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Year 2000 Computer Software Conversion: Summary of Oversight Findings and Recommendations

Item Type	House Committee Approved Report
Download date	2026-06-10 22:09:24
Link to Item	https://hdl.handle.net/20.500.14300/1364

Union Calendar No. 464

104th Congress, 2nd Session - - - - - House Report 104-857

YEAR 2000 COMPUTER SOFTWARE CONVERSION: SUMMARY OF OVERSIGHT FINDINGS AND RECOMMENDATIONS

SIXTEENTH REPORT

BY THE

COMMITTEE ON GOVERNMENT REFORM AND OVERSIGHT



SEPTEMBER 27, 1996.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE

27-317 CC

WASHINGTON : 1996

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
Washington, DC, September 27, 1996.

Hon. NEWT GINGRICH,
Speaker of the House of Representatives,
Washington, DC.

DEAR MR. SPEAKER: By direction of the Committee on Government Reform and Oversight, I submit herewith the committee's sixteenth report to the 104th Congress.

WILLIAM F. CLINGER, Jr., *Chairman.*

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104TH CONGRESS }
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SEPTEMBER 27, 1996.—Committed to the Committee of the Whole House on the
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Mr. CLINGER, from the Committee on Government Reform and
Oversight, submitted the following

SIXTEENTH REPORT

On September 24, 1996, the Committee on Government Reform and Oversight approved and adopted a report entitled “Year 2000 Computer Software Conversion: Summary of Oversight Findings and Recommendations.” The chairman was directed to transmit a copy to the Speaker of the House.

I. SUMMARY

A. BACKGROUND

After midnight, December 31, 1999, computer systems throughout the world are at risk of failing. Computers may confuse the year 2000 with the year 1900 on January 1, 2000, and go backward in time instead of forward when the new century begins. The severity of the problem was raised when Congress was told that if businesses and governments continue to ignore this issue, disruption of routine business operations and the inability of the Federal Government to deliver services to the American public could result.

According to a Congressional Research Service memorandum dated April 12, 1996, “Many people initially doubted the seriousness of this problem, assuming that a technical fix will be developed. Others suspect that the software services industry may be attempting to overstate the problem to sell their products and services. Most agencies and businesses, however, have come to believe that the problem is real, that it will cost billions of dollars to fix, and that it must be fixed by January 1, 2000, to avoid a flood of erroneous automatic transactions.” The memorandum further sug-

gests that it may already be too late to correct the problem in all of the Nation's computers, and that large corporations and Government agencies should focus on only their highest priority systems.¹

The Committee on Government Reform and Oversight is deeply concerned that many Federal Government departments and agencies are not moving with necessary dispatch to address the year 2000 computer problem. Without greater urgency, those agencies risk being unable to provide services or perform functions that they are charged by law with performing. Senior agency management must take aggressive action if these problems are to be avoided.

B. JURISDICTION

The Committee on Government Reform and Oversight (the "committee") has primary legislative and oversight jurisdiction with respect to the "overall economy, efficiency and management of Government operations and activities, including Federal procurement." It also has primary oversight responsibility to "review and study, on a continuing basis, the operation of Government activities at all levels with a view to determining their economy and efficiency."² In addition to its other oversight responsibilities:

[T]he Committee on Government Reform and Oversight may at any time conduct investigations of any matter without regard to the provisions . . . conferring jurisdiction over such matter upon another standing committee. The committee's findings and recommendations in any such investigation shall be made available to the other standing committee or committees having jurisdiction over the matter involved. . . .³

Pursuant to this authority, the Subcommittee on Government Management, Information, and Technology (the "subcommittee") convened an oversight hearing on April 16, 1996 to examine whether January 1, 2000, is the date for a potential computer disaster⁴. Currently, computers which use two-digit date fields will fail to recognize the entry of the next millennium on January 1, 2000. If left unchanged, a global computer virus could result. The subcommittee reviewed Federal agency management of this potentially disastrous computer problem.

The subcommittee's jurisdiction centers on the Federal Government's operations. Consequently, although the year 2000 problem affects both public and private organizations, the subcommittee has focused its attention on the preparedness of Federal Government departments and agencies.

II. FINDINGS

A. PROCEEDINGS OF THE SUBCOMMITTEE

On April 16, 1996, Subcommittee Chairman Stephen Horn convened a hearing of the Subcommittee on Government Management,

¹ Richard Nunno, Analyst in Information Technology, Science Policy Research Division, *Year 2000 Computer Problem*, Congressional Research Service, April 12, 1996, p. CRS-2.

² Rules of the House of Representatives, 104th Congress, X, 1(g)(6) and (12) and X, 2(b)(2).

³ Rules of the House of Representatives, 104th Congress, X, 4(c)(2).

⁴ The decision to record two-digit date fields as "66" rather than "1966" was a way to save very limited storage space on computers. Many believed at the time that there would be difficulty in the year 2000, but they assumed that any systems already in operation would be replaced by the year 2000. At this point no magic bullet has appeared to solve this problem.

Information, and Technology to collect the facts on the steps Federal agencies are taking to prevent a possible computer disaster. Among the questions he raised were whether agencies are taking the necessary actions to identify where the problem lies and whether they are providing the necessary human and capital resources to correct the problem.

In her opening statement, the subcommittee's ranking minority member, Representative Maloney noted: "The cost of failure is high—systems that deliver services to individuals will not work, and those services will not be delivered. Checks will not arrive on time. Planes will be grounded, and ports will be closed."

As noted by subcommittee member Representative Tom Davis (R-VA), "think for a moment how dates play a part in each one of our lives and how the failure of a computer system or computer scanner to recognize and understand a date can affect us. Our driver's license may prematurely expire and the Social Security Administration may recognize 25-year-olds as 75-year-olds, without conversion that is needed for the year 2000."⁵ And as pointed out by Representative Peter Blute, "this is a very important issue—an economic issue for the entire country."⁶

A number of examples were received by the subcommittee of incidences that could occur if industry and government continue to ignore this issue. In fact everything from unexpected expiration of drivers' licenses to the erroneous dates for final mortgage payments could occur if two-digit date fields remain unable to recognize the year 2000. Knowing this information technology project has a fixed date for completion, January 1, 2000, Subcommittee Chairman Horn asked hearing witness, Kevin Schick of the Gartner Group, the estimated cost of fixing this problem. Mr. Schick provided recent estimates as high as \$600 billion worldwide, half of which would be in the United States and \$30 billion for the Federal Government. In accordance with Congress' responsibility to better understand what steps Federal agencies are taking to ensure a minimalization of risk and cost to the American taxpayer, Subcommittee Chairman Horn then queried Schick of his knowledge regarding the administration's and, in particular, the Office of Management and Budget's current efforts to convey the urgency of this problem. Mr. Schick responded "there is no sense of urgency . . . We [the Gartner Group] are not interested in creating a sensational story here about the year 2000. We don't want to panic. That does nobody any good . . . Yet, if [Federal agencies] are not already well into this project by October of 1997, [the Federal Government] will be doing a disservice to the very constituents that depend on [it] to prevent something like this from happening to them. . . ."⁷

⁵ Opening statement of Representative Tom Davis before a hearing of the Subcommittee on Government Management, Information, and Technology, House Committee on Government Reform and Oversight, *Is January 1, 2000 the Date for a Potential Computer Disaster?* April 16, 1996.

