



Issues

The Clock Is Ticking: Are Financial Institutions Prepared for the Turn of the Century?

If we open a quarrel between the past and the present, we shall find that we have lost the future.

—Winston Churchill
June 18, 1940

What is 1,999 plus 1? Simple math? Not necessarily. When these numbers represent turning the calendar forward into the next century, the answer depends on the number of digits used to represent the year and the logic that computer systems use to run everything from coffeemakers to weapons systems. Using two digits, the answer is 00. But will computers recognize this as the year 1900 or 2000? Many computer systems have been programmed to assume that all dates refer to the 1900s and have not been updated to handle 21st-century dates.

Although organizations across all industries are currently assessing their systems for Year 2000 compliance, the financial services industry is considered particularly at risk should its systems fail to handle the century date change correctly. Financial institutions rely on the proper sequencing of events and calculations based on dates. The logic built into applications to sequence events and perform calculations may cause systems to produce erroneous results or even crash, resulting in a disruption of services and jeopardizing an institution's reputation. It is imperative that as the clock ticks toward the year 2000, financial institutions have a strategy in place that ensures all of their systems, as well as those of their customers and vendors, are Year 2000 compliant.

The Basic Problem

The Year 2000 computer problem is a global one. There are billions of lines of code running various mainframe applications and millions of personal computers in

use today, all of which may need to be tested and possibly modified to ensure Year 2000 compliance. Estimates to renovate all these systems worldwide range from \$52 billion to \$3 trillion or more once you factor in the cost of liability lawsuits and lost productivity.¹

Unless the date or program logic is modified, a two-digit representation of the year may be interpreted by many applications to mean the year 1900, not 2000. Calculations could indicate that transactions have been open for nearly a hundred years, or they could produce negative numbers (*Table 1*). New files may not be recognized as current, causing them to be erased or archived. These and other logic issues could significantly disrupt normal business operations.

When dates are compared, customer billings may change from charges to re-

Table 1
The Year 2000 Issue

Using two-digit format for the year:

Current date	Birth date	Calculated age
04/05/99	04/05/62	37 (99 - 62)
04/05/00	04/05/62	-62, 62, or ERROR

Using four-digit format:

Current date	Birth date	Calculated age
04/05/2000	04/05/1962	38

NOTE: There are basically two solutions—either modify the date formats or change the program logic to recognize 00 as greater than 99.

There are two kinds of people, those who aren't working on [the Year 2000 problem] and aren't worried and those who are working on it and are terrified.

— Nigel Martin-Jones
Data Dimensions
in "The Millennium: The Day
the World Shuts Down"
Newsweek
June 2, 1997

funds or vice versa. For example, what would happen to the interest calculations and payment schedule for a 30-year mortgage with a maturity date in 2025 if the computer interprets the current year as 1900? Will the ATM or point-of-sale terminal conclude that your credit/debit card expired almost 100 years ago? Even building systems, such as security, elevators and climate control, may be affected because of embedded logic to facilitate maintenance and operations.²

A Safety and Soundness Issue

Financial institutions rely on their automated information processing and telecommunications systems to participate in the global payments system, exchange information with counterparties and regulatory agencies, and manage their internal control systems and sophisticated computer equipment. The integrity of the financial industry depends on the hardware and software used by individual financial institutions, their third-party vendors, their clearing associations, government entities and their customers. A widespread disruption in information flows could endanger the industry's safety and soundness.

