YEAR 2000 RECESSION?

"Prepare for the worst. Hope for the best."

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Version 3.7, March 17, 1998

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Chapter 1

THE PROBLEM

I. Introduction: A Serious Problem

Recession Odds Are Rising

The Year 2000 Problem (Y2K) is a very serious threat to the US economy. Indeed, it is bound to disrupt the entire global economy. If the disruptions are significant and widespread, then a global recession is possible. Such a worldwide recession could last at least 12 months starting in January 2000, and it could be as severe as the 1973-1974 global recession. That downturn was caused by the OPEC oil crisis, which is a useful analogy for thinking about the potential economic consequences of Y2K. Just as oil is a vital resource for our global economy, so is information. If the supply of information is disrupted, many economic activities will be impaired, if not entirely halted.

The goal of this book is to assess the likelihood of a year 2000 recession. I first began studying the Year 2000 Problem last summer. In July, I concluded that there was a 30% chance of a worldwide recession in 2000 that could be as severe as the one during 1973-1974. [*Topical Study #37*, "New Era Recession? Deflation, Irrational Exuberance & Y2K", July 14, 1997].

In Congressional testimony on November 4, 1997, I raised the odds of a recession to 40%, based on numerous disturbing documents I found on the Internet, particularly on the web sites of several important government agencies, including the Federal Aviation Administration, the Internal Revenue Service, and the General Accounting Office.

In early January of this year, after reading the federal government's third quarterly Y2K progress report for the three-month period ended November 15 and released on December 15, 1997, I wrote that I would most likely raise the odds to 60%. I would do so if the next quarterly federal progress report, compiled by the Office of Management and Budget (OMB), continued to suggest that vital computer systems operated by the government might not be ready for the century date change [*Y2K Reporter #11*, January 5, 1998].

OMB released its fourth progress report on March 10, 1998 for the three-month period ended February 15. After studying it very carefully, I conclude that there is an increasing chance that vital government services will be delayed, disrupted, pared, and curtailed in 2000. (See Chapter 7) This precarious situation implies that foreign governments, as well as many business organizations around the world may fail to meet the deadline too.

Therefore, I am raising the odds of a severe global recession to 60%. It could last at least 12 months. Real GDP could fall by at least 4% in the United States from peak to trough. I am the first to admit that there is nothing scientific about my assessment. It is not based on a rigorous global economic model. It is simply my own subjective assessment of the situation. I am assigning a probability to a Y2K recession scenario to communicate my level of conviction and concern.

A Recession In 1999?

The recession could begin before January 1, 2000, perhaps during the second half of 1999, if the public becomes alarmed and takes precautions. If stock

prices fall sharply in 1999, in anticipation of a recession in 2000, the resulting loss in confidence could cause consumers to retrench in 1999 and trigger a recession sooner as well. It could start in 1999 if bankers cause a credit crunch by refusing to lend to companies that are most at risk of failing in 2000 [Jay Golter and Paloma Hawry, "What Every Loan Officer Needs to Know about the Year 2000 Computer (But Doesn't Know How to Ask), *FDIC Banking Review*, March 1998]. If these companies are not bailed out by their key vendors or customers, they might start failing next year.

How Severe A Y2K Recession?

My basic premise is that most computer systems will be fixed in time, but some important ones won't be ready. The question, then, is whether the resulting disruptions will be significant enough to cause a recession. If so, then how severe could it be? I am using the 1973-1974 oil-crisis recession as a possible analogy.

In that downturn, real GDP fell 3.7% in the United States from peak to trough over a five-quarter period. I estimate that an identical drop, starting in 2000, would reduce real GDP by $300 billion, back to where it was in early 1998, or three years prior to the end of 2000.

In this déjà vu scenario, the flow of information would be disrupted to such an extent that our impaired information systems will be able to handle only the level of business of three years ago, i.e., 1998. Is this too pessimistic, or realistic? Actually, in my opinion, it might be too optimistic to believe that the information gridlock won't be even more damaging, sending us further back in time, when the level of GDP that our information systems supported was even lower.

A Deflationary Recession

If a recession is coming within two years, it will be deflationary, unlike the 1973-1974 recession, in which many prices and wages increased sharply, led by soaring oil prices. Economists labeled the subsequent period of slow growth and high inflation "stagflation."

With inflation rates falling close to zero in most industrial nations, a 2000 recession could easily push us over the edge into deflation:

1. The financial crisis in Asia has pushed that region into a recession that is likely to last all year, and possibly into 1999 [*Topical Study #41*, "Asia's Great Leap: Forward Or Backward?" February 10, 1998, *Topical Study #40*, "Is Asia Minor?" November 17, 1997].
2. As a result of Asian currency devaluations, US import prices are falling and depressing producer prices in the US. Indeed, I do expect deflation in the PPI this year and next year.
3. Oil prices have tumbled recently, partly because crude oil demand in Asia is down by at least one million barrels a day ["Oil demand: Is Asia minor?" *Weekly Economic Briefing*, December 3, 1997].
4. Japan has been in a depression since 1990 and is experiencing some

shocking record low of 1.51%.

Could Y2K efforts boost inflation by depressing productivity and raising labor costs? I doubt it. In today's highly competitive markets, higher labor costs are more likely to hurt profits than to be passed through to prices.

A Trillion Here. A Trillion There

How much might the US price deflator fall in 2000? Conceivably, prices might drop 5% in a deflation scenario. If real GDP drops as much, then a 10% decline in nominal GDP would amount to a loss of nearly $1 trillion. Is this a worst-case scenario? Maybe, maybe not. By the way, this $1 trillion potential loss estimate is just for the US, and before litigation fees and damages, which may also exceed $1 trillion.

Stock investors might lose at least $1 trillion if stock prices drop as they do in every recession. In the first half of the 1970s, the Dow Jones Industrial Average peaked at 1026.82 during January 1973. It plunged 42% to a trough of 596.5 during December 1974. The bear market lasted 23 months. A similar drop in the Dow from a peak of 10,000, let's say, would put it at 5800.

It's Not Too Late

Don't get me wrong. I am not saying that such a scenario is inevitable. I am not predicting the end of life on planet earth. It is not too late to minimize the impact of the Y2K problem on our global economy. Besides, even if key systems miss the deadline, we must push harder to fix them now so they might be ready sooner in 2000, which is better than later. Let's recognize that Y2K is an emergency situation that requires immediate attention and enormous resources. Let's mobilize these resources. Here are a few of my proposals:

1. I would like to see the United States and every country on this planet establish national Y2K War Councils to coordinate the repair efforts and to prepare for the disruptive consequences of inevitable failures domestically and globally.
2. Intra- and inter-industry Y2K cooperatives should be established nationally and globally to pool resources, establish standards, and coordinate testing.
3. Organizations that actively and openly cooperate with others should be protected from legal liability as much as possible.
4. We should study whether a one week worldwide Y2K holiday might be necessary so that the global computer system won't be stress tested under peak load conditions.
5. We should consider stress testing the global computer system a month before January 1, 2000 to determine the weakest links in the global IT chain.
6. The number one priority must be to make sure that the utilities supplying electricity, gas, water, and phone services will all function properly.
7. Also at the top of the priority list are air and rail transportation,

8. In the United States, we should increase government spending to buy new computers for every federal, state, and local agency that needs them for the coming century. The federal budget will certainly be in deficit again in a year 2000 recession. Better to be in deficit in 1999 to repair Y2K and to prepare for problems so as to minimize the consequences of such a recession.

Staying Flexible, Stay Tuned

I am an optimist by nature. I am not inclined to be an alarmist. Indeed, I have been one of the most vocal stock market bulls on Wall Street for more than 10 years (bio). I am relatively optimistic that most computer systems will be fixed in time. However, I doubt that all computer systems around the world will be 100% fixed. If so, then some will fail, possibly causing widespread disruptions at critical choke points of vital economic systems and a global recession. If my ongoing research confirms this pessimistic hypothesis, then I may raise the odds of a recession. I am very willing to lower the odds if the unfolding story turns out more optimistically.

I hope to see more of us giving top priority to fixing Y2K around the world. I've prepared a generic questionnaire to help you assess the progress toward Y2K compliance of your own organization and everyone you depend on including vendors, customers, bankers, borrowers, distributors, utilities, transportation, government, maintenance and security services, etc. We must all assess the impact of Y2K disruptions and prepare contingency plans for plausible worst-case scenarios. Conceivably--though highly unlikely--as the deadline approaches, we may conclude that the economic risks are small and temporary. But with so much at stake, we should prepare for the worst, and thereby realistically hope for the best. If we are not all at least a small part of the solution, we will certainly be a big part of the problem.

I would love to be wrong on this issue. I would prefer to find that enough progress is under way over the time remaining so that I can lower the probability of a global recession. Stay tuned: I will continue to review and analyze the latest relevant documents in my Y2K Reporter and to incorporate my findings and conclusions in this net book.

II. The Problem In Brief

Trivial And Overwhelming Problem

The Year 2000 Problem is both trivial and overwhelming at the same time. Unless fixed soon, almost all older mainframe computer software systems, many PCs and software programs, and millions (perhaps billions) of embedded semiconductor chips potentially could crash on January 1, 2000 simply because the new year will appear as "00" in the standard two-digit

systems will be fixed in time. But even if only a small percentage fail, the resulting disruptions are bound to cause some trouble, and worse if the minority of noncompliant Y2K systems have an adverse Domino Effect on compliant ones.

[February 29, 2000 is also a problem date because 2000 is a leap year. Under current calendar conventions, years ending in 00 are generally not leap years, even though evenly divisible by 400. The exception is for centuries that are themselves divisible by 4. Thus, 2000 is the exception to the exception!]