⁶ Statement of Representative Peter Blute before a hearing of the Subcommittee on Government Management, Information, and Technology, House Committee on Government Reform and Oversight, *Is January 1, 2000 the Date for a Potential Computer Disaster?* April 16, 1996.

⁷ Oral testimony of Kevin Schick, research director, The Gartner Group, before a hearing of the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight, *Is January 1, 2000 the Date for a Potential Computer Disaster?* April 16, 1996.

To further understand the impact of this issue on the Nation's businesses and State and local governments, Representative Constance Morella, chairwoman of the Subcommittee on Technology of the Committee on Science, called for a joint hearing with the Subcommittee on Government Management, Information, and Technology, to review the impact on personal computers, State governments and Federal agencies. During the hearing held on September 10, 1996, Larry Olson, Deputy Secretary for Information Technology for the Commonwealth of Pennsylvania, presented Pennsylvania's plan of action. As noted by Olson, the key to success of the plan is senior level support. Mr. Olson pointed out that during his first year as Governor of Pennsylvania, Tom Ridge quickly recognized the dramatic implications of the year 2000 date field problem. Subsequently the Governor took quick action to ensure that Pennsylvania businesses and governments will be prepared before January 1, 2000.⁸

At the September session Harris Miller, president, Information Technology Association of America, presented an outline of how the year 2000 situation presents three problems for personal computer users in homes and businesses across the country: (1) the BIO's chip of individual machines;⁹ (2) the operating system that generally comes bundled with new computers; and (3) the commercial software purchased for those machines. Most equipment manufacturers in the past 18 months have modified their products. Operating system software is also an issue. Operating systems in personal computers in most cases can have their operating systems "fixed" through a simple procedure using the computer's mouse. Commercial software products may or may not be year 2000 compliant. An issue of great concern for personal computer users is the increasing interconnectedness with other systems. In order to ensure that computer systems are operational in the year 2000, most systems will need modification.

Mr. Miller testified further that personal computer users as well as mainframe information technology managers need to be aware of this issue and take appropriate corrective steps.¹⁰

In her testimony Sally Katzen, Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget, provided an outline of the Clinton administration's current strategy for solving the problem: (1) raise the awareness of the most senior managers in Federal agencies to the dimensions of the problem; (2) promote the sharing of both management and technical expertise; and (3) remove barriers that may slow down or impede technicians fixing systems.¹¹

⁸Statement of Larry Olson, Deputy Secretary for Information Technology, Commonwealth of Pennsylvania, before the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight, Subcommittee on Technology, Committee on Science, September 10, 1996.

⁹The BIO's chip instructs the basic input/output system of a computer.

¹⁰Oral statement of Harris Miller, president, Information Technology Association of America, before Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight, Subcommittee on Technology, Committee on Science, *Solving the Year 2000 Computer Problem*, September 10, 1996.

¹¹Statement of Sally Katzen, Administrator, Office of Information and Regulatory Affairs, Office of Management and Budget, before the Subcommittee on Government Management, Information, and Technology, Committee on Government Reform and Oversight, Subcommittee on Technology, Committee on Science, *Solving the Year 2000 Computer Problem*, September 10, 1996, p. 3.

B. OVERSIGHT ACTIVITIES OF THE SUBCOMMITTEE

Alarmed by what the subcommittee had learned at its April 16 hearing, Subcommittee Chairman Stephen Horn and Ranking Minority Member Carolyn Maloney sent a joint congressional oversight letter. The letter was addressed to the heads of each executive department and 10 additional agencies. The letter, dated April 29, 1996, asked 13 detailed questions intended to ascertain the status of each agency's software conversion preparation for the year 2000.¹²

The agencies receiving the letter were selected by the subcommittee because each would be required under the Information Technology Management Reform Act to appoint chief information officers.¹³

The overall response the subcommittee received was discouraging. Only 9 of the 24 departments and agencies responded that they had a plan for addressing the problem. Five of them had not even designated an official within the organization to be responsible for the problem. Seventeen of the departments and agencies lacked any cost estimates for addressing the problem. Even those with partial cost estimates could only provide projections for a limited part of their agency.¹⁴

Four agencies surveyed did have superior records, compared with the others. The Social Security Administration began its year 2000 initiatives in 1989. Although it should be observed that their efforts are not yet near completion. The Agency for International Development wrote the subcommittee that a "system migration" to newer technology had addressed the problem. Both the Office of Personnel Management and the Small Business Administration also had more advanced year 2000 efforts. However, none of these four agencies is a Cabinet department. Each organization has a more focused information technology mission than other agencies.¹⁵

Several Cabinet departments, with diverse subagencies and bureaus, reported to the subcommittee that they only had limited year 2000 projects underway. Efforts at the Departments of Energy and Transportation were so underdeveloped that both could not answer any of the 13 questions posed by the April 29 oversight letter. Many agencies with direct responsibilities for furnishing services to the public, such as the Departments of Labor, Veterans Affairs and the Federal Emergency Management Agency, had only minimal year 2000 initiatives underway.

Subcommittee Chairman Horn, Ranking Member Maloney and other members of the subcommittee released their conclusions based on the agency responses at a July 30, 1996 press conference. To underscore their conclusions, each of the 24 departments and agencies received letter grades based on the subcommittee's assessment of their relative performance. Four were given "A's" and four agencies were given "F's." Ten agencies were given "D's," none of

¹²Letter from Representative Stephen Horn and Representative Carolyn Maloney to 24 departments and agencies, April 29, 1996 (letters on file with the subcommittee). It is attached as an appendix to the report.