For financial institutions, the turn of the century could affect record-keeping, investments, currency transfers, legal liability and electronic transfers for payroll or pension recipients. The century rollover could produce errors in checking account transactions, interest calculations or payment schedules—not to mention the possible ricochet effects on the international payments system.³

Equipment that relies on embedded computer chips to perform date-driven functions, such as ATMs, telephone switchboards, vault locks, security systems, elevators and climate control systems, also may malfunction. In addition, data exchanges with business partners outside the financial institution may be disrupted, and credit quality issues could arise as borrowers deal with these same vulnerabilities. Finally, corrupt data creates the potential for fraud against the industry and its customers.⁴

Federal Reserve Governor Edward Kelley, in remarks before a congressional subcommittee, put it this way: "A bank's need for adequate preparation for the year 2000 is regarded as a safety and soundness issue. Where progress is deemed to be substantially less than satisfactory, resulting in excessive risk and possible unsafe and unsound condition, we will address the

issue in a manner consistent with our long-standing supervisory approach to dealing with other safety and soundness issues. The full range of our supervisory tools and remedies are available, including intensified monitoring, progressively more detailed reporting requirements, presentations to the board of directors, insistence on bank commitments to initiate corrective action, and, ultimately, possible use of enforcement actions as appropriate."⁵

In addition to conducting special Year 2000 assessments, bank regulators already have incorporated Year 2000 compliance into their regular examinations and, in one case, have instituted a supervisory action against an organization for not properly addressing the Year 2000 computer problem. The Federal Reserve, together with the Federal Deposit Insurance Corp. and a state

Table 2
Checklist for a Successful
Year 2000 Program

- ✓ Top management understanding and endorsement as a strategic priority
- ✓ Line management appreciation that it is not just a technical issue but a matter of business survival
- ✓ Explicit assignment of responsibility and empowerment to carry it out
- ✓ Detailed planning that recognizes testing as the most resource-intensive part of the process
- ✓ Appreciation that external testing may be among the most difficult parts of the process
- ✓ Recognition that vendors and service providers cannot certify that their products will work properly with a bank's own applications, equipment and operating environment
- ✓ Proactive communication with external vendors, service providers, correspondents and customers
- ✓ Recognition that correspondents and customers pose credit and other risks
- ✓ Prioritization of applications as to their strategic importance
- ✓ Identification of explicit resources to address the Year 2000 issue
- ✓ Establishment of explicit target dates and regular progress reports to top management
- ✓ Active involvement of audit staff
- ✓ Clear contingency plans with trigger dates and procedures for implementation
- ✓ Strong monitoring of security controls throughout the process

SOURCE: Basle Committee on Banking Supervision, "The Year 2000: A Challenge for Financial Institutions and Bank Supervisors," September 1997.

Table 3
Year 2000 Risks to Banking

Internal

- ◆ Lending systems: to calculate interest payments, due dates and past-due amounts
- ◆ Investment systems: to calculate accretions, amortization and yields
- ◆ Deposit systems: to calculate interest payments, overdrafts and other fees
- ◆ Accounting systems: to calculate accruals, depreciation, income and expenses
- ◆ Fiduciary systems: to perform portfolio analysis and stock transfers, and calculate dividends and maturity dates
- ◆ Management information systems: to integrate information by time period

External

- ◆ Reliance on vendors: to perform critical operational processes (for example, check processing, accounting, ATM maintenance and wire transfers)
- ◆ Data exchange: to clear checks, process electronic transfers and maintain data for customers
- ◆ Corporate customers: to maintain cash flow for debt repayment

SOURCES: FFIEC, "Year 2000 Project Management Awareness," Interagency Statement, May 5, 1997; Eugene A. Ludwig, Oral Testimony, Financial Services and Technology Subcommittee of the Banking, Housing and Urban Affairs Committee, U.S. Senate, July 30, 1997.

banking department, recently issued a cease-and-desist order against one banking organization. This order requires the organization to inform regulators of the full extent of its Year 2000 problem and detail any credit risks posed by borrowers by early next year. In addition, the organization must complete system repairs by August 1998 to prepare for testing by year-end 1998, with final repairs completed by July 1, 1999.⁶ Institutions that still feel no sense of urgency regarding the Year 2000 issue should note that the deadline is one that cannot be missed or postponed, and it is a deadline shared by everyone.⁷

What Should Financial Institutions Do?