Obviously, there are simple solutions to this. The two-digit fields can be found and replaced with four-digit ones. The software programs can be "windowed" to recognize incoming years in a range, say, between 0 and 40 as being in the 21st century. New software programs can be written to replace "legacy" programs that may be too difficult to fix.

The problem is time. All the money in the world will not stop January 1, 2000, from arriving at the rate of 3,600 seconds per hour. There is not enough time to fix and test all the systems, with billions of lines of software code around the world, that need to be fixed. Many businesses, governments, and organizations have become aware of the Year 2000 Problem only recently and may simply run out of time.

Testing is much more time-consuming than repairing noncompliant code. This might not be a problem for some stand-alone systems. However, the majority of software programs are part of a bigger corporate, industrial, national, and even global network. They often depend on input information generated by other programs. They must all remain compatible as they are fixed.

Y2K Virus Is Everywhere

In other words, the sum total of all interdependent computer systems must all be compliant. The network is the computer. A problem in one system could trigger a Domino Effect, which poses a great risk to all who fail to test whether their local compliant system is compatible with their global network. The networks that must function perfectly--at the risk of partial and even total failure--include:

1. electrical power systems,
2. telecommunications,
3. transportation,
4. manufacturing,
5. retail and wholesale distribution,
6. finance and banking,
7. government services and administration (including taxation),
8. military defense, and
9. international trade.

removed from all of them. A failure in any one system could corrupt other systems. Most obvious would be a serious disruption in the supply of electricity. The Year 2000 Problem will be a non-event only if the global network is fixed 100%. Much will be fixed in time. But there is no doubt that some significant fraction will not be ready in time. Indeed, most so-called embedded microchip systems will be stress tested for the first time under real world conditions starting at midnight on New Year's Eve 2000. There are billions of these mini-computers embedded in appliances, elevators, security systems, processing and manufacturing plants, medical devices, and numerous other vital applications. Most are probably not date-sensitive. But many are and could seriously disrupt vital economic activities and create serious safety hazards.

No Silver Bullet

On Wall Street, investors have sharply bid up the prices of several Y2K companies that offer various tools and solutions for fixing the problem. However, none has a "silver-bullet" solution that can fix Y2K over a weekend. They can help to find and repair code that is not Y2K compliant. But every change requires time-consuming testing of each system. Each change has the potential of creating a new bug in the repaired program, which then requires another round of "debugging" and testing. There is simply no silver bullet for this process. Notwithstanding the widespread belief that "Bill Gates will fix it," the official position of Microsoft is that this is a problem that everyone must fix on his own. It is too big and overwhelming for even Microsoft.

Software programming is far less disciplined and rigorous than most people realize. Two different programmers can and do write completely different programs that will perform exactly the same task. Programming is more of an art than a science. One of the biggest Y2K headaches is that few programmers take the time--or are even asked--to document the logic of their programs. Also, the original source code for many older programs is lost. The source code was translated into "machine language," i.e., the binary combinations of zeros and ones that computers understand, by so-called "compiler" programs. Reverse compiling is possible, but many of the original compiler programs are also lost.

Most folks don't believe Y2K is a serious problem--"You must be kidding." There is a great deal of confidence in American ingenuity: "This is a recognized problem and it will be fixed in time."

I too prefer to be an optimist. However, I am taking Y2K seriously. The more I study it, the more convinced I am that there is no "silver bullet." I hope I am wrong, but there are too many different software languages, programs, and computer systems than can be fixed with one simple, ingenious solution. Y2K solution companies can help their customers repair their noncompliant software. But the process is still time consuming, especially the testing phase.

There is no single way of fixing existing applications and databases. There are two common approaches: 1) The most obvious is to add two digits to the year field. 2) The windowing technique analyzes the two-digit year field and automatically recognizes years under a specified number (say 60) as being 20yy, while years over are 19yy. Windowing is not always feasible, e.g., when birth dates are part of a database. All Y2K fixes require repetitive, time-consuming testing each time an application is modified to be Y2K compliant to make sure it works with linked internal and customer-based and vendor-based applications that might have been repaired with a different technique.

Some currently noncompliant systems are just so huge and complex that there simply isn't enough time left to fix and test them. The Internal Revenue Service is an especially relevant example. (For more on the IRS, see Chapter 6.) So are lots of other government computer systems. (See Chapter 7).

Inconsequential Aberration? I Think Not!

Why am I basing my recession forecast mostly on the progress of the US federal government? I don't have similar progress reports for business. I assume that most will be ready, especially large corporations. But I do not believe that all businesses will be ready, especially smaller ones. I believe that it is prudent and reasonable to assume that the alarmingly slow pace of progress of our federal government is closer to the typical experience of all earth-based organizations with a Y2K problem than an exception, or an aberration.

Besides, even if everyone on our small planet did fix Y2K except for a few key US government agencies, a global recession would still be a plausible scenario. After all, the federal government accounts for a great deal of US economic activity, which, in turn, accounts for a great deal of global economic activity. US federal, state, and local government spending accounts for 17.5% of real GDP. This percentage is even higher for most other countries around the world.

Mission Critical Approach Guarantees Failure

In fact, the US government's approach to fixing Y2K seems to be the way everyone else is approaching this problem. The approach has the following troublesome characteristics:

1. ***Decentralized.*** It is highly decentralized. Each government agency is responsible for fixing Y2K. On February 4, 1998, President Bill Clinton did establish a Y2K Conversion Council, but its power and mandate are very limited [*Y2K Reporter #14* "Clinton's New Y2K Council Too Weak," February 23, 1998]. In business, most companies are fixing Y2K on their own. There are too few intra- and inter-industry groups working to solve the problem collectively.

2. ***Uncontrolled.*** Each Y2K-fixing entity independently establishes a triage process to identify critical versus noncritical systems. No national authority, regulator, or industry association has defined the

"mission critical."

3. ***Undisciplined.*** Available resources are focused on fixing mission critical systems, however defined. Y2K managers are free to reclassify mission critical systems as noncritical. They might do this under the increasing pressure of the looming deadline to show more progress than is in fact possible to achieve.

4. ***Unaccountable.*** Noncritical systems are either compliant or they are not. If not, Y2K managers must decide whether to fix them or to let them fail in 2000. Without a cooperative or collective approach, it is likely that some entities will doom noncritical systems that are actually mission critical to some of their external, and even internal dependents.

This last point is crucially important: It is the epicenter of the potential Y2K earthquake. We all need to know if the products, services, information, orders, jobs, incomes, and payments we depend on have been doomed by the triage decisions of those who provide them. [I've prepared a short questionnaire you can use to assess progress toward Year 2000 compliance of your own organization and everyone you depend on, including vendors, customers, bankers, borrowers, distributors, utilities, transportation, government, maintenance, security, etc. It is by no means all inclusive or foolproof.] If so, we might already be toast in 2000 and not know it in 1998 or even in 1999.

Next time someone tells you that they've 1) identified their mission critical systems; 2) are fixing the ones that are noncompliant; and 3) expect to finish testing in time to implement them before January 1, 2000, ask them to tell you about their noncompliant noncritical systems that won't be fixed and are expected to blow up starting on that fateful date.

An Oxymoron

Once federal government agencies and other entities have inventoried all their mission critical systems, the presumption is that all the resources necessary to fix them will be available and mobilized to do so. So, they will be fixed in time. This may be a very bad assumption:

1. Information resources are scarce. They are likely to get scarcer and much more expensive as judgment day approaches for our computers.

2. Even if available and affordable, the resources might not be fully utilized if Y2K managers aren't sufficiently alarmed, or even aware. The fact that the wage rate for computer programmers, as measured by average hourly earnings, is up only 4.7% over the past 12 months through January of this year is disturbing, in my opinion. It suggests that even at this late date there isn't enough concern about the Year 2000 Problem.

3. If resources are fully and effectively utilized, failure can still occur.

that only 20% of information technology (IT) projects are delivered on time: "A fixed deadline is an oxymoron in the IT industry."

No Low-Tech Backup

If IT systems do fail, perhaps the resulting disruptions and adverse economic consequences will be minimized by contingency planning and preparations. I hope so. This has been one of my goals, i.e., to alert everyone I can to the inevitability of disruptive Y2K failures and domino effects, and the need to prepare so as to minimize the damage.

Now, let's be realistic: We collect, sort, store, process, analyze, and report so much information with our IT systems that in most cases there are simply no viable low-tech alternatives. Going back to "manual" systems means going back in time to when our output and productivity were much lower than today. The alternative to just-in-time inventory management is the more costly and cumbersome just-in-case stockpiling of yesteryear.

III. Business Leaders Sound The Alarm

Chaos Coming

The January 13, 1998 *Financial Times* reported that 60 senior business executives warned that governments are not moving quickly enough to fix their Year 2000 Problem in a statement to be delivered to President Bill Clinton and the Prime Ministers of Britain and Canada.

"We fear that governments lag in assessing and addressing the problem," says the statement. It warns that disruptions could extend to "delays in welfare payments, the triggering of financial chaos by a breakdown in revenue collection and debt management, and malfunctions in the air traffic control and defense systems."

The Wild Bunch

Among the 60 executives signing the statement are impressive fellows from

Lloyds TSB Banking Group
British Aerospace
BAT Industries
Thames Water
Bechtel Group
Unilever
Bombardier
Texas Industries
Ford Motor Company.

Quite an impressive bunch. This is a very important statement: This is the first time that a group of business executives has sounded the Y2K alarm. It's nice to get some confirmation that I'm not delusional about the Y2K issue. Y2K skeptics claim that Y2K consultants are stirring up unwarranted fears to

sounding the alarm.

