To assist in managing the Year 2000 effort, Team 2000 produced a document entitled, *HUD's Year 2000 Readiness Guide*. This guide is available at HUD's intranet website and follows GAO's best practices in planning, managing, and evaluating Year 2000 efforts. The guide describes five phases supported by program and project management; awareness, assessment, renovation, testing, and implementation.

## **Audit Objectives, Scope and Methodology**

The overall audit objective was to determine whether HUD's Year 2000 resolution plan and its execution are adequate to ensure that mission-critical information systems will be made Year 2000-compliant and, continue to operate without an interruption of service after Year 2000. Specifically, the audit focused on the:

- 1) Year 2000 management organization;
- 2) Configuration management;
- 3) Utilization of limited resources; and
- 4) Development of contingency plans for a variety of possible disruptive events at the turn of the century.

To accomplish the objective, we conducted our review at HUD's Year 2000 office. We interviewed HUD program, IT, and CFO staff and the General Accounting Office (GAO) staff. We analyzed HUD's written response to Office of Management and Budget (OMB) and GAO. We also reviewed minutes from HUD's Technology Investment Board (TIB).

We performed our work from February through April 1998. We conducted the audit in accordance with generally accepted governmental auditing standards.



# *Finding*

## **Executive Level Attention to Year 2000 Problem Is Needed**

HUD recognized the Year 2000 date problem two years ago and established a Year 2000 project in the Office of Information Technology (IT). Some progress has been made in HUD's effort to correct the Year 2000 date problem. Both the awareness and assessment phases of the project have been completed. In particular, the project office has identified all mission critical systems, prepared a Year 2000 readiness guide, and conducted a risk assessment. However, HUD has failed to take several "industry recognized" best practices to minimize the risk and impact of system failures caused by the Year 2000 date problems.

### **Executive Level Project Office Must Be Established**

We believe an executive level office is needed to provide adequate oversight over the progress of the Year 2000 project within the short time left. On February 4, 1998, President Clinton issued an Executive Order that states agency heads are responsible for the Year 2000 problem. Prior to February 4, 1998, OMB guidance stated that the agency Chief Information Officer (CIO) had been responsible for the Year 2000 fix. However, the Executive Order recognized the Year 2000 problem as a "...major technological and managerial effort..." Section 3 of the Executive Order effectively shifted the Year 2000 responsibility from the CIO to the head of each agency. In line with this shift, HUD needs to establish an agency-level program office to manage and coordinate Year 2000 activities rather than leaving the project management at two levels below the Office of Information Technology.

Another reason for a high level Year 2000 Project Office is to ensure accurate reporting of progress. While HUD has made progress in the awareness and assessment phases of Year 2000, slippage is apparent but has not been reported to HUD's Executive Technology Investment Board (TIB). Based upon the last status report provided by the Year 2000 Project Manager, many of HUD's mission critical systems are either behind the Year 2000 schedule or are not being tracked. When we brought this to the attention of the Project Manager, OIG was told the schedule was not up to date because the appropriate Team 2000 members had not updated the tracking and management system. A high level Project Office should have the needed clout to ensure accurate and timely reporting of status. Slippage cannot be prevented without accurate reporting of progress.

On March 24, 1998, GAO testified before the House Committee on Banking and Financial Services that they had found the same lack of oversight problem at HUD. GAO testified that HUD's tracking and management systems for Year 2000 did not contain information on the mission critical systems scheduled to be replaced. GAO

also testified that 20 of HUD's 30 mission critical systems are behind schedule by over 2 months, with five that have failure dates between August 1, 1998 and January 1, 1999.

### **Triage Study of HUD's Systems Has Not Been Completed**

An important aspect of Year 2000 correction is prioritizing which systems have the highest impact on HUD's mission, thus, need to be corrected first. This best practice concept helps ensure that the most vital systems are not treated the same as systems that have minimal impact on HUD's core business. OIG found that the Year 2000 Project had not completed a triage study. The current procedures allow non-mission critical systems to be renovated before the mission critical business core systems have been renovated. HUD's Year 2000 project manager told us that there is no need to prioritize systems for correction because all of HUD's systems will be certified by the Year 2000 deadline.

However, OIG noted that IT had become concerned about meeting the Year 2000 deadline. On March 3, 1998, IT informed two HUD Offices that effective April 1, 1998, IT will defer all new development and will only focus on Year 2000 work for the five largest and most difficult to renovate. They are:

- F17, Computerized Homes Underwriting Management System (CHUMS);
- A43I, Single Family Insurance System (SFIS);
- A43C, Single Family Insurance System - Claim Subsystem (CLAIMS);
- A67, Line of Credit Control System (LOCCS); and
- A96, Program Accounting System (PAS).