The Year 2000 project should be a strategic objective for every financial institution and one that is managed at the highest level (*Table 2*). There are many date-sensitive systems and processes, both internal and external, that are at risk for Year 2000 problems (*Tables 3 and 4*). By now, institutions should have identified what needs to be done and developed plans for fixing any problems. Efforts to renovate mission-critical systems should be well under way. According to the Federal Financial Institutions Examination Council's

(FFIEC) May 1997 Interagency Statement, institutions and their vendors should have a Year 2000 problem resolution process that includes at least five basic steps: awareness of the problem, assessment of the complexity, renovation, validation and implementation (*Table 5*).⁸

In an effort to ensure that financial institutions avoid major disruptions, the federal banking agencies, working together through the FFIEC, have implemented a supervisory plan designed to heighten awareness of the Year 2000 problem within the industry. Recently completed industry assessments indicate that the industry's awareness level is high. Many institutions, particularly larger ones with complex internal systems, already have begun renovating affected systems. However, many smaller organizations, which often rely on vendor-supplied software, are only beginning to realize the extent of testing that will be necessary, both for internal systems and third-party connections (*Table 6*). U.S. offices of foreign banks were generally aware of the Year 2000 issue but showed less concern than their U.S. counterparts. Most service providers and software vendors consider their ability to deal with the Year 2000 problem a survival issue of critical importance in order to remain competitive in an aggressive industry.⁹

Unfortunately, simply ensuring that internal systems are compliant will not be sufficient. Given the amount of data exchange that takes place within the financial industry, extensive testing of all third-party connections and exchange methods is necessary. Financial institutions must also evaluate their corporate customers for Year 2000 compliance; noncompliance could affect a corporate customer's ability to conduct business and harm its creditworthiness.

What the Federal Reserve Is Doing

The Federal Reserve initiated its Century Date Change project in late 1995 to ensure that its business and processing functions continue uninterrupted. Recoding is under way for many systems, with the expectation that all critical applications will be Year 2000 compliant by year-end 1998. For the Federal Reserve, "software and hardware systems are defined as compliant if they can demonstrate correct management and manipulation of data involving dates, including single-century and multi-century formulas, without causing an abnormally ended scenario within the system of data exchanges via application inter-

To put off the Year 2000 project is to put your institution at risk of significant processing problems, including lost transaction records, incorrect interest calculations, inaccessible funds, and ATM and credit cards that won't work.

—Federal Reserve System
Century Date Change News
November 1997

Table 4
Will Your Bank Be Ready?

As the bank opens on Monday, January 3, 2000...

- ◆ Is the security system operating (burglar alarm, fire alarm, entry system)?
- ◆ Can the vault be opened and the contents accessed?
- ◆ Are monitoring reports available and accurate (past-due reports, daily statement, account balances)?
- ◆ Can the incoming cash letter be processed?
 - Can the correspondent prepare it?
 - Can the letter be proofed?
 - Can the items be posted?
 - Can the items be sorted?
 - Can return items be prepared?
 - Can information on customer balances and available overdraft coverage be accessed?
 - Can microfilming be performed?
 - Can date stamping be done?
 - Can large items be memo-posted?
 - Can paid checks be canceled with the appropriate dates?
- ◆ Is the night depository accessible?
- ◆ Can the ATM be accessed and serviced?
- ◆ Can clearings be sorted and prepared for transmission?

Once the bank is open...