¹³National Defense Authorization Act for fiscal year 1997; Division E; Public Law 104-106.

¹⁴Refer to appendix (on file with the subcommittee).

¹⁵Each of the four also has some comparability to the private sector financial services industry which also moved faster than other private industries in addressing the problem.

which had any plan in place for addressing the problem, or available cost estimates. The decision to give each agency a grade was intended to emphasize the responsibility that individual departments and agencies have for their own performance.

[The information referred to follows:]

YEAR 2000 AGENCY PREPAREDNESS

	Grades	Does the agency have a Year 2000 plan?	Is there a Year 2000 Program Manager?	Does the agency have any cost estimates for Year 2000 solution?	Did the agency respond to the questions?
International Aid	A	✓	✓	*	✓
Personnel (OPM)	A	✓	✓	✓	✓
Small Business	A	✓	✓	✓	✓
Social Security	A	✓	✓	✓	✓
Education	B	✓	✓	✓	✓
Nuclear Regulatory	B	✓	✓		✓
State	B	✓	✓	✓	✓
Defense	C		✓	✓	✓
Treasury	C	✓	✓		✓
Science Foundation	C	✓			✓
Agriculture	D		✓		✓
Commerce	D		✓		✓

YEAR 2000 AGENCY PREPAREDNESS

	Grades	Does the agency have a Year 2000 plan?	Is there a Year 2000 Program Manager?	Does the agency have any cost estimates for Year 2000 activities?	Did the agency respond to the questions?
Environmental Protection	D		✓		✓
General Services	D		✓		✓
Health and Human Services	D		✓		✓
Housing (HUD)	D		✓		✓
Interior	D		✓		✓
Justice	D		✓		✓
NASA	D		✓		✓
Veterans Affairs	D		✓		✓
FEMA	F				✓
Labor	F				✓
Energy	F				
Transportation	F				

Prepared for Subcommittee Chairman Stephen Horn
 Subcommittee on Government Management, Information, and Technology

Other major findings resulting from the April 29 oversight letter which were presented at the July 30, 1996 press conference with Representatives Horn, Maloney and other members of the subcommittee include:

- Major departments are in the initial planning stages of this effort, even though, agencies need to have their systems inventoried and fixed by 1998, in order to provide sufficient time to test and ensure complete accuracy. This means, in the next year and a half departments and agencies must complete their plans, inventory and fix millions of lines of code, while simultaneously meeting agency needs.

- Even those agencies considered leaders in this effort, such as the Social Security Administration and the Department of Defense are not close to completing the inventory and solution stages of the conversion process.

According to the information received, only six agencies have cost estimates on the monetary resources needed to address the problem. These agencies include, the Department of Agriculture, the Department of Education, the Department of Health and Human Services, the Office of Personnel Management, the Small Business Administration, and the Department of State. In fact, the Department of Health and Human Resources, has cost estimates for only two divisions, amounting to \$125 million and the Department of Agriculture has cost estimates for only one division, amounting to \$5.6 million. The total estimate for these six agencies and their departments is \$298 million.¹⁶

- The Department of Defense has not yet completed its inventory of the computer software code which needs to be converted.

- The cost estimate to fix the 358 million estimated lines of code to be reviewed is between \$1.02 and \$8.52 per line. This means the cost to review and fix Department of Defense's systems could range somewhere between \$358 million and \$3 billion.¹⁷

- NASA, one of the most innovative, advanced and computer dependent agencies in the Federal Government, has not prepared a plan to solve the problem and does not anticipate having a plan completed until March 1997. With this schedule, the agency will have less than a year to inventory, and fix systems.

C. COMMITTEE FINDINGS

The committee finds the following:

¹⁶Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Donna Shalala, Department of Health and Human Resources, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Dan Glickman, Secretary, Department of Agriculture, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Richard W. Riley, Secretary, Department of Education, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable James B. King, Director, Office of Personnel Management, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Philip Lader, Administrator, Small Business Administration, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Christopher Warren, Secretary, Department of State, April 29, 1996, (on file with the subcommittee).

¹⁷Tom Backman, MITRE Corporation, *MITRE Assessment on the Effects of Two-Digit Years for the Year 2000*, January 10, 1996.

1. *The year 2000 problem results from the unanticipated consequences of data processing decisions made decades ago*

The two-digit year date field in many computer systems perform various functions, such as calculating the age of U.S. citizens, sorting information by date, or comparing multiple dates. When computer technology was developed 20 years ago disk storage was very expensive.¹⁸ During this time, many computer programmers never considered an alternative format, because of the cost and the idea that these programs would not last 10 years let alone through the year 2000. Systems which have been in place for nearly 30 years have been enhanced through advanced technology development but continue to be programmed for the 20th century. During the development of computer technology many experts within the Federal Government and the private sector believed that the rapidity with which technology advanced could always yield a “silver bullet” solution to any technical difficulty. Others believed that the software services industry was overstating the problem in order to sell their product solutions. It has been noted that while correcting the date field is technically simple, the process of inventorying, correcting, testing and integrating software and hardware among all interactive systems (both among and between industry and Government) is a very complex management task.

2. *Senior management involvement is required to address the year 2000 problem*

According to the various witnesses who appeared before the subcommittee, the key to success is support from senior level management to fix systems accordingly. Witnesses revealed the fact that many information technology experts have been aware of this issue, in some instances for a decade, but have been unable to take corrective action because the issue has been perceived as irrelevant to the success of agencies’ missions. According to private sector witness, Michael Tiernan, it was only after senior level management realized the potential economic impact of this issue did they move quickly to develop a plan to resolve the problem.¹⁹

Within the Federal sector an interagency committee has been established to raise awareness of the daunting task facing Federal information technology managers. The “Interagency Committee on the Year 2000” has taken several actions including requiring vendor software listed in future procurement schedules to be year 2000 compliant.²⁰

3. *The year 2000 deadline cannot be extended; no schedule slips are possible*

According to Kevin Schick, research director, The Gartner Group, the crisis revolves around three considerations: time, cost and risk.

¹⁸ Oral testimony of Kevin Schick, research director, The Gartner Group, before a hearing of the Subcommittee on Government Management, Information, and Technology, House Committee on Government Reform and Oversight, “Is January 1, 2000 the Date for Computer Disaster?” April 16, 1996, p. 8.