While this recognition is the right step in developing a priority of Year 2000 work, we remain concerned with the other 58 mission critical systems that did not receive the same priority for renovation. At the start of the Year 2000 process, around the end of June 1996, HUD had 1280 days to certify all its systems. On February 10, 1998, HUD reported to OMB that 25 of 63 mission critical systems were Year 2000 compliant. On that date approximately 50% of available time had expired, while 60% of the mission critical systems remain to be made Year 2000 certified. On average it took 25.5 days to get a mission critical system certified. At that pace, it will take 971 days to complete the remaining 38 systems. However, as of February 10, 1998, HUD had only 641 days left to complete the necessary certification and testing process.

With the limited time left, HUD needs to adopt a systems priority and to continually revisit the priority strategy to assure the most current appraisal of systems importance and vulnerability estimates are being used. An adequate systems prioritization will help to lower the risk of failure for the most strategically important systems in case of unexpected delays or other problems encountered during HUD's Year 2000 effort.

### **Impact of Financial System Integration On Year 2000 Work Not Assessed**

During our review, we were informed that the same program and technical staff and their associated contractors involved with the Year 2000 work would also most likely be involved with system development work for the Financial System Integration (FSI) Project. FSI is a key Management 2020 Reform to “modernize and integrate HUD’s outdated financial management systems with an efficient, state-of-the-art system.” HUD’s Risk Assessment Report dated August 15, 1997, did not consider the possible impact of this new system development work on Year 2000 efforts.

The Reform Plan’s Executive Summary noted that HUD’s new consolidated financial management information system is scheduled for full implementation by mid-1999. The FSI effort would require a considerable amount of system development work. For Fiscal Year 1998, the following FSI items are planned:

- Implement a consolidated HUD-wide general ledger by the combination of four existing general ledger systems: (1) PAS/LOCCS, (2) HUD’s Central Accounting and Program System (HUDCAPS)-Section 8, (3) Federal Housing Administration (FHA’s), and (4) Government National Mortgage Association (GNMA’s) general ledgers;
- Implement a General Ledger for FHA;
- Upgrade HUDCAPS for Year 2000;
- Develop the HUD-wide Chart of Accounts;
- Modify the PAS/HUDCAPS Interface;
- Implement direct entry of budget into HUDCAPS;
- Implement process to load GNMA balances into HUDCAPS;
- Design and Implement an Executive Information System (EIS);
- Implementation of HUDCAPS for the Financial Management Center (FMC); and
- Pilot HUDCAPS for the Low Rent Public Housing Operating Subsidies Program (LRPH).

Concurrent to the proposed FSI work listed above, the same HUD staff and contractors are completing the last three phases of Year 2000 work, renovation, testing and certification, and implementation. Based upon industry literature, HUD has more Year 2000 work ahead than completed. Industry literature indicates testing is more than 50 percent of the total Year 2000 effort. The Year 2000 staff has scheduled the last phase, implementation, to be completed by OMB’s due date of March 31, 1999. Then from March 31 to December 31, HUD staff and contractors will be testing systems to get out any final bugs prior to January 1, 2000. This is the same timeframe for implementation of the FSI.

Best practices require that staff with the most knowledge perform testing and review the testing results. The systems development work for the FSI could be in direct conflict with resources required for the Year 2000 effort as the most knowledgeable staff is currently doing the FSI development work.

### **Configuration Management Is Critical To Year 2000 Effort**

Another critical best practice not implemented is software configuration management (CM). CM is an industry accepted practice of controlling changes made to a system's software and associated documentation throughout the development and operational life of the system.

OIG has reported, and continues to report, that HUD does not have an adequate software CM process. Over the past three years, OIG reported, in five separate reports, the lack of an automated CM process as an internal control weakness. These reports are: the Software Maintenance Audit Report of 1996; HUD's Financial Statement Audits for fiscal years 1995, 1996, and 1997; and the "Interim Review on HUDCAPS Performance: Year 2000 Compliance" of 1998. In general, OIG has strongly recommended that HUD implement the already purchased CM software on the Hitachi for its mission-critical systems, and especially for HUDCAPS, a core system for HUD's financial activities.

However, the Year 2000 Project has not addressed concerns in configuration management. Although IT purchased and installed a configuration management tool (CA-ENDEVOR) for the Hitachi mainframe more than four years ago, still only two systems have been partially placed under the control of this tool. For the Unisys mainframe, even though there are CM tools available, IT has not made a selection.

It is imperative that the appropriate control is in place to ensure vigorous Year 2000 software testing. Decisions and procedures developed for configuration management will inevitably influence testing; and most experts agree that configuration/change management must be handled with an appropriate automated CM software. An automated configuration management tool, such as CA-ENDEVOR, helps to manage the software life-cycle by:

- providing consistent and flexible logical structure for creating, classifying, and maintaining software inventory;
- tracking and documenting changes/modifications to software products over time by creating an online change history of when and by whom the changes are made, which, in turn, speeds up the correction/debugging process;
- preventing conflicting changes to the same system component;
- allowing prior versions to be correctly restored;
- tracing the flow of date-field data through subsequent occurrences in all affected modules;
- placing change packages and approvals on-line, thereby eliminating the need for change-related paperwork; and
- documenting all components used to build executable programs, thereby assuring correspondence between source code and its executable code. ("Source code" refers to the human-readable code, such as COBOL, FORTRAN, etc.; "executable code" basically refers to the machine-readable code produced as a result of source code translation.).