- ◆ Can tellers provide deposit receipts with appropriate dates?
- ◆ Can daily work be proofed, microfilmed, sorted and posted?
- ◆ Can new accounts be opened (availability of third-party information, such as credit checks and address and employment verification)?
- ◆ Can new loan documents be generated? With correct APR calculations?
- ◆ Can payments be accurately applied to the loan system?
- ◆ Can dormant accounts be determined?
- ◆ Can the main bank communicate with branches and vice versa?
- ◆ Can the general ledger be updated with accurate accruals?
- ◆ Can wires be processed?
- ◆ Can historical account information be obtained (for tax documents and other inquiries)?
- ◆ Will automatic rollovers of depository contracts take place?
- ◆ Will the bank's tickler system operate correctly?
- ◆ Can the bank track outstanding official checks and money orders?
- ◆ Can the bank's payroll be processed accurately?
- ◆ Can the bank ensure compliance with the Bank Secrecy Act and other reporting requirements?

And the list goes on....

Year 2000 compliant means information technology that accurately processes date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations. Furthermore, Year 2000 compliant information technology, when used in combination with other information technology, shall accurately process date/time data if the other information technology properly exchanges date/time data with it.

—Federal Acquisition Regulations System
48 C.F.R. § 39.002

faces, as well as data spanning the period before, during, and after the turn of the century."¹⁰

The Federal Reserve has outlined plans to make its products, services and access methods Year 2000 ready and is prepared to support customer testing for century-date-change compliance beginning July 1, 1998, and continuing through 1999. Detailed customer test procedures for each Federal Reserve application will be published in *Century Date Change Bulletin No. 3* in early 1998. This bulletin will describe the schedule, levels of support, availability of the test environments and other special procedures for testing.¹¹

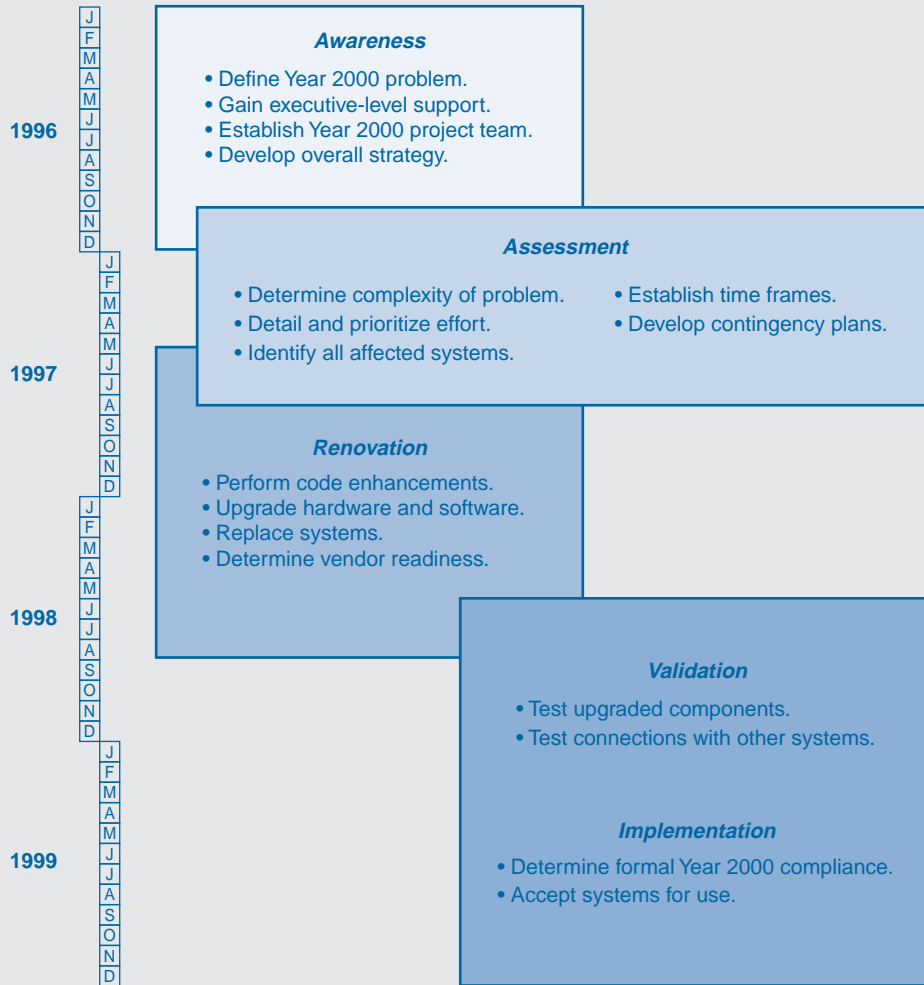
Other Issues

Some mistakenly assume that the Year 2000 problem applies only to 30-year-old mainframe computers running long-forgotten programs. While these systems are