¹⁹ Michael B. Tiernan, chairman, Year 2000 Subcommittee, Data Management Division of Wall Street, Securities Industry Association, testimony before the Subcommittee on Government Management, Information, and Technology, April 16, 1996, p. 79.

²⁰ Richard Nunno, Analyst in Information Technology, Science Policy Research Division, *Year 2000 Computer Problem*, Congressional Research Service, p. CRS-3.

Businesses, Federal agencies, and State and local governments need to understand that this is the only information technology project that will not allow for a schedule slip. Saturday, January 1, 2000 cannot be moved to another day or time. Federal, State and local governments may need to shift resources from other projects in order to work on year 2000 efforts.²¹ In most cases, Federal agencies are running out of time.

4. The cost of addressing the year 2000 problem is expensive

Addressing the year 2000 computer problem will be very expensive. Estimates received by the subcommittee run as high as \$600 billion for systems worldwide. The cost for the Federal Government alone, could reach \$30 billion. These estimates are based upon the private and public sectors developing plans to inventory their current programs; analyze the percentage of code affected by dates; implement a “fix” to the problem, and provide for testing to ensure that the changes are correct.²² All of these solutions need to be applied while successfully operating current information technology programs.

Only six agencies furnished any cost estimates on the monetary resources needed to solve the problem to the April 29, 1996 oversight letter. These agencies include, the Department of Agriculture, the Department of Education, the Department of Health and Human Services, the Office of Personnel Management, the Small Business Administration, and the Department of State. In fact the Department of Health and Human Services, has cost estimates for only two divisions, amounting to \$125 million.²³ The Department of Agriculture has cost estimates for only one division, amounting to \$5.6 million. The total estimate for these six agencies and the remaining 22 departments is \$298 million.²⁴

As of this date, there are no estimates for solving the problem within and among the various departments and agencies.

5. There is a high risk of system failure if the year 2000 computer problem is not corrected

As stated by the Congressional Research Service, it may be too late to correct every system in the Nation before the clock strikes

²¹The State of Nebraska has imposed a new tax to pay for the cost of the year 2000 computer conversion.

²²Kevin Schick, research director, The Gartner Group, testimony before the Subcommittee on Government Management, Information, and Technology, April 16, 1996, p. 16.

²³Stephen Horn, chairman, Subcommittee on Government Management, Information, and Technology, Ranking Member Carolyn Maloney, “letter”, April 29, 1996.

²⁴Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Donna Shalala, Department of Health and Human Resources, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Dan Glickman, Secretary, Department of Agriculture, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Richard W. Riley, Secretary, Department of Education, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable James B. King, Director, Office of Personnel Management, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Philip Lader, Administrator, Small Business Administration, April 29, 1996 (on file with the subcommittee). Letter from Representative Stephen Horn and Representative Carolyn Maloney to the Honorable Christopher Warren, Secretary, Department of State, April 29, 1996 (on file with the subcommittee).

twelve on December 31, 1999.²⁵ If this is the case, then, businesses need to know what steps they must take in order to avoid disruptions in normal business operations. Federal, State and local governments, need to prioritize mission critical systems, immediately correcting those systems which have the greatest human impact.

Federal, State and local governments, must ensure that the American public is not at risk of losing any currently available government service. Additionally, agencies, such as the Department of Defense, the Federal Aviation Administration, and the National Aeronautics and Space Administration, need to ensure that January 1, 2000 will not be a day when computers go haywire and life as we know it is severely disrupted.

On June 7, 1996, the Congressional Research Service (CRS) provided both the House and Senate with a memorandum on the various issues complicating the year 2000 solution process. The CRS also identified the potential consequences resulting from a failure to address this problem at the Federal level. Some examples of the impact of system failures could include:

- Miscalculation by the Social Security Administration of the ages of citizens, causing payments to be sent to people who are not eligible for benefits while ending or not beginning payments to those who are eligible;
- Miscalculation by the Internal Revenue Service of the standard deduction on income tax returns for persons over age 65, causing incorrect records of revenues and payments due;
- Malfunctioning of certain Defense Department weapon systems;
- Erroneous flight schedules generated by the Federal Aviation Administration's air traffic controllers;
- State and local computer systems becoming corrupted with false records, causing errors in income and property tax records, payroll, retirement systems, motor vehicle registrations, utilities regulations, and a breakdown of some public transportation systems;
- Erroneous records by securities firms and insurance companies;
- False billing by telephone companies resulting in errors in consumers' bills or lapses in service.²⁶

6. There are potential liability issues if the year 2000 computer date conversion is not completed

In the future, industry may face potential liability for failing to provide year 2000 compliant products or services. These same providers need to ensure that their databases are not corrupted by bad data from other sources. This issue may cause banks, securities firms and insurance companies to ascertain whether the companies they finance or insure are year 2000 compliant before making investment decisions. Additionally, governments and businesses will need to protect themselves from purchasing noncompliant software

²⁵ Richard Nunno, Analyst in Information Technology, Science Policy Research Division, *Year 2000 Computer Problem*, April 12, 1996, p. CRS-2.

²⁶ Richard Nunno, Analyst in Information Technology, Science Policy Research Division, *Year 2000 Computer Problem*, Congressional Research Service, June 7, 1996.

products and services through the use of commercial market warranties.

7. Interconnected computer systems pose international risks

As the leading user of computer technology the United States probably has more at risk, in terms of economic loss, if the year 2000 issue is not resolved properly. The economic impact on businesses both domestically and internationally could be dramatic, especially if our allies do not quickly take action to correct date dependent software. In fact, Federal agencies and the private sector need to emphasize the urgency of this problem worldwide.

III. RECOMMENDATIONS

The year 2000 is less than 40 months away. The problem, although not technically complex, is managerially challenging and will be very time consuming for private and public sector organizations. Additionally, the task may be more difficult for the public sector, where systems which have been in use for decades, may lack software documentation and therefore increase the time it takes from the inventory phase to solution. Further increasing the time to solve the problem could be a lack of qualified personnel willing, or able, to correct the problem.

According to estimates received by the subcommittee during the hearing process, the cost to fix Federal systems, is estimated to be at least \$30 billion. After requesting budget information from 24 departments and agencies, Congress still does not have a complete picture of the cost of solving this problem. This lack of cost information may hinder Federal agency efforts to correct every system. In fact, as stated by the Congress Research Service memorandum dated April 12, 1996, "it may be too late to correct all of Nation's systems". The clock is ticking and most Federal agencies, have not inventoried their major systems in order to detect where the problem lies within and among each Federal department, field office and division. The date for completion of this project cannot slip.