At HUD, deficiencies in software change control have already resulted in a significant number of production problems, as reported in the 1996 report: "Controls over Software Maintenance Must Be Significantly Strengthened." The report further stated that IT's own study of change releases concluded that release-related problems are costly in time lost and resources wasted. Those changes, attempted without adequately controlled procedures, resulted in a need for further changes to correct the problem caused by the preceding change. If we were to use HUD's past performance statistics to predict the future Year 2000-related conversion outcome, our prediction would be one of unacceptable failure rate for the converted systems when the system-wide integration testing takes place in 1999.

During the Year 2000 renovation, changes will be made to many more software modules than is the norm. Consider, for example, one of HUD's mission-critical systems, Single Family Asset Management System (SAMS), which is composed of over 1,000 programs/modules with a total of over 7 million lines of code. Each of these programs will be examined to determine if it uses date fields in calculations, comparison or sorting. Then, the program code will be remediated to distinguish between dates in the 1900's and the dates in the 2000's and then tested to determine whether that particular program handles the four digit date correctly in both centuries. If implemented, the CM software will automatically track the changes made, when and by whom. In this way, CM software provides an auditable assurance that only the required changes to the appropriate modules are made and that all the components used to build the new Year 2000-compliant executable code are from correct versions of source code.

Since the volume of date-fields in need of Year 2000 renovation will be enormous, it is essential to anticipate that not all date-fields will be identified. In this regard, CA-ENDEVOR software provides yet another advantage for HUD's large systems, such as SAMS or HUDCAPS, to function under the automated CM software. Once a data element has been identified as a date-field, the CM software can identify every module/program in the entire application which uses that field. Thus, the benefit of processing under CM is that it provides greater assurance of accurately identifying date related fields in modules/programs. A reliance on a manual process, on the other hand, is prone to errors and omission.

Although each program remediated is tested individually to determine that it handles dates in both centuries, HUD will conduct system-wide integration testing for each system during 1999 to surface discrepancies. Some of these discrepancies may be due to missed computational date-fields, while others may be due to mismatch of source-to-executable code, etc. However, if these systems were under CM control, problems of mismatch of source-to-executable would have been eliminated early in the process and the risks of missed date-fields would be significantly reduced.

In summary, automated configuration management is recognized as the computing industry's best practice for software maintenance; and, as such, automated CM is a critical component of software reliability and staff accountability.

## Contingency Plans Do Not Exist For Mission Critical Systems

Another missing piece to the Year 2000 effort is contingency planning. So far HUD has not completed any Year 2000 contingency plans for its mission critical systems. Executive management must consider that while HUD has made progress in its Year 2000 effort, there is no guarantee that the current initiatives will in fact be completed on time or will be free of unforeseen problems. Best practices outlined in GAO's Year 2000 Assessment Guide<sup>1</sup> require agencies to initiate realistic contingency plans during the assessment phase for critical systems to ensure the continuity of their core business processes.

Contingency planning is important because it identifies alternative activities, which may include manual and contract procedures, to be employed should systems fail to meet the Year 2000 deadline. GAO's exposure draft, Year 2000 Computing Crisis: Business Continuity and Contingency Planning<sup>2</sup> states that executive management needs to be fully aware of the potentially devastating financial, organizational, and political consequences of the failure of one or more mission critical information systems. It is the responsibility of agency executives to reduce the risk of the Year 2000-induced business failures. GAO's draft guide requires:

- Initiation - Establishment of the business continuity project workgroup, strategy, master schedule, milestones and executive support.
- Business Impact Analysis - Assess the potential impact of mission critical systems failures on HUD's core business processes, define failure scenarios, perform risk and impact analysis of each core business process.
- Contingency Planning - Identify contingency plans and implementation modes, define triggers for activating contingency plans, establish business resumption team for each core business.
- Testing - Develop and test contingency test plans and update disaster recovery plans and procedures.

Further, HUD's Readiness Guide, page 1-12, states that a contingency plan should be prepared that provides options in the event of unexpected system failures caused by the Year 2000 date problems. HUD's Year 2000 Project Manager told us that program officials were requested to prepare contingency plans after the GAO's exposure draft was issued. However, the Year 2000 Project Manager stated that so far only Housing responded with an indication that any contingency planning work had been started.