likely to have significant problems, many personal computers also may be affected. To quote Peter de Jager, "On January 1, 2000, more than 80,000,000 PCs will think the Berlin Wall is still standing and that Trudeau is still the Prime Minister of Canada."¹² PCs with 486 processors or lower can be expected to have problems, and some Pentium-based PCs are not Year 2000 compatible. In fact, depending on the operating system, PCs could revert to 1900, 1980 or 1984. To ensure Year 2000 compliance for PCs, the hardware and software, including the operating system, should be tested (*Table 7*).¹³

Moreover, a system's ability to handle 01/01/00 without a hiccup does not ensure success. Some systems could encounter problems before and/or after the century change. For example, many systems use 99 in a year field or the date 9/9/99 to indicate something special about a record, such as

Table 5
Year 2000 Project Management



SOURCES: FFIEC, "Year 2000 Project Management Awareness," Interagency Statement, May 5, 1997; General Accounting Office, "Year 2000 Computing Crisis: An Assessment Guide," September 1997.

No amount of money or resources will postpone the year 2000. It will arrive on time, even if all too many computers fail to recognize its presence.

— "The Millennium: The Day the World Shuts Down"
Newsweek
June 2, 1997

an infinite expiration date or "end of file." Without changes to either the program logic or the date fields, on September 9, 1999, these systems may delete current records or simply stop processing before they reach the last record of a file.

There is also the tricky issue of February 29, 2000. The year 2000 will be a leap year—the first time the beginning of the century has been a leap year since 1600. Did the programmer who designed your hardware and software remember that the year 2000 is a leap year? Could any of your systems incorrectly skip from February 28, 2000 to March 1, 2000? Will your data-entry screens recognize February 29, 2000, as a valid date?

The dawn of the year 2000 also poses what is referred to as the "day of the week" problem. January 1, 1900, was a Monday, but January 1, 2000, will be a Saturday. What if the microchip controlling the bank's vault interprets the year 00 as 1900 rather

than 2000? Who will be in your bank when the vault's time lock opens on Saturday, January 1, 2000?

In addition, there are some nontechnical items that will need to be addressed. For

Table 6
Vendor Assessment

- ◆ Inventory all vendor-supplied software and hardware.
- ◆ Rank products to identify the most critical.
- ◆ Request information on vendor plans for Year 2000 compliance.
- ◆ Identify noncompliant products, evaluate when/if they will become compliant, and find replacements if necessary.
- ◆ Install and test products that vendors have certified as compliant.
- ◆ Develop contingency plans.

SOURCE: Federal Reserve System, *Century Date Change News*, Spring 1997.

Table 7
Personal Computers and the Year 2000

PC elements affected by Year 2000 problem

- ◆ The real-time clock, which is maintained on a chip in the system board
- ◆ The basic input/output system (BIOS), which controls the operation of PC components
- ◆ The operating system (DOS, Windows, OS, etc.)
- ◆ Software applications, including applications developed in-house
- ◆ Networks that may provide date information to individual PCs

Achieving PC compliance

- ◆ Start an intensive awareness campaign among end users.
- ◆ Inventory all PCs (and keep the inventory up to date).
- ◆ Inventory all software (operating systems, system software, development tools and application code).
- ◆ Inventory all systems that exchange data with desktop systems, both internally and externally.
- ◆ Test hardware and software for compliance.
- ◆ Mandate that all new in-house-developed code use four digits to represent the year.
- ◆ Impose central millennium approval for new purchases.
- ◆ Be prepared to spend a quarter of your Year 2000 project budget on PC problems.