The administration, particularly, the Office of Management and Budget must ensure that agencies convert two-digit date fields to recognize the year 2000 by ensuring the necessary and appropriate resources—including both human and capital—are available to senior agency managers. The Government has a responsibility to its constituents and we must not fail to ensure that Government services and public safety are available to all of our citizens.

Additional specific recommendations for the Federal Government by the committee include:

- Agencies must prioritize mission critical systems, and determine the resources needed to make these systems year 2000 compliant.
- The Office of Management and Budget should direct Federal agencies to begin implementation of agency year 2000 plans by January 1, 1997.
- The Office of Management and Budget should work with Federal agencies to ensure appropriate funding levels are allocated to solving this problem.

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ONE HUNDRED FOURTH CONGRESS
Congress of the United States
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BERNARD SANDERS VERMONT
 REPRODUCED

MAJORITY—(202) 225-4891
 MINORITY—(202) 225-4891

April 29, 1996

Dear

Pursuant to its responsibilities under Article I of the U.S. Constitution and Rules X and XI of the Rules of the U.S. House of Representatives, the Government Reform and Oversight Committee's Subcommittee on Government Management, Information and Technology is conducting an inquiry into the ability of the Federal Government's information technology systems to properly process year date fields on January 1, 2000. This year 2000 problem results from the computer software limitations that use only two digit fields to recognize the year. Consequently, many computer programs will fail to recognize the change in century and misread "00" or the year 2000, as 1900.

The Subcommittee on Government Management, Information and Technology conducted a hearing on this issue on April 16, 1996. All witnesses underscored to the subcommittee the importance of the Federal Government and other computer users to address this issue in an urgent and decisive manner. One witness, representing the Gartner Group, estimated the worldwide conversion cost to be up to \$600 billion. He projected that the cost to the Federal Government alone could be \$30 billion.

To assist us with our inquiry, we request the following information:

1. Has your agency begun an effort to ensure that your information systems are year 2000 compliant? If so, when did the effort begin? What steps are they taking to ensure compliance?
2. Has your agency represented on the Interagency Working Group on the Year 2000?
3. Have you performed a risk assessment of the vulnerability of your programs and applications to the year 2000 problem? If one is planned, but has not been completed, indicate when it is expected to be completed and how it is being performed. If it has been completed, please furnish a copy.
4. Have you evaluated the vulnerability of your agency's systems and applications to

external organizations, such as states or other entities, that fail to modify their own systems for the year 2000 problem? If one is planned, but has not been completed, indicate when it is expected to be completed and how it is being performed. If such an analysis has been completed, please furnish a copy.

5. Have you developed a plan for the year 2000 problem? If one is planned, but has not been completed, indicate when it is expected to be completed and how it is being developed. If it has been completed, please furnish a copy.

6. Does your year 2000 plan, if completed, contain specific timetables and milestones? What performance indicators are you using for determining whether your computer programs and applications are year 2000 compliant?

7. Do you have contingency plans for your year 2000 project if your agency is unable to complete your year 2000 plan as scheduled? When would you make a decision to implement the plans? If available, provide a copy of the plan.

8. Do you have an inventory of the major computer programs, platforms and languages for your agency? If so, please provide the inventory to the subcommittee.

- a. Does that inventory identify the users for each application?
- b. Does the inventory include the total number of lines of programming code at your agency and the number of lines required to be changed?
- c. Does the inventory provide an assessment of the likelihood that the application or program may be affected by the year 2000 problem?

9. Have you developed a prioritization of which systems need to be fixed in order to avoid an adverse impact on the public? Have you prioritized your applications and determined which ones can be set aside if all cannot be modified by 2000? Please provide a list of those major applications that have been designated secondary and the activity with which they are used.

10. Who at your agency is your project manager?

- a. Who has overall responsibility for the year 2000 issue?
- b. Who has day-to-day responsibility?
- c. What other responsibilities does the day-to-day manager perform?

11. Provide an organization chart for your year 2000 project, indicating the reporting arrangements for personnel, including names, titles and grade levels. (Where appropriate, include the activities of constituent components of your agency.)

12. When was the last time you received a status report on the year 2000 project? Please provide a copy of the most recent report.
13. What resources are being devoted or do you project will be devoted the year 2000 issue?
- a. What are your cost estimates, by fiscal year? What are the components of those cost estimates?
 - b. Have you made or anticipate making any new needs requests for your year 2000 project, as opposed to providing for it through reprogramming existing budget? If so, what is the request?
 - c. How many man years do you estimate will be devoted to the year 2000?
 - d. What is your estimate of your cost per line of code for your year 2000 project?
 - e. Do you have any acquisition plans for this project? If so, and what is the status of your plans?
 - f. What proportion of the year 2000 work will be done in-house, and how much will be out-sourced?
 - g. Have vendors already been engaged? If so, please identify them. What is the scope and dollar value of their contract?

Your full and complete responses to these questions will be very helpful to the subcommittee. Please supply all requested information by the close of business, Friday, May 24, 1996. In addition, please notify the committee of a point of contact at your department for your response by Monday, May 6, 1996. If you have any questions regarding this matter, please contact Mark Uncapher, Professional Staff Member and Counsel, or David McMillen, Professional Staff Member.

Sincerely,

Stephen Horn, Chairman
Subcommittee on Government Management,
Information and Technology

Carolyn Maloony, Ranking Member
Subcommittee on Government Management,
Information and Technology

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Letter Recipients

The Honorable Dan Glickman
Secretary
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The Honorable Michael Kantor
Secretary
Department of Commerce

The Honorable William J. Perry
Secretary
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Office of the Secretary

The Honorable Richard W. Riley
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Chairman
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**The Honorable Philip Lader
Administrator
Small Business Administration**

**The Honorable Shirley A. Chater
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Social Security Administration**

**The Honorable James Lee Witt
Director
Federal Emergency Management Agency**

**The Honorable J. Brian Atwood
Administrator
Agency for International Development**



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Memorandum

April 12, 1996

TO : House Committee on Government Reform and Oversight
Management, Information, and Technology Subcommittee

Attention: Mark Uncapher and Susan Marshall

FROM : Richard M. Nunno *CRS for EMN*
Analyst in Information Technology
Science Policy Research Division

SUBJECT : Year 2000 Computer Problem

In response to your request, the following is a summary of the year 2000 computer problem, also called the millennium problem, and efforts to correct the problem within the Federal Government.