Ugly Scenario

The list of possible disruptions in the statement adds up to a mighty ugly scenario. It happens to coincide with some of the worst-case scenarios I have been writing about. Just imagine the possible consequences and domino effects caused by the three disruptions listed in the statement:

1. If welfare payments are delayed, social unrest might result. Criminal activity, e.g., looting and robberies, could increase significantly. The phone system could be overwhelmed with welfare beneficiaries attempting to call government offices for their checks.
2. If government tax collection is impaired, many businesses that are government vendors could fail if they are not paid on a timely basis. Bond investors might not receive their coupon payments on schedule. They might refuse to buy more bonds, especially of state and local governments.
3. If air traffic control systems don't function properly, flights will be canceled. This would be bad for business travelers. It would be bad for the air freight delivery and travel industries too.

Tony Gets It, Bill Doesn't

According to the January 2, 1998 *Financial Times*, the UK Prime Minister, Tony Blair, already is well aware of the millennium problem: "He will signal his determination to use the UK presidency of the European Union to highlight the need for action to avert serious economic and social problems which may be caused by the inability of older computer systems to cope with the date change at the turn of the century." Mr. Blair is reportedly shocked at the widespread ignorance of the problem in the United Kingdom and Europe. He should be just as shocked by the total lack of leadership on this issue from the White House. (One jokester told me he heard rumors that Vice President Al Gore is chairing a secret Y2K committee, and plans to have a logo ready to show the public this summer.)

Power Of The Pen

According to the *FT* article, the prime minister's spokesman "pointed to recent analysis by Edward Yardeni, chief economist of Deutsche Morgan Grenfell, who warned there was a 40% chance the date change could cause a worldwide economic slump as deep as the recession that followed the 1973 oil price rise."

IV. Clinton's New Council Too Weak

No Bridge

President Bill Clinton and Vice President Al Gore say they are building a bridge to the 21st century. Unfortunately, the bridge could collapse just as the new millennium begins because the administration isn't doing enough to ensure that the Year 2000 Problem won't crack the technological foundation of our economy. This should be a major concern for the vice president since he plans on running for the top job in 2000. I predict that the Y2K explosion will blow up Mr. Gore's political bridge. The odds are higher that he will be swimming in the River Kwai than sitting in the Oval Office in 2001.

No Czar

On February 4, President Bill Clinton created a Year 2000 Conversion Council at the White House to coordinate the government's efforts to head off the problem. Unfortunately, this is too small a step. It may do more harm than good by creating the false impression that the administration is now giving Y2K top priority and is moving fast enough to fix the problem.

From what I gather so far, the head of the council is no Y2K Czar. He lacks the authority to act decisively to fix the problem and to prepare contingency plans for inevitable disruptions and failures in key public and private sector computer systems. Indeed, the president's February 4 executive order limits the council's mandate to overseeing the Y2K-fixing progress of the federal government's executive branch, where the effort remains decentralized at the agency and departmental levels.

Previously, the Office of Management and Budget (OMB) had been in charge of overseeing the progress of federal agencies in fixing the problem. Sally Katzen headed this effort at the OMB's Office of Information and Regulatory Affairs. She had other responsibilities besides monitoring federal Y2K progress. In January, she was appointed deputy director of the National Economic Council.

No Staff

The new Year 2000 Conversion Council will be chaired by John Koskinen, deputy director of the OMB. Ms. Katzen will serve as vice-chairperson. Each executive department will have a representative on the council and so will other federal agencies as may be determined by the chairman. Mr. Koskinen's ambitions are limited. He made it very clear that he won't be the nation's Y2K czar. He expects to be a "coordinator, facilitator, and catalyst" to reinforce the independent efforts of the various federal agencies. "We will not take over what is being done by agencies and other groups. We will reinforce the work they are doing." He is no empire builder: "I'll have a relatively small staff."

No Rush

Mr. Koskinen left government service in June 1997 after three years at OMB, where he focused on finding new strategies for how the government buys computers. He is scheduled to start March 9, which suggests that there isn't a

council: The Hill, industry worry action is too late," *Federal Computer Week*, Feb. 5, 1998]. Indeed, the administration is looking forward to a big party in 2000. Two days before he set up the Year 2000 Conversion Council, President Clinton signed an executive order establishing the White House Millennium Council "to recognize national and local projects that commemorate the millennium…in a national and educational celebration of our culture, democracy, and citizenry."

No Planning

The Clinton Administration's disturbing lack of urgency about Y2K is all the more apparent when compared to the heightened sense of alarm and activism among government officials in the United Kingdom. According to the February 15 issue of *The Sunday Times*.

1. "The government is drawing up urgent plans to prevent a millennium nightmare in which the start of 2000 is marked by power failures, flight problems and hospital disasters triggered by mass computer malfunction."
2. "Two cabinet committees have been set up to deal with the problem; one is to commission a study on whether power supplies and other utilities will fail, causing traffic gridlock and problems inside hospitals."
3. "Another minister admitted there was a question mark over whether the authorities or airlines would ground aircraft on the evening of the millennium, saying: You won't catch me flying on the new year in 2000."

Assessing the risks of plausible worst-case Y2K scenarios has become a top priority of the British government. It should be a top priority in Washington, D.C. The government's decentralized approach is inadequate. The administration is simply monitoring the progress of the independent efforts of the federal agency. Presumably, any agency that lags behind will be pressured to move faster and to prepare contingency plans. The problem is that Y2K poses system-wide risks for the economy. Therefore it requires a centralized "war-room" approach to contingency planning, rather than one that leaves it up to individual "field commanders" on the Y2K front to improvise solutions.

President Clinton should establish another council--the Year 2000 Contingency Council--to assess the likelihood of disruptions and failures in the following systems: government services, banking and finance, telecommunications, public health, transportation, and electric power generation. With this information, this council can prepare national contingency plans. We need to assess the likelihood of numerous plausible worse-case scenarios in the event that some vital computer systems are not ready for the century date change. Then we can prepare for the worst, and thereby hope for the best.

Editorial:

The President's Commission on Critical Infrastructure Protection (PCCIP)

Switch In DC

was created on July 1, 1996 by Executive Order 13010 [http://www.pccip.gov/]. The stated reason for the order was the need to assure the uninterrupted operation of critical infrastructure. The commission was tasked with addressing vulnerabilities of eight different critical infrastructures: telecommunications, electric power systems, water supply systems, transportation, banking and finance, gas-oil storage and distribution, emergency services, and continuity of government. The PCCIP delivered its first report to the President on Wednesday, October 22, 1997 [http://www.pccip.gov/report_index.html]. It states that "solving the Year 2000 problem was not part of the commission's mission."

The first sentence of Executive Order 13010 states, "Certain national infrastructure are so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States" [http://www.pccip.gov/eo13010.html]. Surely, Y2K represents such a clear and present danger. There is nothing in the order that limits the commission's authority to study and make recommendations about Y2K.

Chapter 2

SILVER BULLETS?

I. Bill Gates To The Rescue?

Don't Shoot The Messenger

I am amazed at how many people believe that somebody will find a silver-bullet solution before the immovable deadline of January 1, 2000. Many assure themselves that, "Bill Gates will find a solution."

Don't count on it. Mr. Gates' Microsoft Corporation doesn't want to touch Y2K with a 10 foot pole:

> The real Year 2000 readiness issues are more about testing, good practices, and user education than product warranty. We will continue to provide detailed information to customers about Year 2000 readiness, but contractual warranties specific to Year 2000 readiness are not appropriate given the true nature of Year 2000 issues and the simple fact that a single technology provider, even one as well prepared for the year 2000 as Microsoft, cannot solve all issues related to the transition to the Year 2000 [http://www.microsoft.com/cio/articles/year2000faq.htm].

Microsoft expects that its biggest Y2K problem will be "getting end users to not 'shoot the messenger.' Many PCs are used as terminals into mainframe-based applications. Microsoft warns, "It is highly likely that not all mainframe programs will function properly when we reach the year 2000."

believe that it is a Microsoft problem. Microsoft hopes "to build awareness of this issue so people can quickly identify the real problems and take appropriate and cost-effective steps to solve the problem."

Is Microsoft Y2K Compliant?

A few of Microsoft's products have had Y2K-related bugs which are documented in the Microsoft Technical Support Knowledge Base . All of Microsoft's operating systems, including MS-DOS, were designed to handle four-digit dates well into the next century. Users can enter two-digit shortcuts that are then stored as four digit dates by Microsoft products. Since there is no industry-wide standard on how to interpret two-digit shortcuts, some PC applications may interpret a two-digit date differently than a user needs. The user will need to type in all four digits--e.g., "2000" instead of "00"--in order to ensure accurate data. "Users must of course take responsibility for the accuracy of the data that has been entered under either the two-digit or four-digit method, but Microsoft products give users the ability to properly enter and store dates into the next century. Relative to the severity and expense of the mainframe problem, this is a minor issue."

Are You Confused Yet?

Many of Microsoft's products do not actually store dates. Instead, they rely on the operating system, and sometimes databases, for storing and manipulating dates. Every Microsoft database product including Microsoft Access, Visual FoxPro, and Microsoft SQL Server stores years in a four-digit form. Microsoft Access 97 interprets manual year input from "00" to "29" as short cuts for the years "2000" to "2029." Access 97 converts all two-digit years within imported text files to 1900-based years. Microsoft recommends "that all legacy data sources be updated to contain four-digit years to avoid incorrect conversions." Microsoft Access 95, and earlier versions, interpret manual year input from "00" to "29" to be short cuts for "1900" to "1929." Microsoft Excel versions 4, 5, and 7 all interpret "00" to "19" as short cuts for "2000" to "2019." Microsoft Excel 97 interprets two-digit years from "00" to "29" as "2000" to "2029" and the short cut "30" will resolve to "1930." Got that? Are you ready for the quiz?