Contingency plans should be formulated to respond to two types of failures: those that can be predicted (e.g., system renovations that are behind schedule) and those that are unforeseen (e.g., a system that fails despite having been certified as Year 2000 or a system that cannot be corrected by January 1, 2000, despite appearing to be on schedule today). Without both adequate and tested contingency plans, HUD is facing the risk that its core business processes will be interrupted or will fail. For example,

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<sup>1</sup> GAO/AMID-10.1.14. September 1997

<sup>2</sup> GAO/AIMD-10.1.19 March 1998

LOCCS disbursed \$22.2 billion in Fiscal Year 1997. If this system were to terminate abnormally due to a Year 2000 problem, over 100 programs related to a broad range of recipients would not receive their grants, loans and subsidies. These recipients include State Governments, municipalities, independent companies, non-profit institutions, and individuals. Another example is the impact of the Computerized Home Underwriting Management System (CHUMS). If this system fails, HUD cannot accept new customers from banks. HUD underwriting would not be possible affecting the First Time Homebuyers Program as well as reverse mortgages that augment income to the elderly. Also, if the Single Family Insurance System (SFIS), \$61.1 million in new insurance during fiscal year 1997, were to fail, FHA would not have the ability to insure low down payment mortgages to individuals.

The potential for problems resulting from the lack of contingency plans is already evident with two systems, A44D, Low Rent Housing System LRH Security Ledger, and A49, National Credit Bureau Referral. These two systems were suppose to be replaced. However, they have recently been reclassified from "To Be Phased Out With Replacement" to "To Be Renovated" due to delays in completing the replacement systems. Given the dangers associated with not having contingency plans and the interdependencies of HUD's systems and partners, we believe it is imperative that HUD immediately develop contingency plans for all critical core business processes and supporting systems.

## RECOMMENDATIONS

We recommend the Deputy Secretary of HUD:

1. Establish an executive-level project office to manage and coordinate Year 2000 activities. The Year 2000 Project Office should report directly to the Deputy Secretary.
2. Direct IT to renovate all mission critical systems prior to any work on non-mission critical systems based upon a triage study.
3. Direct IT to place HUD's mission-critical systems, in order of priority, under the control of the already purchased configuration management tool for the Hitachi mainframe platform.
4. Direct IT to select a CM tool for the Unisys mainframe platform and place HUD's mission-critical systems, in order of priority, under the control of that CM software.
5. Conduct an impact analysis to determine whether there are sufficient resources (HUD and Contractor employees) to complete both the FSI and the Year 2000 work. Given the short time and the amount of work left, ensure that Year 2000 work has a higher priority for limited resources.
6. Direct senior level program officials to immediately prepare and test Year 2000 contingency plans for all of HUD's core business processes and supporting mission critical systems. These plans should be based on the GAO's March 1998 guide and should address these two questions:
  - How will we conduct core business if HUD's mission critical systems fail?
  - How will we conduct core business if HUD's Partner's computer systems fail?



# Appendices

## Appendix 1

### Auditee Comments

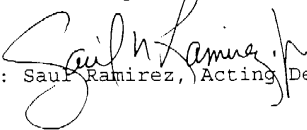


U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT  
THE DEPUTY SECRETARY  
WASHINGTON, D.C. 20410-0050

MAY 12 1998

MEMORANDUM FOR: Susan Gaffney, Inspector General, G

ATTENTION: Benjamin K. Hsiao, Director, Information  
Systems Audit Division, GAA

FROM:  Ramirez, Acting Deputy Secretary, SD

SUBJECT: Review of HUD's Efforts to Correct Year 2000  
Problems

We have received the subject draft report for review and comment. Office of Inspector General findings and recommendations indicate that: 1) HUD needs to establish an agency-level program office to manage and coordinate Year 2000 activities; 2) there was a lack of triage in prioritizing HUD's development work, and the report called for a comprehensive assessment of resource requirements to confirm that there are sufficient resources available to handle competing priorities; and 3) the Office of Information Technology (IT) should immediately implement automated configuration management tools for HUD's mission critical systems.

We disagree with these recommendations. The Year 2000 Project has always had executive-level involvement and oversight from the Secretary and Deputy Secretary. In addition, HUD recently hired a new Chief Information Officer (CIO) who has direct, senior management-level oversight of all Year 2000 activities. While becoming Year 2000 compliant is basically a business problem, most of the corrective work that is needed is technology-related and is appropriately managed within IT. It would not be prudent to reassign project accountability with so little time left and there is no evidence to suggest that IT is not managing the project well.

The report focuses attention on industry's triage approach, a strategy that is neither appropriate nor well advised for HUD. Triage is only important if you have far greater demand than you can meet with a constrained and

See OIG  
Comment 1

See OIG  
Comment 2

thoroughly interchangeable resource. Nearly 18 months ago, we concluded that HUD could complete all renovation in time by relying on the expertise of the existing development resources. Risk mitigation steps have also been taken to ensure we stay on schedule. IT's strategy is working.

The report's findings and recommendations appear to give implementation of an automated Configuration Management (CM) tool a higher priority than either direct Year 2000 compliance work or implementation of HUD's management reform initiatives. The Year 2000 Project Office agrees strongly with industry literature that warns it is not prudent to incorporate any other agenda into the Year 2000 work, including infrastructure efforts as important as configuration management, because of the potential for delay and risk of failure that are inherent with that decision.