Many computer systems record dates in the format using a two-digit number for the year; for example, 96 represents the year 1996. This is especially true for older systems, designed when memory storage was more expensive. The problem with this format is that the year 2000 is indistinguishable from 1900. When the year 2000 (or later) is entered under this format, computer systems will fail to operate properly. Given society's increasing reliance on computers, this problem could have a significant impact on a wide range of activities, from commerce to government operations and military readiness.

The year data field in computer programs performs various functions, such as calculating the age of U.S. citizens, sorting information by date, or comparing multiple dates. Computer systems of all sizes (mainframe, mini, and micro) must be inspected for this problem and converted to a four digit year field where necessary. Year data fields must be corrected in operating systems, compilers, applications, procedures, databases, and in the data itself. Unfortunately, it is impossible to determine whether a computer system needs to be upgraded without reviewing all of its software code. All computer systems need to be inspected, corrected, and tested before January 1, 2000 to avoid major system malfunctions.

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Many people have initially doubted the seriousness of this problem, assuming that a technical fix will be developed. Others suspect that the software services industry may be attempting to overstate the problem to sell their products and services. Most agencies and businesses, however, have come to believe that the problem is real, that it will cost billions of dollars to fix, and that it must be fixed by January 1, 2000 to avoid a flood of erroneous automatic transactions. The problem is not technically difficult to correct, but it is very time-consuming. Moreover, the task may be more difficult in some cases due to the lack of availability of software documentation. Some have suggested that it is already too late to correct the problem in all of the Nation's computers, and that large corporations and Government agencies should focus on only their highest priority systems first.

The Government Management, Information, and Technology Subcommittee has an interest in ensuring that Federal agencies are correcting the problem to prevent the malfunctioning of government computer systems. Federal computer systems use millions of lines of software code, and each must be checked and corrected if a date field is present. Many Federal Government computer systems tend to be larger and older than systems used by the private sector. The year 2000 problem is likely to be more pervasive in these, so called, "legacy" systems.

The information resources management personnel at most Federal agencies are aware of the problem and are working to correct it. The Social Security Administration (SSA) identified the problem in 1989 and is the furthest along among Federal agencies. Representatives at SSA intend to complete and test all software changes by December 31, 1998, so they can run it in production one full year before 2000. The Department of Defense (DOD) has also invested significant resources in this problem, although it has been working on it at the Department level for only a few months. A major problem for DOD is managing the efforts across all of the services and defense agencies to maximize efficiency and coordinate changes among systems that interact across organizations. DOD is also concerned that hardware changes must be made in weapon systems whose clocks store dates using two-digit codes. The DOD coordinator is the Deputy for Information Management under the Command, Control, Communications, and Intelligence Assistant in the Office of Secretary of Defense.

The Office of Management and Budget (OMB) asked SSA to champion the "year 2000" cause across Government and raise awareness of the problem. As a result, SSA assembled an interagency ad hoc committee to facilitate dealing with the year 2000 problem. SSA has held seven informal meetings with other Federal agencies over the past six months. The committee meetings have helped to raise the level of awareness of the issue, and provide a forum to share cross-cutting ideas and strategies. Attendance at these meetings started small but has increased to over 20 agencies participating.¹ SSA emphasizes that the agencies

¹Federal agencies attending interagency meetings include: OMB, Environmental Protection Agency, Dept. of Education, State Dept., General Services Admin., Veterans Admin., National Institute of Standards and Technology, Dept. of Justice, Dept. of Commerce, Health Care Finance

that own the software are responsible for correcting it, and that the interagency committee can only facilitate their efforts. The interagency committee is planning a conference on May 2 at the Department of Commerce Auditorium to discuss corporate and Government experiences and identify approaches to solving the problem.

Software tools have been developed to assist with the conversion of year fields to four digits. These tools can identify locations in software code where date references occur, make the necessary changes, and test the upgraded system. There may not be enough time, however, for in-house personnel at most agencies to purchase a software analysis tool, learn how to use it, and perform the software conversion and testing. Furthermore, Federal agencies would not be able to share tools, due to copyrights and other restrictions. The year 2000 interagency committee suggests that Federal agencies may be able to address the problem more quickly by hiring experienced contractors who can correct the problem more efficiently and effectively than in-house personnel. Unfortunately, many firms that specialize in the year 2000 conversion are already under contract to correct the problem for private sector corporations.

The interagency committee has already accomplished some concrete changes. The committee and the General Services Administration (GSA) have agreed to allow only year 2000 compliant vendor software on the GSA procurement schedule. This would prevent Federal agencies from perpetuating the problem by purchasing non-compliant systems. The committee was also instrumental in the National Institute of Standards and Technology's publication of a Federal Information Processing Standard recommending that Federal agencies purchase year 2000 compliant software, and proposing guidelines for intergovernmental data exchange. The interagency committee is currently developing a "best practices" report which will describe how agencies can best implement a solution. It will also include a comprehensive conversion plan, setting milestones for Federal agency progress over the next few years. The committee is also producing a site on the world wide web to provide the latest information on year 2000 conversion activities.