Free Advice

In effect, Bill Gates is saying, "Don't expect me to fix the world's Y2K problem. It's too big for my company to solve." Fix it yourself:

> While Microsoft does provide the tools for others to build solutions, we do not provide the vertical applications (e.g., payroll, accounting, Medicare, social security, and tax systems). Software developers can create their own software to collect, store, and manipulate dates. If they have not accounted for the year 2000, they may have problems. Microsoft strongly encourages software developers to use the date functions supplied by the operating system, software development tool, or database to avoid this problem. Microsoft also recommends that year 2000 testing be included in the software development process.

Editorial: The Prozac Solution

Hey, is everybody on Prozac, or what? No single individual or corporation on this planet can solve this problem for us. There are no quick and easy miracle drugs to make this depressing issue go away. Y2K can be fixed, but it will require a huge coordinated community, national, and global effort. We must also prepare for disruptions in the event that Y2K isn't completely fixed by the turn of the century. I urge Mr. Gates to make a public statement to this effect. Then, perhaps our leaders and the public will take Y2K more seriously and make it a top priority. Or, maybe I should take Prozac.

II. Y2K Vendors Say Business Is Slow

Surprising Survey

The Information Technology Association of America (ITAA) conducted a survey of IT companies in July 1997. Asked if they have all the Y2K business they can handle for the next six months, over 80% of respondents said no. Only 4% were at full capacity! Only 22% expected to be turning away Y2K customers by January 1998.

> On the contrary, customers appear to be moving slowly in making supplier commitments--at least from the suppliers' point of view. Forty-six percent of IT companies polled told ITAA that customers were not moving quickly to "lock up" market resources [http://www.itaa.org/pulse.htm].

Y2K vendors are clearly disappointed by the lack of panic buying. However, they believe that last-minute Y2K shoppers will strain the resources of the industry. In fact, 82% of respondents think capacity is a serious issue. Asked the same question in a slightly different context, 62% of respondents said the Y2K capacity issue has not been "over-hyped."

ITAA sent the e-mail survey to 375 companies and received 98 back. Most companies polled are "not realizing significant sales revenues" from Y2K. Almost 53% told ITAA that Y2K accounts for 25% or less of their revenue. Only 9% said it accounted for 75% or more of their total sales.

Editorial: Laugh Or Cry?

Could it be that companies with Y2K problems are fixing it with the resources they already have in-house? Could it be that the problem is not so serious after all? Or, could it be that business managements are not taking the problem seriously enough?

III. Family Feud: Survey Said!

Purchasers Say Y2K Is No Problem

Last year, I suggested to my friends at the National Association of Purchasing Management that their widely followed monthly business survey of their members should include a question on Y2K. They did so for the first time in the January survey. Here is what they found:

> Of the respondents, 89% indicated that they are either presently compliant or will be in advance of the year 2000, while 10% indicated they would be compliant with a few exceptions for non-critical applications and only 1% have major concerns within their company about the issue.

This is very reassuring. However, the NAPM survey tends to focus on large industrial companies. Most Y2K observers expect that such corporations will be ready, but worry about small companies, small banks, and state, local, and federal government agencies.

70% Of CIOs Lack Y2K Confidence

I wonder if the purchasing managers are getting their Y2K input from the Chief Information Officers of their respective companies. I doubt it. *CIO Magazine* conducted a poll of 400 CIOs in February. Of those responding, nearly 70% are not confident the millennium bug will be fixed in time. More than half said they probably won't fly in an airplane during January 2000.

German CEOs Say They Are Ready

The January 15, 1998 issue of Börse Online, a major German investor magazine, reports that a poll of 200 CEOs of public German companies found that 77% are already finished converting their systems for both the euro and the century date change. Moreover, the conversion costs were tiny, with a one-time hit ranging between only 0.1% and 0.4% of yearly sales. Some of the CEOs said that the long-term benefits of Y2K/euro preparations outweighed the immediate costs.

This is a very impressive finding, assuming it reflects the widespread situation in Germany. In January, I visited with institutional money managers in nine European cities. I saw about 1000 of them and received 88 responses to a survey I asked them to complete. One of the questions was: "Will most European companies be ready for the century date change?" Half of my respondents answered yes, the rest were negative. I also inquired if they expected that European governments will be ready. An astonishing 74% said no.

IV. Why Are They All Leaving?

Y2K Canaries

In the old days, miners took a canary in a bird cage along to work as an early warning system against poisonous gases. If the bird croaked, it was time to get out of the mine. Similarly, let's keep track of IT professionals for an early

that they will leave the FAA, IRS and DOD. They may be motivated by personal issues rather than Y2K concerns. Nevertheless, it is a setback for the Y2K efforts of these important government agencies.

Retiring FAA

According to a January 30, 1998 report to Congress on the Federal Aviation Administration (FAA) prepared by the General Accounting Office (GAO), the "FAA appointed its initial program manager with responsibility for the Year 2000 only six months ago...." He retired at the end of 1997!

Gross Out At IRS

Arthur Gross, the Chief Information Officer of the Internal Revenue Service, plans to leave on April 1 of this year. He first joined the IRS in March 1996. His announcement came just three months after another technology expert, Charles O. Rossotti, became the agency's new commissioner. Reportedly, the two disagreed on the approach toward modernizing the IRS. Mr. Gross was widely respected for his IT management skills. He was also remarkably candid about the huge effort required to modernize the IRS and to prepare the agency for the century date change. His leaving could be a major setback in this area. Nevertheless, Mr. Rossotti told the House Ways and Means Oversight Subcommittee that he hopes the bulk of the work will be done before the start of the 1999 filing season.

Bad Break In the Chain Of Command At DOD

According to the February 2, 1998 issue of *Federal Computer Week*, the leaders of the Y2K effort in the Office of the Secretary of Defense (OSD) are all taking early retirement. Anthony M. Valletta, the acting assistant secretary of the Department of Defense (DOD) in charge of C3I (command, control, communications, and intelligence), and at least five senior members of his staff are all taking advantage of a DOD "buyout" offer open to personnel in GS-3 through GS-15 positions through March 20. Good for them. Bad for DOD's Y2K effort.

Chapter 3

ELECTRIC POWER SYSTEMS

I. Nuclear Power To The People

Nukes

My number one concern about Y2K is disruptions to the electric power systems. Without electricity, we won't know about--let alone be able to fix--all the other Y2K-impaired systems. Let's start with an analysis of the Y2K

fuel electric plants.

On December 24, 1996, the US Nuclear Regulatory Commission issued Information Notice 96-70: "Year 2000 Effect on Computer System Software". It alerted the nuclear power industry to potential problems their computer systems and software may experience in 2000 if not fixed. What disturbed me most is that the notice did not require any formal response. Here is an interesting item from the notice:

> This issue may affect NRC licensees in many different ways. For example, computer software used to calculate dose or to account for radioactive decay may not recognize the turn of the century, which could lead to incorrectly calculated doses or exposure times for treatment planning. Other examples of software that may be affected include security control, radiation monitoring, technical specification surveillance testing, and accumulated burn-up programs. Also, equipment that licensees have purchased may contain computer software susceptible to the Year 2000 problem. The problem could occur not only in computer software or data that have been acquired from external sources, but also in programs developed by licensees or consultants. For many licensees, this issue may not prove to be a significant health and safety concern. However, to prevent any other potential problems this issue may precipitate, licensees are encouraged to examine their uses of computer systems and software well before the turn of the century. In assessing computer software, licensees may want to consider reviewing those programs that are used to meet licensing requirements or those that have safety significance.

I spoke with a fellow who works on the NRC's Y2K committee. He reminded me that his agency is responsible only for the industry's safety, not output. Apparently, the NRC was not overly concerned about Y2K issues at the end of 1996: They sent Information Notice 96-70 "to alert addressees to the potential problems their computer systems and software may encounter as a result of the change to the new century." The commission expected that "recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid potential problems." Suggestions contained in the information notice "are not NRC requirements; therefore, no specific action nor written response is required."

(On September 17, 1997,one day after I spoke with the NRC official and I signed up for the e-mail Discussion Group sponsored by the NRC for the industry, I received a message from the NRC informing the uncensored group that it would be a "moderated forum" from now on. It must have been a coincidence.)

They Are Safe, But...

I am less concerned about the safety of nuclear reactors than about the supply of electric power in 2000. The safety issue is briefly discussed in a September 24, 1997 memo from the NRC's chief information officer to the agency's commissioners. It too is posted on the NRC's Web site. [Memo from

The good news is that "safety-related initiation and actuation systems" don't have a Y2K problem because they do not rely on date-driven databases to perform their required functions. The NRC bases this conclusion on "discussions" with vendors of digital protection systems including Westinghouse, General Electric, Combustion Engineering, Foxboro, Allen Bradley, and Framatome/Babcock & Wilcox.

I feel better. Don't you? Well, not so fast; there's more to this story.

...Will The Lights Go Out?

The NRC memo notes that numerous "not-safety-related, but important, computer-based systems, primarily databases and data collection *necessary for plant operations"* are date sensitive and must be made Y2K compliant. [Emphasis added.] I guess this means the lights might flicker, or possibly go out, in some areas that depend on nuclear power plants if they are not fixed in time.

Here is a list of some of the systems that might be affected by Y2K problems at your neighborhood power plant according to the NRC:

1. security computers
2. plant process (data scan, log, and alarm)
3. safety parameter display system computers
4. radiation monitoring systems
5. dosimeters/readers
6. plant simulators
7. engineering programs
8. communication systems
9. inventory control system
10. technical specification surveillance tracking system

Y2K-Challenged Operators

It is hard to tell if the NRC is 100% sure that Y2K won't pose a safety threat. The NRC staff "believes that safety-related safe shutdown systems will function as intended." However, the NRC staff sees a possible "worst-case scenario" where several non-safety-related systems go berserk and "significantly challenge the plant staff."