Lastly, the report states that HUD needs to develop business process continuity plans to ensure operational continuity in the event of unforeseen equipment and software failures in the Year 2000. We agree with this recommendation.

Please see our specific comment for each recommendation.

1. Establish an executive-level project office to manage and coordinate Year 2000 activities. The Year 2000 Project Office should report directly to the Deputy Secretary.

RESPONSE: The Year 2000 Project has always had executive-level involvement and oversight. The Deputy Secretary is part of the Year 2000 management structure. The Department now has on board a new CIO, Gloria R. Parker, who is already familiar with HUD's Year 2000 program progress and is providing executive-level oversight. As CIO, Ms. Parker reports directly to the Deputy Secretary and consults with him on a regular basis. This relationship assures that any changes or deviations to the Year 2000 program or schedule will be brought to the immediate attention of the Deputy Secretary and Secretary. Additionally, the Technology Investment Board Executive Committee (TIBEC), chaired by the Secretary, includes Year 2000 Project status as a regular feature on its agenda. The Executive Order did not shift responsibility. The agency head, the Secretary, has always been fully accountable for this agency and its response to the Year 2000 issue. The oversight and reporting structure of the Year 2000 Project provides the Secretary with the support and

See OIG  
Comment 3

See OIG  
Comment 4

information necessary to fully carry out this responsibility.

While the Year 2000 issue is a business problem, much of the work that is needed is technology-related and is appropriately managed within the IT domain. The IT organization is where the renovation work occurs for HUD's applications. IT makes decisions on the renovation strategy standard, considering industry recommendations, but tailors those recommendations to ensure success within the HUD environment. IT has chosen to vary from industry practices only when it has determined that an alternative approach is more pragmatic for HUD.

We believe it would be ill advised to change the management structure at a point in the project life cycle that demands consistency in vision and accountability. There is no evidence that IT is not managing the Year 2000 compliance efforts well. Nor is there evidence that HUD's systems are at risk of being non-compliant in the Year 2000. The Year 2000 Project Office encourages any and all efforts that enhance opportunities to ensure that the urgency and priority of this project are understood.

IT management has taken prompt corrective actions to improve Year 2000 Project status and tracking integrity. The Year 2000 Project Office continually monitors project progress, enabling IT management to initiate corrective actions immediately. Changing the management structure does not, in itself, change the quality of status reporting.

2. **Direct IT to renovate all mission critical systems prior to any work on non-mission critical systems based upon a triage study.**

The Year 2000 Project Office understands and appreciates the importance of working smart, and not foolishly expending resources on work that does not have the highest payback. The industry's triage approach was considered by the management team and a conscious decision was made against the triage approach. Furthermore, this agency is following an important industry corollary: once a strategy has been selected, stick with it if it is working. IT's strategy is working.

Triage is only important if you have far greater demand than you can meet with a constrained and thoroughly interchangeable resource. Nearly 18 months ago, we concluded that HUD could complete all renovation in time by relying on the expertise of the

existing development resources. The Social Security Administration had already established a precedent for this approach. IT chose not to assign the renovation work to a "factory" through which its application work would be single threaded. Instead, IT formulated the Integrated Implementation Plan, a compilation of what systems work has to be completed by the knowledge workers currently supporting development/maintenance of those systems.

These knowledge workers are not transferable. Each possesses skills specific to one of HUD's four distinct platforms (the Unisys and Hitachi mainframes, PC/LAN, and Client/Server) and are often further specified to individual systems on those platforms. It is not feasible, for example, to move LAN systems workers to a Unisys renovation project. This was among the chief factors considered by IT management when the plan was developed and the decision was made not to do triage but to use the existing structure instead. We remain convinced that this was the correct strategy for HUD to follow, and, in any event, it is much too late in the process to reconsider and adopt a triage approach.

The recommended strategy to renovate only mission critical systems prior to any work on non-mission critical systems is not an efficient or effective use of resources. HUD is not dependent upon a single renovation gateway through which code must be sequentially delivered for renovation. In every case, we are using the "home team" for Year 2000 renovation. All teams are working their Year 2000 Project concurrently.

Risk mitigation steps have been taken to ensure that Year 2000 work stays on schedule. In a memorandum to the Chief Financial Officer and the Acting Assistant Secretary for Housing, all development work, except for renovation being done for Year 2000, was suspended on five large, mission critical systems. This allows development teams to apply their energies and resources exclusively toward making their systems Year 2000 compliant. The remaining 58 mission critical systems are receiving the same level of scrutiny and priority as did the five, but they are not candidates for this kind of risk intervention. In another action, the disposition of all systems in the active inventory was locked into place effective April 15, 1998. By keeping system disposition constant, accuracy of progress tracking is maintained, and applied resources are kept properly focused.