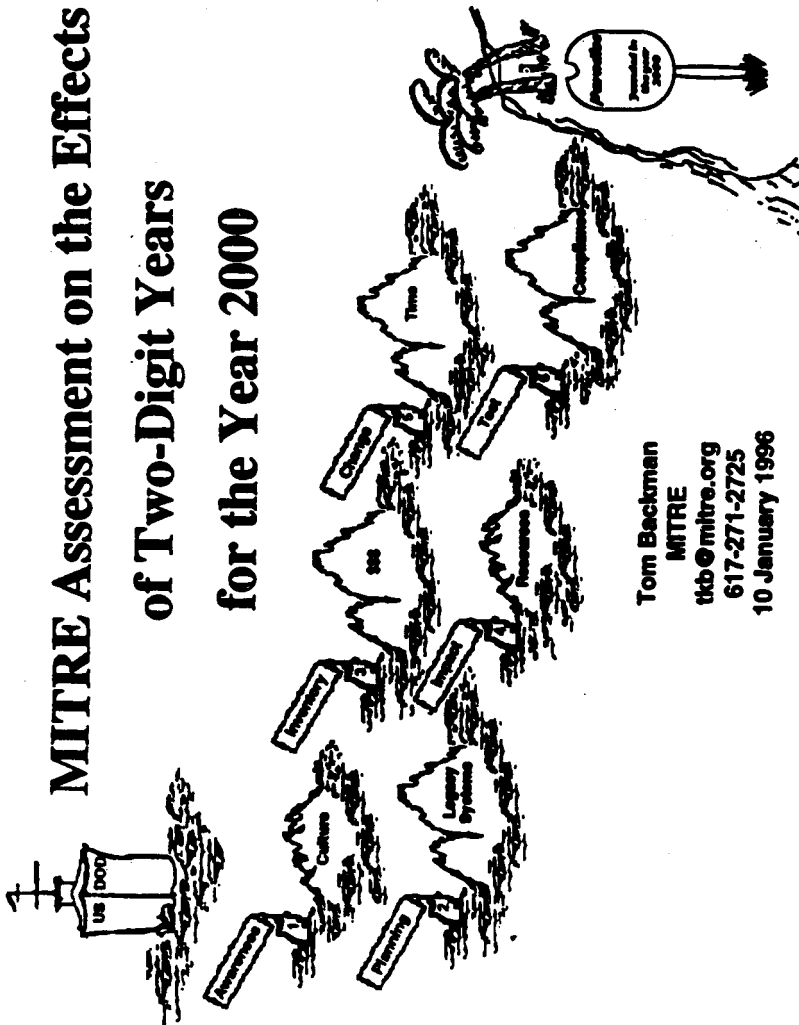
One of the tasks that needs to be addressed is to develop an overall cost estimate to correct the problem within the Federal Government. Several initial data points toward such an estimate are available. SSA estimates that currently it has 30 million lines of code running in production, which it calculates could cost around \$30 million to correct (with a cost of \$1/line). The Air Force estimates a cost of \$325 million for its systems, not including hardware upgrades or weapon system corrections. The Information Technology Association of America, which represents the software and information services industry, states that for the entire U.S. computing systems, estimates range between \$50 and \$75 billion. The Gartner Group, an information technology consulting firm, estimates that about half of the cost of upgrading all U.S. computers will be directly paid by government entities. A substantial part of that could be

Admin., Internal Revenue Service, U.S. Customs Service, Dept. of Treasury, Dept. of Defense (all services and agencies), Dept. of Agriculture, National Institutes of Health, and U.S. Courts.

incurred by the Federal Government. OMB will be requesting each agency to develop estimates for the rest of its year 2000 efforts.

The House Subcommittee on Government Management, Information, and Technology hearing scheduled for April 16, 1996, will explore the year 2000 computer problem, focusing on operations of the Federal Government. Witnesses will present perspectives of the most critical computer functions of the large Departments and agencies. Among the issues the Committee may wish to pursue are (1) increasing oversight of the interagency committee to ensure that progress is being made toward their goal, (2) directing the interagency committee to seek the advice of large corporations that have dealt with the year 2000 computer problem, and (3) prioritizing Federal information technology programs to prepare for potential delays in ongoing projects due to resource limitations.

MITRE Assessment on the Effects of Two-Digit Years for the Year 2000



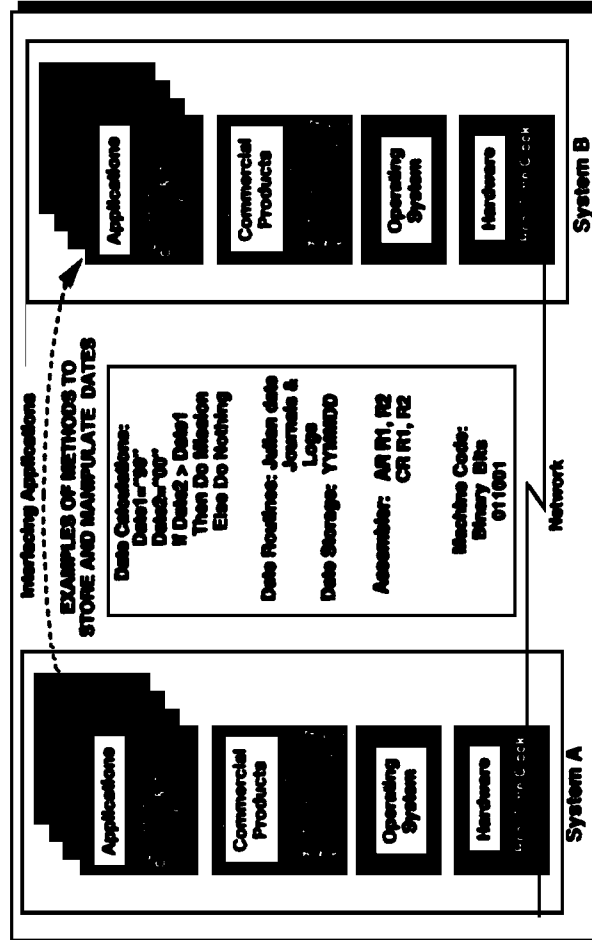
Tom Beckman
MITRE
tkb@mitre.org
617-271-2725
10 January 1996

Summary of Findings

- **The problem with the Year 2000 is real and if it is not addressed, it will become catastrophic**
 - **Systems must be analyzed and tested, not just paper studies**
- **There is time to fix most of the problems if we start now**
- **Some systems will fall in the Year 2000. Make sure they are not critical to the mission**

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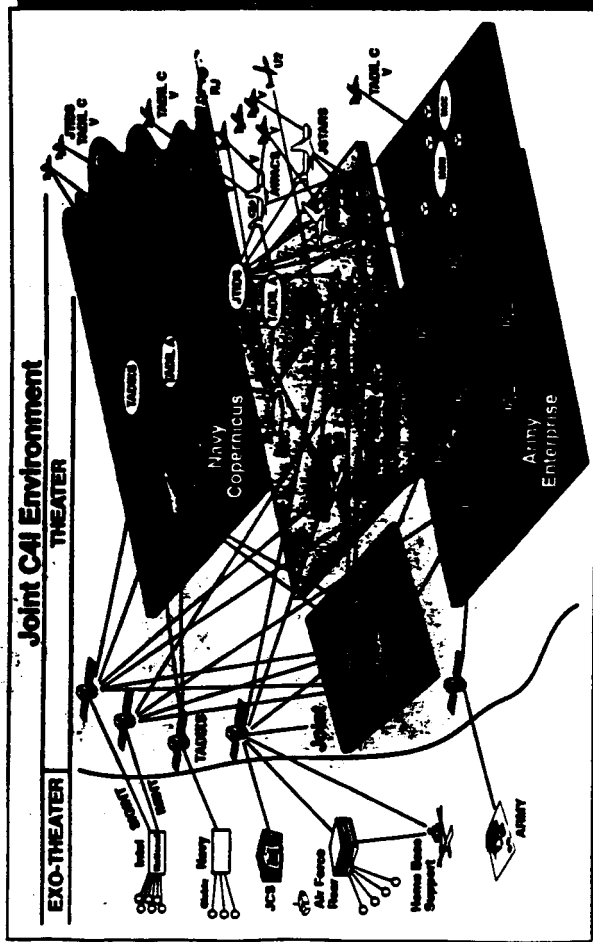
The Date Problems are not Isolated in one Area of a System's Hardware or Software