For example, plant operators may be unable to track the status of the reactor after a Y2K-tripped shutdown if emergency data collection and communications systems fail. "Note that even under such a scenario, plant operators are trained to use their symptom-based emergency procedures and safety-related-post accident monitoring parameter indications to maintain safe plant shutdown conditions." Of course, the risk is that the operators might be overwhelmed by the Y2K havoc--but only in a worst-case scenario. (In this case, they might go fission.)

Dealing With The Problem

So what is the NRC doing to minimize the risks? They are leaving it up to the industry to fix Y2K.

> The most effective strategy for the NRC would be to confirm implementation of an industry-wide effort, such as the one being planned by NEI [Nuclear Energy Institute, the nuclear power industry's trade association and lobby group.] In order to facilitate this action, the staff is considering a request for information pursuant to 10 CFR 50.54(f) to licensees of operating plants requesting designation of a point of contact, and a description of the programs planned or implemented to ensure Year 2000 compliance and their schedules. This request would ask for confirmation of any plan being implemented once the staff agrees that it sufficiently addresses the issue. Such an information request can be issued by the end of calendar year 1997. Meanwhile, the staff will work with NEI to generically address the Year 2000 issue. Whether the staff needs to take regulatory actions under 10 CFR 50.54(f) will be determined by the results of its interaction with NEI.

As of September 1997, the NRC was still "considering" whether to require plant operators to provide them with the information they might need to determine if a plant is or will be Y2K compliant. If not, I presume the NRC will order the shutdown of noncompliant plants.

"Defense-In-Depth"

On the Internet, I found a report titled "Nuclear Regulation: Preventing Problem Plants Requires More Effective NRC Action", dated May 1997, and prepared for Congress by the General Accounting Office. It reviews how the NRC: (i) defines nuclear safety, (ii) measures and monitors the safety conditions to ensure the safety of nuclear plants, and (iii) uses its knowledge of safety conditions to ensure the safety of nuclear plants. On all three counts, the NRC was found to be deficient by the GAO auditors.

The relatively new commissioners [see insert box] have shown a strong commitment to reforming the NRC by expanding the inspection program and revamping the process of identifying plants with long-standing safety problems. "However, changing NRC's culture of tolerating problems will not be easy," warned the GAO report.

The NRC presumes that plants are safe if they operate as designed. Because there are so many redundant ("defense-in-depth") safety systems built into plants' designs, the agency allows some to operate even when some of the systems are not working properly. The GAO audit report observes that not all plants are operating as designed especially because nuclear plant owners are pursuing cost-cutting strategies to stay competitive following the deregulation of the electric utility industry. As many as 37 nuclear sites are vulnerable to shutdown because their production costs are higher than projected prices in a more competitive market for electricity.

The GAO report faults the NRC for not effectively overseeing the plants that have problems; not getting licensees to fix deficiencies in a timely manner; relying too much on plant managers to fix problems; taking enforcement

competent management.

Unanswered Questions

On March 20, 1997, in Congressional testimony, Ann K. Coffou, a managing director of Giga Information Group, an IT advisory service, listed several of the Y2K software challenges facing the nuclear power industry:

1) "The first area of concern is the radiation exposure system. The program for the control of radiation exposure is called ALARA (As Low As Reasonably Achievable). Nuclear facility personnel wear dosimetry devices that measure the amount of whole body exposure that the employee receives while in the plant. These dosimetry devices are analyzed on a regular basis and the data (exposure amounts) are maintained on a computer system that controls personnel access. To meet Nuclear Regulatory Commission (NRC) and The Institute of Nuclear Power Operations (INPO) regulations the exposure amounts are monitored on a daily, weekly, monthly, quarterly, and yearly basis."

2) "Second, a 'Training Records Tracking System' computer controls access and actual work assignments to ensure that the Reactor Operators, Second Assistant/Auxiliary Operators, Maintenance Technicians, Radiation Protection Personnel, and Plant Management employees have completed the required initial and requalification training for their work assignments" [Ann K. Coffou, "Year 2000 Risks: What Are the Consequences of Technological Failure?" Testimony before the Subcommittee on Technology, Mar. 20, 1997].

Ms. Coffou raised the following related questions in her testimony:

- Will all plant personnel risk exceeding radiation exposure limits because the ALARA computer system is inoperative?
- Will unqualified employees be allowed access to the plant and work assignments because the Training Tracking computer system is inoperable?
- Will plant personnel be at risk because of expired respiratory protection qualifications?
- How will the Department of Energy (DOE) control, track, and inventory uranium 235/238, plutonium, tritium, or americium with Year 2000 problems?
- Will plant commitments be delayed or not completed on time because the commitment tracking computer system is inoperative?
- Will unqualified operations personnel be operating the reactor in the

training, qualification card sign off, or requalification training?

- Will personnel be wearing respirators with expired qualifications (e.g., annual physical examination, medical screening, annual radiation protection requalification training, mask fit process)?

- Will the maintenance schedules on plant hardware be carried out properly if computer-based records fail?

II. Nuclear Power Makes The World Go Round

Hooked On Fission

In 1995, approximately one-fifth (22 percent) of the nation's electricity was generated by 109 operating nuclear reactors in 32 states. US electric generating capability totaled approximately 706 gigawatts. Nuclear energy accounted for approximately 14 percent of this capability. There are currently 110 commercial nuclear power reactors licensed to operate in 32 states. Six states relied on nuclear power for more than 50 percent of their electricity. Thirteen additional states relied on nuclear power for 25 to 50 percent of their electricity [http://www.nrc.gov/NRC/reactors.html].

Here are some more facts for the United States and the rest of the world:

1. There are 110 licensed nuclear power plants generating 22% of the nation's electricity.

2. Three of the six major regions of the country depend on nuclear power for at least one-quarter of their electricity (see table below).

3. Six states--Connecticut, New Jersey, Maine, Vermont, South Carolina, and Illinois--rely on nuclear power for more than half their electricity.

4. More than 80 nuclear plants have gone on line since 1973 and they accounted for 40% of the increase in US electricity demand since then.

5. More than 30 nations rely on nuclear energy for a portion of their electricity supply. In 1996, the 442 nuclear power plants operating in the world generated one-sixth of the total electricity produced on the planet.

6. Western Europe depends on nuclear energy for about 42% of its electricity. Japan is at 35%. East Asia is at 17%.

Nuclear Power In the United States, 1996

	Number Of Nuclear	Percent Of Electricity

	Plants	Needs
New England	7	40
Middle Atlantic	21	36
Southeast	37	25
Midwest	31	22
Southwest	7	15
West Coast	5	14
United States	**108**	**22**

Source: Nuclear Energy Institute

They Light Up Our Lives

The Energy Information Administration of the US Department of Energy published the "Nuclear Power Generation and Fuel Cycle Report 1997" ["http://www.eia.doe.gov/fuelnuclear.html]. It includes a table showing the share of electricity generated by nuclear power plants all around the world.

1. In 1996, nuclear power plants supplied 23% of the electricity production for countries with nuclear units, and 17% of the total electricity generated worldwide.

2. In the United States, the share is 19.4% of all electricity generated and 21.9% of utility-generated electricity.

3. In Western Europe, the share from lowest to highest is Netherlands at 4.8%, the United Kingdom at 26%, Germany at 30.3%, Spain at 32.0%, Switzerland at 44.5%, Sweden at 52.4%, Belgium at 57.2%, and France at 77.4%.

4. In Eastern Europe, the share exceeds 40% for Hungary, the Slovak Republic, and Ukraine (home of Chernybol). Russia is only 13.1%.

5. In the Far East, Japan, Korea, and Taiwan get about one-third of their electricity from nuclear power reactors. China gets only 1.3%.

Editorial: NRC Too Passive

It seems to me that the NRC is a bit too passive about Y2K. It should get more pro-active. It is true that its mandate is to ensure the safety of the nuclear power industry, but it should also take some responsibility for ensuring the supply of electrical output from nuclear power plants. Rather

informal discussions with plant operators and vendors, the NRC should send staff inspectors to assess the situation on site. A monthly "Y2K Watch List" from the NRC would help the public and political leaders to assess the risks of brown outs or black outs in 2000 and to prepare for such disruptions if necessary. "Prepare for the worst. Hope for the best."

III. Old Nukes Are Good Nukes

Analog Is Better Than Digital

According to the January 24, 1998 issue of the ITAA's *Year 2000 Outlook*, an e-mail reporting service provided by the Information Technology Association of America, most nuclear reactors are so old that their plant safety and control systems are mostly based on analog, rather than digital technologies. Analog systems are much less likely to have any Y2K problems than digital ones. There have been no new plants built in the last 20 years. Indeed, a top official of the Nuclear Regulatory Commission (NRC) claims that more than 90% of safety systems in nuclear plants are analog ["Litigation Big Concern at California Y2K Summit," *Government Technology*, Feb. 19, 1998]

. On the other hand, there are plenty of digital systems in nuclear power plants that must function in 2000. For example, nukes are required by the NRC to maintain logging systems that record every event, allowing inspectors to reconstruct any mishap. Also federal regulations require a shutdown during major disruptions to local emergency response systems.

A Smooth Operator

I received an e-mail from an operator of a nuke, who was also a former training instructor. He wrote, "You are way off base with your concerns about the Y2K effects...We can operate these plants safely with all on-site computer systems susceptible to Y2K problems shutdown." He added in a follow-up message that the software used by plants is not especially complex and does not require a lot of "date math."