The conclusion that renovation progress occurs only when certification is achieved is incorrect. It is a common industry practice to level demand and mitigate risk by dividing large work efforts into phases. The Year 2000 Project does not record an application being renovated in phases as compliant until all phases are compliant. For example, Computerized Homes Underwriting Management System (CHUMS, F17) has been divided into five phases. Two of these 5 phases have been certified Year 2000 compliant. CHUMS is 50% complete. Even though two of its phases are compliant, CHUMS is not counted toward our certification objective. The Tenant Recertification Tracking System (TRACS, F87), another example, is divided into two phases; one is certified. TRACS is 72% complete because the component that is certified is a much larger part of the system.

The attached chart demonstrates the progress made on the ten mission-critical systems that are being renovated and certified in phases.

The OIG draws an incorrect conclusion that HUD's Year 2000 Project life cycle should be linear in nature (e.g., 50% of the applications should be certified if we are halfway through the project duration). The Year 2000 Project Office, in February 1997, examined how to establish achievable and measurable objectives, by quarter, to ensure IT was making continual progress toward the goal of having all application systems completed by the end of calendar year 1998. IT's Integrated Implementation Plan incorporates all system renovation schedules. These are the metrics against which it is appropriate to measure the project's progress. IT is achieving these objectives.

3. Direct IT to place HUD's mission critical systems, in order of priority, under the control of the already purchased configuration management tool for the Hitachi mainframe platform. And
4. Direct IT to select a configuration management tool for the UNISYS mainframe platform and place HUD's mission critical systems, in order of priority, under the control of that configuration management software.

**RESPONSE:** IT recognizes the importance of a good configuration management process to the successful completion of the Year 2000 renovation and certification processes. We disagree with the OIG recommendation that explicitly calls for the

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Comment 8

implementation of large, complex configuration tools as the only way to achieve the configuration management goals. IT management has recognized from the start of the Year 2000 planning effort that resources needed to fully implement automated configuration management tools would be the same resources that are needed to successfully achieve Year 2000 renovation and certification, and that it was necessary to choose which of the efforts had the highest priority. Clearly, the top priority is to complete the Year 2000 renovation and certification. This is consistent both with industry literature which warns against undertaking significant infrastructure improvements, such as implementation of new Configuration Management tools, because of the high risk that it would pose for Year 2000 delay and failure, and with recommendations from the President's Industry Council on Year 2000 advising agencies to focus on achieving Year 2000 compliance, and putting off other work until after Year 2000 compliance is achieved.

Implementation of automated configuration management tools, however, is not the only way to achieve the needed benefits of good management. Accordingly, IT is instituting a configuration management process for changes to systems, or system phases, which have undergone Year 2000 Renovation and certification. Proposed changes or modifications to Year 2000 certified compliant systems, or system phases, will be screened to determine first if the changes must be made at this time; and second, for those changes that must be made, that the criteria established in the existing Year 2000 certification procedures are applied to determine which changes or modifications will be required to undergo Year 2000 compliance re-certification themselves before being returned to the Year 2000 certified system code. This change management process is being implemented, and will ensure that ongoing changes or modifications to systems do not introduce non-compliant code into system code that has already been renovated and certified as Year 2000 compliant.

The report suggests that IT has been ignoring configuration management. This is not the case. IT has installed Endeavor on the Hitachi platform, surveyed the market, evaluated the only robust, commercially available product on the Unisys platform, and evaluated three commercially available configuration management tools for the Windows client server platform. Individual applications have instituted proprietary configuration management techniques as well.

IT is bringing applications under the control of Endeavor, but experience shows it is a resource intensive effort. This direct experience is very much at odds with the OIG's perception. For example, the Endeavor team for Single Family Insurance System (SFIS, A43I), which is only partially implemented under configuration management, has defined the infrastructure, implemented initial/front-line security, started to develop processors to manage the inventory, and created an outline for the User's Guide. The Endeavor configuration team for HUD's Central Accounting and Program System (HUDCAPS, A75) has defined the infrastructure, implemented security, loaded the source code into the Endeavor libraries and started to develop the processors to manage the inventory. After the Year 2000 renovation effort has been completed for SFIS and HUDCAPS, IT will complete the configuration of these systems under Endeavor. Other critical applications will be configured under Endeavor once they have been certified and after the SFIS configuration management effort is successfully demonstrated.

On the Unisys platform, the Line of Credit Control System (LOCCS, A67) development team evaluated Software Quality Assurance (SQA) developed by ArkData AB, a Swedish company, and determined it was not cost effective for LOCCS to implement SQA. LOCCS has developed a utility that manages source code, providing developers with an automated demand-based method to check out software, logs the reasons for check out, and logs the results. This check out method was designed primarily to prevent two developers from working on the same program at the same time. When a developer checks out source code, the utility moves the source code from the source library to the developer's library and marks the central control table as to who checked out the source. During the Summer of 1997, two other projects (Low Rent Housing Security Ledger, A44D and the Telephone Directory Personnel Locator System, A47) began to evaluate SQA. After these projects complete their evaluation of SQA, IT will decide whether to purchase and implement SQA. If IT decides not to implement SQA, an alternative approach may be the adaptation of the LOCCS configuration management utility for use by the other Unisys applications.