SOURCE: Institute of Electrical Engineers, "Compliance and Personal Computers," <<http://www.iee.org.uk/2000risk/old/actpc.htm>>.

When you get back home on 01/01/00, your lights may not go on, or the hands on your clocks may be spinning from the wrong power frequency. Your automated teller machine may not work, because your bank thinks your ATM card expired back when Queen Victoria did. Your neighborhood traffic lights may give mixed messages. Expect anything from calm to calamity.

—Marilyn Vos Savant
Parade Magazine
 October 26, 1997

example, can the date stamps used by your institution show a date beyond 1999? Also, some hard-copy forms and reports that assume a 19 for the century (for example, checks and deposit slips) will need to be modified.

Finally, even the most careful planning and preparation should be backed up with a contingency plan. An institution's contingency plan should identify steps the institution needs to take if one or more critical systems experience problems because of Year 2000 changes, if the renovation is not completed in time, or if a business partner's systems do not function properly. The contingency plan also should consider scenarios resulting from failures in the electrical, security, vault or other systems (*Table 8*).¹⁴

Conclusion

Financial institutions that have not yet developed and initiated a plan of action to deal with the Year 2000 issue may find themselves at a serious competitive disadvantage. Furthermore, the Federal Reserve, together with the other federal banking agencies, regards Year 2000 compliance at financial institutions as a significant safety and soundness issue to be handled in a manner similar to other such issues. To allow substantial testing time for both internal processing and third-party connections, renovation of mission-critical applications should be complete and testing well under way by year-end 1998. Internal testing and compliance also should include embedded-chip systems, such as those that operate elevators and security systems, and should address Year 2000

efforts of corporate customers to ensure their continued creditworthiness. As Kevin Schick of the Gartner Group put it, "The year 2000 is not rocket science....The complexity of the project is not in the solution but rather in the size and scope of the project itself."¹⁵

—Kelly Klemme

Table 8
Contingency Planning

Questions to consider

- ◆ What products or services could you do without during a failure?
 - Are any manual, automated or out-sourced backup systems available?
 - How long will it take to set up an alternative?
- ◆ What products or services could your customers do without?
- ◆ What impact will a system problem have on your ability to service your customers?
 - When will you notify customers of a potential disruption of service?
- ◆ How will you mobilize your staff to address an application or environmental system problem?
- ◆ What if your software vendor, service bureau or data processor is not ready in time?
 - Are there alternative vendors?
 - When should you pursue alternatives?
 - Should you contract ahead of time for services that may be needed?
- ◆ Has audit/legal reviewed your Year 2000 contingency plans?

SOURCE: Federal Reserve System, *Century Date Change News*, November 1997.

Year 2000 Century Date Change Resources on the Web

Federal Reserve System

<http://www.bog.frb.fed.us/y2k>
<http://www.frbsf.org/fiservices/cdc>

Federal Financial Institutions Examination Council

<http://www.ffiec.gov/y2k>

IBM

<http://www.ibm.com/IBM/year2000>

Information Technology Association of America

<http://www.itaa.org/year2000.htm>

CIO Year 2000 Research Center

<http://www.cio.com/forums/year2k.html>

The Year 2000 Information Center (Peter de Jager)

<http://www.year2000.com>

Mother of All Year 2000 (Y2K) Link Centers

<http://pw2.netcom.com/~helliott/00.htm>

Federal Year 2000 Commercial Off-the-Shelf (OTS)

Product Database

<http://y2k.policyworks.gov>

on the Millennium Bug: Banking and the Year 2000 Computer Problem, Banking and Financial Services Committee, U.S. House of Representatives, November 4, 1997.