NRC Requires A Response

Last year, I criticized the NRC for sending a letter to all nuclear power plant operators alerting them to Y2K, but not requiring any response from them about the problem. That is about to change. The NRC will soon issue a letter to require that they provide this information. The NRC will require a written response within 90 days of receipt of the letter describing the plant operator's Y2K readiness program. July 1, 1999 is the deadline for written confirmation that the plant is Y2K ready. The NRC is especially concerned about:

- scheduling of maintenance and technical specification surveillance requirement,
- use and application of programmable logic controllers and other commercial off-the-shelf software and hardware,
- operation of process control systems,

- collection of operating and post-accident plant parameter data

Clearly, the NRC now wants to know more about the digital systems that are important to running nuclear power plants in 2000. I have two questions: 1) If a nuclear power plant operator does not provide written confirmation that the plant is ready for the year 2000 by July 1, 1999, will the NRC shut it down? 2) If it does shut down some plants, will we be ready to deal with the disruption to the supply of electricity?

IV. Fossil-Fuel Electricity: Winter Wonder Land

Fossil-Fuel Electricity At Risk Too?

The July 5, 1996 issue of *The Wall Street Journal* included a story about the Year 2000 efforts of Con Ed, New York City's electric utility. Company officials started to work on Y2K in early 1995, when they first became aware that the date-problem was everywhere, including payroll, pension plans, and purchasing. All told, 105 systems running 8,100 programs needed to be fixed. Con Ed's Y2K man told the *Journal's* man that even in the worst-case scenario there is no danger the lights will go out in New York City: "Pumping out megawatts is not date-dependent." The *Journal's* man ended the store with some lingering concerns:

> And yet, isn't everybody connected to everybody? Even if Con Ed becomes thoroughly date-compliant, what about suppliers? What about the coal mines, oil dealers and railroads of the world, and everyone on whom they, in turn, depend? What about all the date-dependent links, switches and satellites between them?

Hopefully, the Con Ed folks and other fossil-fuel electric power plants won't forget to check that the folks who provide the coal and oil they must have will be Y2K compliant. The mess in the Union Pacific railroad system (Chapter 3) should heighten the electric utility industry's concerns about possible weak links in their supply chain. They should also check all their exposure to Y2K problems with embedded microcomputer systems.

Blackout Committee

In November 1997, the North American Electric Reliability Council (NERC) released its "1997/98 WINTER ASSESSMENT: Reliability of Bulk Electricity Supply in North America." NERC was formed in 1968 in the aftermath of the November 9, 1965 Blackout that affected the Northeastern United States and Ontario, Canada. NERC's mission is to promote the reliability of the electricity supply for North America. "In short, NERC helps electric utilities and other electricity suppliers work together to keep the lights on," according to the Council's web site [http://www.nerc.com/].

If The Trains Don't Run, The Juice Won't

The latest NERC assessment includes a discussion of how the Union Pacific mess [Chapter 3] upset the electric power industry's preparations for the 1997/98 winter heating season. This case study vividly shows how Y2K

computer systems that manage our railroad transportation system are not Y2K-compliant:

> Operators of coal-fired generation dependent on rail deliveries of western coal are concerned about the potential impacts of recent slowdowns in rail deliveries. The Southern Pacific and Union Pacific railroads merger, together with safety-imposed restrictions, resulted in the slowdowns of rail traffic. Deliveries from Wyoming's Powder River Basin are particularly impacted.
>
> Rail delivery problems of western coal have resulted in reduced on-site coal supplies at a number of plants. Reduced stockpiles increase the risk of restricted generation output from coal-fired plants. Severe winter storms could result in additional delays in deliveries, further compounding the problem. Already, some plants have reduced output to conserve coal. Where possible, some generating plants have switched to other fuels or utilities, or are purchasing alternative coal-fired generation replacement capacity. This switch in fuels has resulted in increased demand for gas and oil. So far, adequate supplies of other fossil fuels exist to replace the impacted coal-fired generation. However, importing replacement generating resources may alter normal power flow patterns, possibly resulting in unusual transmission loading problems.
>
> Utilities are analyzing their coal inventory projections to assess their individual situations and identify possible solutions to problems that may be anticipated. The Surface Transportation Board of the U.S. Department of Transportation held a public hearing on the subject in late October. The railroads are promising to correct the slowdown by year's end. Reliability should not be adversely affected if the coal delivery problems are corrected before the winter peak. However, if the delivery problems persist throughout the winter, operable generating capacity margins could fall to **dangerously low levels** in some areas. [Emphasis added.]

At a meeting with federal regulators, i.e., the Surface Transportation Board, on October 27, 1997, electric utility managers confirmed that they were entering the winter heating season with dangerously low coal stockpiles due to the western railroad crisis. Wisconsin Electric recently announced reduced power production because of delays in the delivery of coal due to the unavailability of railroad cars.

Surge Protection

The chart is from the NERC report. It shows the "nonsimultaneous transfer capabilities" of the North American electric power grid. It represents the ability of the transmission network to transfer electricity from one area to another for a single demand and generation pattern. There are limits to how much electricity can be moved around from surplus generating sectors to those that suffer a deficit. Historically, power demands in deficit sectors could be met by borrowing surplus energy from other suppliers on the grid. In two years, this may not be an option.

Chapter 4

TRANSPORTATION

I. Union Pacific Turmoil: Opening Act for Y2K?

Light At The End Of The Y2K Tunnel

The turmoil in Union Pacific's railroad system during 1997 is a very useful example of the sort of disruptions that may become widespread after January 1, 2000. Some old-timers said the situation was the biggest railroading crisis in decades. According to the October 13, 1997 issue of The Wall Street Journal, "The nation's largest railroad has lost its ability to accurately track the movements of hundreds of freight cars." The problem started when Union Pacific acquired Southern Pacific Rail Corp. last year. Each company had its own computer system and dispatching method. Integrating the two has been a nightmare according to a Union Pacific spokesman.

Early Y2K Effort Derailed?

This problem disrupted business for many companies as they prepared for the usual seasonal rebound in sales during the final two months of 1997. It could be much worse in the year 2000 if Union Pacific is distracted from addressing its Y2K problem by the current mess.

Ironically, the company was among the first to recognize and start working on the Y2K problem. According to the January 1, 1996 issue of Datamation, the company began experiencing Y2K problems in 1995 with software programs that handle five-year car scheduling, budgeting, and forecasting tasks. It was an early wake-up call. A company analysis revealed that 82.5% of the programs had date-related fields. The Y2K project manager estimated that his team had to fix 7,000 COBOL programs totaling about 12 million lines of executable code. He estimated the job would require 200,000 hours or 100 staff years ["Union Pacific Stays on Track for 2000," *Datamation*, Jan. 1, 1996].

State-Of-The-Art In Theory

By its own description, Union Pacific is "one of North America's leading transportation, computer technology, and logistics companies, with operations in all 50 states of the United States, Canada, and Mexico." Union Pacific Technologies (UPT) was founded in 1987 as the technical arm of the

systems and services throughout the corporation. The corporation's Web site boasts that UPT's Transportation Control System (TCS) is the premier freight car management system in the rail industry. "With TCS, Union Pacific has been able to centralize train dispatching and customer service, since it remains the only system with proven capability to schedule shipments from origin to destination--all firsts in railroading."

UPT has sold TCS to others to improve Union Pacific's "capability to deliver reliable, seamless service" when it involves other transportation companies. Several US railroads now use TCS. UPT's systems helped to modernize the National Railways of Mexico. According to the corporate Web site, "UPT has extensive experience in railroad computerization. Personnel currently associated with UPT were responsible for the original development of the Transportation Control System (TCS) on the Missouri Pacific Railroad and its subsequent implementation on the Union Pacific and Western Pacific Railroads after the 1982 merger. TCS is recognized as the most comprehensive freight car management system in the railroad industry today." [http://www.unionpacific.com/overview/technolo.htm]

Over 2,000 man-years have been spent developing a highly integrated system that controls all aspects of railroad operation, including:

1. Billing and rating
2. Car and train movement
3. Empty car distribution
4. Freight car scheduling
5. Yard classification and inventory control
6. Car cycle inquiries
7. Intermodal system
8. Locomotive scheduling and maintenance
9. Crew dispatching
10. Work order management
11. Interline shipment monitoring
    [http://www.up.com/upt/upttrans.htm]

State-Of-The-Art In Crisis

In an October 1, 1997 press release, Union Pacific announced that the Railroad division filed a Service Recovery Plan with the Surface Transportation Board ["Service Recovery Plan Filed"]. It presented a plan that should return the Central Corridor--roughly stretching from Chicago to Oakland--back to "acceptable levels" within 30 days. Service in the Southern Corridor, running from Memphis and New Orleans through Texas and into southern California, should be back to normal within 60-90 days. "Once this occurs, UP will begin to restore services that were temporarily withdrawn." The press release also claims that the schedule for implementing the computerized TCS on the former Southern Pacific "has been advanced by several months and will be entirely completed by March 1, 1998."

Editorial

This entire sorry mess should give you a hint of what sort of disruptions could occur in transportation, shipping, manufacturing, retailing, and power generation in plausible worst-case scenarios. In Washington, the policy makers are asleep at the switch. Just the way UP has lost track of many of its freight cars, we could lose track of vital components of our economy. Many companies are so busy acquiring and integrating with other companies that they are derailing the Y2K efforts of their IT departments.

II. FAA: On A Wing And A Prayer

Canceled

Y2K optimists tell me that the Year 2000 Problem is so well recognized--and so catastrophic if it is not fixed--that it will be fixed. I am also an optimist: I agree that Y2K will be fixed; it just won't be fixed 100% everywhere on the Planet Earth. There will be some computer systems that won't be fixed in time, and they might be important enough to disrupt the lives of all of us.