IT has evaluated three commercially available software products for the LAN/PC/Client Server. A configuration management Product Evaluation Report has been written. This report recommends approval of

the PVCS configuration management product, development of a Pilot Test Plan, selection of a Pilot Test Application, and conducting a Pilot test.

Configuration Control Board (CCB) approval of the Product Evaluation Report will trigger initiation of report recommendations.

5. Conduct an impact analysis to determine whether there are sufficient resources (HUD and Contractor employees) to complete both the FSI and Year 2000 work. Given the short time and amount of work left, insure that Year 2000 work has a higher priority for limited resources.

RESPONSE: It is incorrect to assume that the Financial Systems Integration (FSI) systems implementation, occurring in 1999, is concurrent with, and uses the same resources as, Year 2000 certification and implementation occurring during 1998. There will be no FSI impact on Year 2000 efforts for HUDCAPS or CFO Legacy Systems where staff engaged in Year 2000 renovation work will transition to the FSI Project Team after they have finished their Year 2000 renovation assignment. Additional staff to specifically support the FSI and Financial Management Center task requirements have been hired and are actively engaged in recruiting additional resources. The FSI effort will present no staffing conflicts between FSI and Year 2000.

Comments in the report regarding testing indicate a misunderstanding of the nature of the system testing preceding certification and implementation and, further, suggest that the testing during 1999 will be HUD's System Development Methodology (SDM) system testing and user acceptance testing. Both impressions are incorrect. Year 2000 testing to be performed during calendar Year 1999 will take HUD's certified and compliant production systems and confirm, for the third time, that they behave properly in an integrated, and future-dated environment. This software will already have been tested by the application team (system and user acceptance testing in accordance with the SDM). The software will already have been advanced date tested in a compliant environment for the certification process. During 1999, the "third level" of testing represents a level of risk control that is beyond that within the SDM. Subject matter experts from the application development team will need to support the 1999 testing, but it is not correct to conclude that initial testing is inadequate nor that the degree of involvement by the application development team in



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1999 testing is as time consuming as typical SDM System Testing and User Acceptance Testing.

6. Direct senior level program officials to immediately prepare and test Year 2000 contingency plans for all of HUD's core business processes and supporting mission critical systems. These plans should be based on the GAO's March 1998 guide and should address these two questions:

- How will we conduct core business if HUD's mission critical systems fail?
- How will we conduct core business if HUD's Partner's computer systems fail?

**RESPONSE:** The Year 2000 Project Office is currently working with each of the program areas to document their business process continuity plans according to the March 1998, GAO Guidelines exposure draft. Each program office is to formulate strategies on exactly how they will continue to provide their essential business processes should they experience a disruption anywhere within the end-to-end service delivery. These strategies form HUD's basic business process contingency plan.

The first step is for program offices to identify HUD's truly "essential" business services and support, and the potential adverse impact on its end clients if those services and support were interrupted. This effort is necessary to determine the highest priority business functions for which HUD must provide continuing support. Identifying these essential services is indisputably a business/policy call. Following this, it is important to determine what business strategies/processes HUD can pursue to work around any potential interruption of these essential services.

If you have any questions regarding the comments above, please contact Leslie H. Graham, Jr. on 708-0306.

System Code	System Name & Acronym	Lines of Code	Total Phases	Renovation	Certification
A431	Single Family Insurance System (SFIS)	1,158,617	8	2 completed 6 underway	1 completed 7 yet to start
A43C	Single Family Insurance System -Claims Subsystem (Claims)	457,957	10	3 completed 7 underway	Starting process
A67	Line of Credit Control System (LOCCS)	600,000	12/1*	7 completed 5 underway	Starting process
A75	HUD Central Accounting & Program System (HUDCAPS)	1,212,608	2	Both underway	Starting process
A80Q	Public Inquiry Communication Subsystem (PICS)	1,687,002	7	All underway	Starting process
A96	Program Accounting System (PAS)	600,000	13	9 completed 4 underway	Not yet started
F17	Computerized Homes Underwriting Management System (CHUMS)	618,210	5	3 completed 2 underway	2 completed 1 underway 2 yet to start
F51	Institution Master File (IMF)	1,667,667	3	All underway	Starting process
F87	Tenant Recertification Tracking System (TRACS)	2,551,776	2	Both completed	1 completed 1 underway
N31	Integrated Business System (IBS)	1,627,319	2	Both completed	Starting process

\*LOCCS is renovating in 12 phases, but is undergoing certification as a whole system.