¹⁰ Federal Reserve System, *Century Date Change News*, Spring 1997.

¹¹ Federal Reserve System, *Century Date Change Bulletin No. 2*, October 6, 1997.

¹² Peter de Jager, "Believe Me It's Real: Testing Your PC for Year 2000 Problems," <<http://www.year2000.com/archive/believeme.html>>.

¹³ Board of Governors of the Federal Reserve System, "Testing Personal Computers for Year 2000 Compatibility," <<http://www.bog.frb.fed.us/y2k/pctesting.htm>>.

¹⁴ Federal Reserve System, *Century Date Change News*, November 1997.

¹⁵ Kevin Schick, Oral Testimony, Government Management, Information and Technology Subcommittee of the Government Reform and Oversight Committee, U.S. House of Representatives, April 16, 1996.

Questions regarding the Century Date Change project may be directed to the following contacts at the Federal Reserve Bank of Dallas:

CDC Eleventh District contact

Sam Gray, (214) 922-5723

Business Development contact

Carolyn Hartmann, (713) 652-1659

Supervisory contact

Ann Worthy, (214) 922-6156

Public Information contact

Sarah Jennings, (214) 922-5259

Notes

- ¹ "The Millennium Bug: Please Panic Early," *The Economist*, October 4, 1997.
- ² Basle Committee on Banking Supervision, "The Year 2000: A Challenge for Financial Institutions and Bank Supervisors," September 1997.
- ³ James A. Leach, Opening Statement, Hearing on the Millennium Bug: Banking and the Year 2000 Computer Problem, Banking and Financial Services Committee, U.S. House of Representatives, November 4, 1997.
- ⁴ Andrew C. Hove, Jr., Written Statement, Hearing on the Millennium Bug: Banking and the Year 2000 Computer Problem, Banking and Financial Services Committee, U.S. House of Representatives, November 4, 1997.
- ⁵ Edward W. Kelley, Jr., Oral Testimony, Financial Services and Technology Subcommittee of the Banking, Housing and Urban Affairs Committee, U.S. Senate, July 30, 1997.
- ⁶ Dean Anason, "Government Gets Tough with Bank on Year-2000," *American Banker*, November 18, 1997.
- ⁷ Peter de Jager, "Unjustified Optimism," Oral Testimony, Science Committee, U.S. House of Representatives, May 14, 1996.
- ⁸ FFIEC, "Year 2000 Project Management Awareness," Interagency Statement, May 5, 1997.
- ⁹ Edward W. Kelley, Jr., Oral Testimony, Hearing

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Lydia L. Smith

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Jeffery W. Gunther, Thomas F. Siems

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Kay Champagne

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Federal Reserve Century Date Change Project Publications

Additional information on the Federal Reserve's Year 2000 Century Date Change (CDC) initiatives is available in *Century Date Change News* and *Century Date Change Bulletin*. The November 1997 issue of *Century Date Change News* presents information on the Year 2000 projects of various financial industry trade associations, discusses strategies for working with business partners to prepare for the year 2000 and outlines some basic questions to consider in developing contingency plans.

The *Century Date Change Bulletin* addresses specific technical issues of Year 2000 compliance. *Bulletin No. 1* (August 1, 1997) outlines compliance information for FedLine[®],* Bulkdata and Computer Interface Protocol Specifications (CIPS). *Bulletin No. 2* (October 6, 1997) discusses the Federal Reserve's strategy for customer testing. *Bulletin No. 3*, scheduled for publication in early 1998, will provide a detailed customer test support plan for each Federal Reserve application.

These publications are available from the Federal Reserve System's CDC project Web site at <<http://www.frbsf.org/fiservices/cdc>>, or you can request copies from Sarah Jennings at the Federal Reserve Bank of Dallas Public Affairs Department, (800) 333-4460, ext. 5259, or E-mail, sarah.jennings@dal.frb.org.

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