For example, I am concerned about disruptions to the global air transport system. There are Y2K problems at airports around the world, including those that are regulated by the US Federal Aviation Administration (FAA). I'm picking on the FAA because I have found documents on the Internet that lead me to conclude that the FAA might not be ready in time.

Of course, if the FAA has major Y2K problems at US airports in January 2000, the odds are high that so will lots of other airports run by airline regulators overseas. If global air traffic is seriously curtailed in 2000, this would be very depressing for global business activity, not just the travel industry. Even if the airline industry announces that most flights will depart as scheduled, the public's concerns about safety could lead to significant cancellations of reservations, especially to Christmas 1999 vacation destinations. Air freight, package, and mail delivery services could also be seriously disrupted and impaired.

Will It Fly?

The Office of Management and Budget is especially concerned about the lack of Y2K progress at the Department of Transportation (DOT). The Federal Aviation Administration (FAA) in the DOT may be their biggest concern. The Year 2000 effort is decentralized within the FAA, which first established its Y2K Steering Committee in July 1996. The committee's members represent the FAA's seven lines of business (LOBs). The committee is chaired by the director of Information Technology. The director issued a "Guidance Document for Year 2000 Date Conversion" during September 1996. An April 1997 updated version is available on Internet. [http://www.faa.gov/ait/year2000/y2kguidefinal.htm]

Each LOB is responsible for the Year 2000 conversion of its own systems.

inventory of systems, prioritizing the conversion of the systems based on the criticality of each system to the mission of the LOB, and developing and implementing a conversion plan.

Here are some less-than-reassuring excerpts from the Guidance Document about the FAA's year 2000 problem:

1) "Much has been written about the problems facing business applications that compute such things as ages, expiration dates, and due dates, by subtracting one year from another. There is much less information available about the impact on more sophisticated systems, such as **radar processors, communications processors, and satellite systems."** [Emphasis added.]

2) "The systems affected are primarily legacy systems, although all systems should be checked to ensure they correctly handle a four-digit year field. The types of systems include mainframe, client/server, workstations, distributed systems, telecommunications systems like PBXs, networks, possibly **radar processors, and communication processors."** [Emphasis added.]

3) "The FAA does not have direct control over updating of commercial application software, commercial off-the-shelf items, or non-developmental items on which many critical systems depend. Many FAA systems depend on data supplied by other systems running on different platforms. Many FAA systems receive data from and provide data to systems external to the FAA. In all these cases, dates need to be changed at the same time and in the same manner, or bridges need to be built to handle conversion of dates from one format to another. In many cases the developers have long since retired or been promoted and the current owners do not know what all the components are or what interfaces are."

4) "The FAA has been downsizing and many of the senior information systems people who developed the software have retired. Even if funds are available to pay for contract programming support, this support is going to become increasingly difficult to find as the deadline approaches."

5) "There is concern that some of the products that the FAA is using will not be upgraded to be Year 2000 compliant. In recent years, a number of large companies have bought out their competitors and continued maintaining their competitors' products even though they perform the same function as their own products. It is not clear that these vendors are going to make all the products Year 2000 compliant. If they drop support on some products, anyone using the abandoned products will need to upgrade or convert to another product. There is also a concern that some vendors will simply go out of business rather than incur the cost of upgrading their products to Year 2000 compliance."

Triage

The FAA document raises an interesting problem for everyone working on Y2K: "The battlefield term 'triage' has come into frequent use in discussing Year 2000 planning. Impact assessment should identify which systems are mission critical and must be converted in order for the FAA to keep airplanes flying safely." In other words, most organizations are dependent on decisions made by their outside vendors about which IT products and services they consider to be "mission critical." Vendors may kill some applications that are critical to the survival of their customers.

Embedded Systems

In an April 3, 1997, response to a Congressional inquiry on embedded microchips, the FAA noted that they have "no formal plan to assess vulnerability of microchips embedded in airborne electronic equipment." However, both Douglas Airplane Company and Boeing Commercial Airplane Company are aware of the problem and are contacting their suppliers. Autopilot systems do not use a year function [http://www.faa.gov/ait/year2000/AppA1.htm].

Bungled Modernization

The US General Accounting Office reports that the FAA initiated an ambitious air traffic control (ATC) modernization program in 1981. "Over the past 15 years, the modernization program has experienced cost overruns, schedule delays, and performance shortfalls of large proportions--particularly in the $7.6 billion former centerpiece. " The good news is that the FAA acquired a functioning interim replacement for its "outage-plagued" system that processes data into radar screens. Nevertheless, the FAA still lacks a modernization blueprint and is poorly managed according to the GAO. [In February 1997, GAO published a Quick Reference Guide that summarizes the status of the 20 high-risk government program areas. See also the GAO's October 1996 "Air Traffic Control: Good Progress on Interim Replacement for Outage-Plagued System, but Risks can be Further Reduced".]

III. Y2K Drill At The FAA

The System Crashed

The November 17, 1997 issue of *Federal Computer Week* includes an article titled "FAA's Y2K tools not up to speed." According to the article,

> The Federal Aviation Administration, faced with a time and date software problem that threatened this month to bring down one of its air traffic management systems, was forced to manually sift through more than a million lines of code after software tools designed to find code containing times and dates failed to find everything that needed to be fixed.

In early 1997, Hewlett-Packard Co. alerted the FAA about a problem with the Enhanced Traffic Management System (ETMS). *This system displays the locations of planes on a national and local scale and alerts air traffic controllers when traffic exceeds a specified limit.* The FAA had to upgrade

unable to process times and dates after 14:49 Greenwich Mean Time on November 2. Hewlett-Packard, the ETMS prime vendor, delivered a software upgrade in April 1997 that fixed the system's clock and timing services.

However, when the FAA ran tests using the patch, the system crashed. The problem was with the software code that the agency had written during the past several years. The FAA used Year 2000 software packages to try to find the lines of code containing times and dates in ETMS. "When we ran [commercial] Year 2000 code-checking software, we discovered that these [references] sometimes didn't show up," said Bob Voss, the integrated product team leader for air traffic management in air traffic systems development at the FAA. "Just running date- and time-checking software isn't enough; you have to do hand analysis of the code."

Close Call

As a result, the FAA had more than 100 people working at all the sites, coordinated out of Boston, manually examine the system's 1.5 million lines of code. They found 150,000 lines of code in ETMS that needed to be rewritten. The software baseline was then rebuilt, tested, and deployed. On November 2, the FAA shut down and successfully restarted 450 ETMS workstations at more than 80 sites for a five-hour period. Close call!

Editorial: From Auto- To Manual-Pilot

The FAA's close encounter ("of the fourth kind") illustrates the daunting challenges faced by those fixing computer systems so that they can properly process dates containing the Year 2000. It shows the serious limitations of software packages designed to identify lines of code containing times and dates. It shows that there are no "silver bullet" solutions. To ensure that all systems work together right, they must be tested each time a change is made anywhere in the network.

IV. NYT Confirms FAA At Risk

Running Out Of Spare Parts

Since last summer, I've put the Y2K spotlight on several US government agencies, especially the Federal Aviation Administration (FAA). Now *The New York Times* has weighed in with an even more alarming Y2K story about the FAA than anything I've written or seen elsewhere. In the January 12, 1998 issue, Matthew L. Wald reports that IBM informed Lockheed Martin Air Traffic Management, an FAA contractor, in an October 1997 letter that about 40 IBM 3083 mainframe computers at 20 Air Route Traffic Control Centers won't work starting January 1, 2000.

These computers are used to collect and process all the radar systems and pass the information to other computers that drive the screens monitored by flight controllers. "The 3083s also receive signals from each plane stating its identity, type of equipment, altitude and destination and helps tag each radar blip with the appropriate data." I guess this means that these computers are

IBM discontinued the 3083 models about 10 years ago and has warned since June 1996 that spare parts are getting scarce. The date functions are programmed in machine language-strings of 0s and 1s-rather than Cobol or Fortran. IBM claims that the computers can't be fixed before 2000. The FAA is ignoring IBM's advice and trying to debug the computers within 90 days with the help of a retired IBM programmer and a team of software experts.

IBM Says Brits Won't Fly Too

In mid-January, IBM also warned Britain's Civil Aviation Authority that their computers would most likely also fail. According to the January 22, 1998 *Electronic Telegraph*:

> The core of British air traffic control systems, operated by the Civil Aviation Authority, use model 4381 mainframe computers which are not ready for the century change at the end of 1999, according to their maker, IBM. Experts and academics warned last week that time to fix the bug safely has run out. British Airways, which is investing millions to correct its own systems, said the revelation that it cannot depend on British air traffic control systems means it cannot guarantee all flights will take off at the end of next year.

An airline spokesman observed, "We could go back to the old method of air traffic control by radio and paper maps, but it will seriously limit the volume of traffic." (I just love that British sense of humor.)

According to a CAA spokesman, the authority expects to be ready for the year 2000 in March 1999. A computer studies lecturer at Cambridge University warns that mistakes made in fixing Y2K on more than 200 systems that constitute the British and European air transport network are bound to cause disruptions. He predicts that air traffic could be cut in half for many months.

Home For The Holidays

Home For The Holidays. I suppose many British residents will stay home for the holidays at the end of 1999. In the United States, the Securities Industries Association, a powerful trade group, backed a proposal by some banking officials to declare December 31, 1999, a trading holiday to help firms prepare for the change. The Federal Reserve Board nixed the idea: "Bank resources would be better spent preparing for the year 2000 changeover rather than addressing the operating, financial, legal and other consequences that would flow from a date-change holiday." The way I see things, many of us could be on extended holiday for at least the first few weeks of 2000.