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System Interoperability Coordination, Analysis and Testing will Make the Problem Difficult to Solve

Executive Summary Chart



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Several Different Types of Tools will be Useful to Assist in Localizing the Problems

<p>Tools for Locating the CODE</p> <ul style="list-style-type: none"> ● Tools and techniques to find the devices containing unmaintained software and firmware <ul style="list-style-type: none"> - Examine inventories of each mission critical system - Query the Engineering Data Computer-Assisted Retrieval System (EDCARS), Computer Program Identification Numbers (CPINS) databases ● Tools to locate source code for the unmaintained software and firmware in documents ● Tools to place source code and documents on-line <ul style="list-style-type: none"> - Scanning, tagging, and conversion tools
<p>Tools for Finding the Errant Code</p> <ul style="list-style-type: none"> ● Tools to search for possible erroneous lines in the source code <ul style="list-style-type: none"> - Operating system search tools - Commercial Year 2000-aware search tools for application code ● Tools to reduce the search to actual problems <ul style="list-style-type: none"> - Only the most intelligent tools

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Tools to Implement Repairs

- Fixing can be done at several levels:
 - Open up the software and firmware and repair it
 - Change procedures and workarounds
 - Create black box solutions around the problem area
- Very few tools do automatic fixes
 - CADRE Teamwork and other upper end case tools can automatically fix software that was fully designed within the CADRE system
 - Peritus has modified an Artificial Intelligence rules-based engine to automatically make the changes, but programming the rules is comparable to writing a parser
- Bottom Line: there are a few semi-automatic methods to fix the software, but full automation is not here

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Background Information on Systems Analyzed for Year 2000 Problems by the Software Quality Assessment Exercise (SQAE)

System Name	System Description	System Type	System Size	System Complexity	System Criticality	System Age	System Status
System 1
System 2
System 3
System 4
System 5
System 6
System 7
System 8
System 9
System 10

Note: this chart indicates the site of potential problems and some of the code may already handle the problem.

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Sample of Results from Quick Data Element Analysis

Name	Date of Sample	# Data Elements	# Suspicious Elements	# of Elements in System	% Suspicious Element
Standards					
DDRS	1985	128	15	1,170	1.3%
JNTACCS	1985	951	37	3,874	1.0%
ATO	1985	24	2	114	1.8%
Logistics	1984	461	73	2,300	3.2%
Programs					
Mobility Mission Planning Mgmt & Exec	1983	38	0	321	0.0%
Force Planning	1985	104	4	1,002	0.4%
Wing Command and Control	1983	411	15	1,183	1.3%

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Costing the Year 2000 Problem

Emerging Studies

Source	Reference	Effort/Cost (Maintenance for AIS)	Comment (Additional MITRE Assumptions)
MITRE	163 systems studied (included 11 other systems assessed (estimated impacts) 2 Quad A Alpha Radar systems 3 Comm. Proc. systems 4 Processing CE systems 2 Logistics AIS	8 SYM ExLOC; \$18E/LOC 17-71 SYM ExLOC; \$2.92-49.25E/LOC 18-46 SYM ExLOC; \$1.23-49.24E/LOC 19-16 SYM ExLOC; \$1.23-41.24E/LOC 9-12 SYM ExLOC; \$1.22-41.23E/LOC 10 SYM ExLOC; \$1.10E/LOC	Assumes \$12M/5Y See notes (below)
Gartner Group	B. Hall, K. Schlick Draft ADM Research Note, 12/96		
Viasoft	S. Whiteman Field Report, Software Magazine, 1/96	16 SYM LOC; \$1.10 - \$1.70E/LOC	Assumes 1800 LOC per program Assumes \$76K - \$160M/5Y
DFAS - DLA	Internet Discussion	9 SYM LOC; \$6.76 - \$1.2M/LOC	Assumes 1024 hrs/5Y and \$63K - \$132K/5Y

Notes: 1. The MITRE assumptions are based on the actual costs and/or projected to the preceding chart.
2. A rough estimate of 1000 LOC per program for the data base. Numbers, not estimates, reflect a projected upper bound.
3. A program is assumed to be 1000 LOC. All programs, software maintenance productivity rates are not used because not very common products. The rate included was developed from MITRE's on-going software maintenance studies.

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Budgeting for the Year 2000 Problem

- Many systems will be able to fix the Year 2000 problems with other changes under normal maintenance
- Many systems that may not be under maintenance and therefore missed
 - Operational systems with no maintenance budget (under no one's watch)
 - "Home-grown" software on individuals' workstations or PCs
 - Firmware
- The cost estimates do not address
 - Inaccessible documentation for software/firmware
 - The capacity to produce and field several new chips may be limited
 - Upgrading COTS products

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Other Recommendations

- **Some systems will fall in the Year 2000. Make sure they are not critical to the mission**
- **Establish a centralized Clearinghouse for information collection and dissemination, and use a de-centralized approach to locating and fixing the problems**
- **Investigate for potential breaches of security due to failed systems (password, encryption keys, etc.)**
- **Year 2000 problems cannot be resolved by fixing one program at a time. Organize and address them as sets of manageable and interoperable groups of systems**

Other Recommendations (concluded)

- Many people are planning on migration systems replacing legacy systems by the year 2000, and therefore are not upgrading the legacy systems. Use Risk Management techniques to identify and mitigate the risks in systems that may not meet their schedule
- There are several different possible solutions for each system. Use the one that is appropriate for the problem set
 - Survival with a 2 digit year
 - Use a sliding window (good for 100 years)
 - Full 4 digit year compliance
- Be prepared for January 1, 2000. It is on a Saturday, and much of the work force will be out of the operational environment when the initial problems occur

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