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## OIG EVALUATION OF RESPONSE

### No. Comments

1. We cannot agree with the claim that the Year 2000 Project always had executive level involvement. Other than periodic briefings at high level meetings, where only positive progress have been reported, we found little evidence of concerns or issues related to the Year 2000 date problems raised by senior staff. For example the possible delays for 20 of the 30 mission critical systems, as described by GAO in their testimony, have never been reported or discussed at the Executive Technology Investment Board meetings. We also disagree with the assertion that there is no evidence to suggest that IT is not managing the Year 2000 project well. The continued refusal to implement fundamental industry accepted sound practices such as configuration management and the triage study increase the risk of Year 2000 failures at HUD.
2. We found no evidence to support IT's claim that HUD could complete all renovation in time by relying on existing resources. During our review, we requested but never received a comprehensive analysis of resources required to fix the Year 2000 date problems.
3. Over the last three years we have repeatedly reported on the need for HUD to implement automated configuration management (CM), an industry accepted practice for maintaining software integrity. Although IT agrees that this important control should be implemented, most systems still lack CM. Since the Year 2000 date problem would require thousands of changes to millions of lines of code in HUD's systems, it stands to reason that these changes must be made through a well controlled automated process. We continue to believe that without relying on an automated system for CM, HUD cannot readily track and test all of the fixes made to the date fields needing correction for Year 2000.
4. The response has not changed the need for Recommendation No. 1 (see OIG Comment 1 above). Also, the claim that Ms. Gloria Parker, the new CIO, will provide the needed executive level oversight is premature. Although she was not on board during our review, we had hoped that with her selection, she would be able to provide the needed leadership for the Year 2000 effort. However, the CIO currently has no staff and no direct control over IT. Further, the Department has not yet decided whether the CIO reports directly to the Deputy Secretary or the Office of Administration.

5. Recommendation No. 2 still stands (see OIG Comment 2 above). Again we reiterate on the need to determine the best approach for resource allocation. It is never too late to properly allocate your resources within the time left. Further, a triage study would have linked HUD's systems to its core business, which would provide the needed analysis to determine the level of testing to be done. The triage study results would not only identify systems that should be tested first but would also recognize the need to test business dependent systems at the same time. Business related integrated tests would logically be completed prior to the planned enterprise testing expected during 1999 and would lower HUD's risk of Year 2000 failure.
6. We cannot agree with the response indicating that the remaining 58 mission critical systems are receiving the same level of priority as did the five systems restricted to Year 2000 work only. We strongly urge that IT suspend all non-Year 2000 development work on all mission critical systems until they are Year 2000 compliant and fully tested at the enterprise level. We believe the remaining 58 mission critical systems are candidates for this kind of risk intervention.
7. We have carefully evaluated the current schedule for renovation and certification. We remain concerned that if IT continues the current renovation/certification pace, there will be insufficient time left for adequate enterprise testing. We also cannot agree with the claim that the Year 2000 Project is meeting the schedule of the Integrated Implementation Plan. During our review, IT admitted that the system, Status 2000, set up for progress reporting did not contain complete and accurate information. As late as May 12, 1998, the Project Office recognized that data updates are still a problem. Without accurate reporting of project status, the Department cannot measure the progress of the Year 2000 Project. Consequently, delays may remain hidden until it's too late to prevent Year 2000 failures.
8. Recommendations No. 3 and 4 are still needed. Automated CM is a fundamental control process that must be implemented as soon as possible. We agree that it is too late to implement a full featured CM process (e.g., complete compile procedures). However, it is not too late to implement just the check-in/check-out portion of the available CM to track changes to components, such as program code. A manual configuration change management process would be staff intensive and subject to human errors and omissions.

Specifically we are concerned with the following control weaknesses, when attempting to control software changes without the aid of automated tools:

- Questionable or non-existent audit trail of which changes were made;
- Questionable or non-existent audit trail of when and by whom the changes were made;
- No assurance that the most recent component versions were used;
- No assurance that standardized compile procedures were used;
- No assurance that executable programs have been built from approved source code, copybooks, etc.;
- No verifiable, automatic record of all components used to build an executable program; and
- No control over results of concurrent check-out of components.

9. Recommendation No. 5 is still needed. Given the limited available technical resources within HUD and in the market place, we continue to believe it is prudent for HUD to evaluate the resource impact of Year 2000 and Secretary's Management 2020 reforms. During our review, we requested such an analysis but have not received it. We also disagree that there will be no FSI impact on the Year 2000 efforts for HUDCAPS and the CFO legacy systems. FSI is a large scope project with an extremely aggressive schedule. Interfaces must be developed to pass data from existing financial and programmatic systems to FSI. We strongly believe that the same set of employees (HUD and Contractor) with the appropriate system knowledge is needed to perform both the Year 2000 renovation and testing work, and the work for FSI implementation.
10. We agree with the positive response to Recommendation 6. We intend to evaluate and monitor the Department's contingency planning efforts for the Year 2000 in the near future.

## Appendix 2

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