Editorial

IBM shows the Y2K status of every computer system it has ever built at http://wwwyr2k.raleigh.I.B.M..com. IBM should also post a list of all of its customers who are currently still using computers that IBM believes will not be ready for 2000.

V. Y2K "No Fly Zones"

Y2K Boycott

The December 14 issue of *The Mail* of London reports that major world airlines are planning to cancel hundreds of flights on January 1, 2000, due to fears that some countries' air traffic control systems may fail. These countries could become "no fly zones" for weeks, or possibly months until they can certify that their airports are Y2K compliant. Especially risky are airports in Africa, Latin America, and the former Soviet Union. The newspaper quoted an American Airlines spokesman as saying, "With only two years to go, I don't think it will be any surprise if we steer clear of a few countries until it is safe."

Special Problems

The International Air Transport Association (IATA), the world airlines trade association, observes that Y2K poses some special problems for the global airline industry:

1) Major use of automated systems: The airlines have always been at the forefront of using computers to support their business functions, starting with the introduction of the first high-performance reservations systems in the 1960s. Since then the application of IT has pervaded every area of the company, providing essential support to the entire business, ensuring high levels of customer service and providing the means for introducing new strategic initiatives.

2) Highly integrated industry: To function effectively the airlines rely heavily on the exchange of information to support their business processes. The industry has much higher interaction between individual companies' systems (e.g., for reservations, check-in, baggage, etc.) than most other sectors. This places an additional level of complexity on efforts to address the year 2000 problem and means that a key component will be ensuring that all the standards for interchanging such data are examined to determine what action is required with regard to dates.

3) Worldwide, round-the-clock operations: By the nature of the industry, critical airline systems need to be operational 24 hours a day, every day of the year. Even short interruptions to system availability can cause major inconvenience to customers; longer "outages" would have serious business implications.

4) High-profile: Airlines are generally considered as "high-profile" companies which receive considerably more interest and media attention than some other business sectors. Speculation on the impact of the year 2000 on the airlines is much more "sensational" than for other industries.

Secret Y2K Directory

The IATA has completed an audit of millennium readiness of 400 airline industry suppliers. It is posted on the trade group's Web site, but can be seen only with a passcode. I am told that the directory informs airline companies of the year 2000 status of on-board systems manufacturers, airports, and air

those organizations who don't yet have things in hand," group industrial development manager Minya Veljanovic told *Computer Weekly*. Why not open the directory to the public so we can all put pressure on Y2K laggards?

Public Y2K Survey

The IATA surveyed 44 airlines about Y2K. The responses were formulated into a report which was finalized at the second meeting of the IATA Year 2000 Group meeting on March 18, 1997, in Geneva [http://www.iata.org/y2k/survey.htm]. The first question was: "What best represents the status of Year 2000 compliance for hardware and system software in your airline (mark one only)." Here are the responses:

Status	Number Of Airlines	Percent Of Airlines
About 50% compliant	17	39
About 25% compliant	14	32
Not Compliant	6	14
Fully Compliant	5	11
Don't Know	2	5

The 1998-99 Problem

Nearly one-third of respondents had "no vendor schedules or scarcely any for most" noncompliant hardware and software. One-fourth reported that vendors of "packaged" products will not provide year 2000-compliant versions and nearly 40% said that they would have to replace packaged IT products because they are not ready for the year 2000.

When asked when Y2K is likely to have a critical effect on the respondent's airline, 68% indicated that problems would start in 1998-99. Asked when they expect to be fully compliant, 28% said by the end of 1998, 32% said during the first half of 1999, and 25% said during the second half of 1999.

Fear Of Flying

According to Reuters, KLM, the Dutch airline said on November 7, 1997 it may ground some of its aircraft on January 1, 2000 if certain routes turn out to be unsafe due to millennium bugs. "If we have the feeling by the year 2000 that we don't control the whole chain of transport...then we won't fly that route,'" spokesman Hugo Baas told Reuters. "Regarding safety, there's no risk we are taking. It could result in aircraft being grounded" ["KLM may ground some aircraft on Jan 1, 2000". Another account of the same story, in *De Telegraaf*, claims that Mr. Bass said that all KLM flights might be canceled if the extensive investigation currently underway reveals that some computers will be unable to cope with the millennium change.]

All Of Society Could Be Affected"

KLM is reportedly making good progress in fixing its Y2K impaired systems. But due to the complex web of interlinking computer systems, such as air traffic control and radar systems, the carrier has to be sure that there are no weak links. KLM sees itself as a leader in the field of millennium compliance and has adopted an open-door policy. It seeks to share expertise it has already gleaned with competitors. "We are not talking about an airline problem, or an industry problem; all of society could be affected,'" said Baas.

Flying Bugs

The Guardian (January 16, 1998) reports that "Lloyd's insurers said they would withdraw cover for airlines that did not adapt their systems before 2000. The fear is that on-board computer systems could fail or go awry while in flight, leading to a disaster."

By the end of January 1998, all large airlines will receive a questionnaire from Lloyd's. Underwriters would draft an exclusion clause that would deny cover to insured clients "if their situation was unsatisfactory." London aviation insurers also cover regulatory authorities--who will also get the questionnaire--including the Civil Aviation Authority in the United Kingdom and the Federal Aviation Administration in the United States.

Sabre Rattling

On October 16, Sabre Group Holdings Inc., a company which distributes travel and travel-related services electronically and provides information technology solutions for the travel and transportation industry, announced it will spend $40 million more in 1998 than previously planned on one-time costs to bring its system and those of its subscribers into compliance for the Year 2000 computer bug.

In late August of this year, US Airways Group Inc. moved to outsource its information-technology operations, shifting to Sabre a host of complex technical chores. The tentative deal called for Sabre to support US Airways' internal reservation system. As goes Sabre on January 1, 2000, so goes US Airways.

VI. The Global Positioning System

Where In The World Is...?

Before January 1, 2000 comes August 21, 1999. The US Naval Observatory warns that some Global Position System (GPS) "receivers may display inaccurate date information [and] some may also calculate incorrect navigation solutions" after midnight August 21, 1999. The world's aircraft

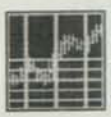
1999 Problem. Shipping and trucking software may also need to be fixed. [http://tycho.usno.navy.mil/gps_week.html]

According to Mitre Corporation, "Global Position System is a satellite positioning system developed by the Department of Defense that provides precise position, velocity, and time information to users. There are 24 satellites in six orbital planes with four satellites per plane. They orbit the earth every 12 hours at a height of approximately 20,000 km, and transmit ranging signals modulated with satellite identification and location information. A user's receiver determines its position by determining the pseudorange to four or more satellites. A pseudorange is the range to a satellite plus the user's clock offset from GPS time. The pseudoranges are used to determine the four unknowns of the user's 3-D position and clock offset [Center for Advanced Aviation System Development].

So what's the problem? The GPS Week Number count began at midnight on January 5, 1980. Since that time, the count has been incremented by one each week, and broadcast as part of the GPS message. The GPS Week Number field is modulo 1,024. This means that at the completion of week 1,023, the GPS week number will rollover to 0 on midnight of the evening of August 21, 1999.

The US Navy warns, "Once the rollover has occurred, it is the responsibility of the user (i.e., user of equipment or software) to account for the previous 1,024 weeks. Depending upon the manufacturer of your GPS receiver, you may or may not be affected by the GPS Week Number Rollover on August 22, 1999. Contact the manufacturer of your GPS receiver to determine if you will be affected by the GPS week number rollover." Fortunately, planes and ships that use GPS to navigate around the globe are unlikely to be driven off course: GPS is rarely used as the sole means of navigation.

Chapter 5



BANKING, CREDIT & FINANCE

I. The Fed Prepares For The Worst

Natural Disasters

In his Y2K testimony on July 30, 1997 before the Subcommittee on Financial Services and Technology of the US Senate's Committee on Banking, Housing, and Urban Affairs, Federal Reserve Board Governor Edward W. Kelly, Jr. said, "as a result of our experience in responding to problems arising from such diverse events as earthquakes, fires, storms, and power outages, as well as liquidity problems in institutions, we expect to be well positioned to deal with problems in the financial sector that might arise as a result of CDC [Century Date Change]." [http://www.bog.frb.fed.us/BOARDDOCS/TESTIMONY/19970730.htm]. He should know: He is the man in charge of the Y2K effort at the Fed.

Last Resort

The Fed is prepared to function as the data processing vendor of last resort for financial institutions that are "unable to access their own systems." Mr. Kelley added that the Fed can also operate paper-based payment systems should there be problems with the electronic payment system. The Fed would join other banking agencies in the takeover of any banks that become insolvent as a result of Y2K.

Mr. Kelley threatened "possible use of enforcement actions as appropriate" against banks that don't move quickly enough to become Y2K compliant. He told the Congressional committee that large banks are moving faster than many small ones that have underestimated the efforts necessary to ensure Y2K compliance. The Fed is working with the Bank for International Settlements and the Group of Ten central banks on global banking Y2K issues. (See below.)

The Century Date Change project was initiated in the Federal Reserve System in late 1995, according to Mr. Kelley. The Fed is setting up an isolated mainframe data processing center for "testing our payments system applications." Testing with banks is targeted to begin June 1998.

By the way, Fed Chairman Alan Greenspan was invited to testify before the Congressional committee. Mr. Kelley went instead. Mr. Greenspan will retire from the Fed during June 2000.

"Disastrous Consequences"

On February 11, 1998, in a speech about Y2K before the Florida International Bankers Association and the Miami Bond Club, Federal Reserve Board Governor Edward W. Kelley, Jr. said the "stakes are enormous, actually, nothing less than the preservation of a safe and sound

He observed that it has taken an enormous effort just to make the banking industry's senior managers aware of "the seriousness and magnitude of the problem...." He noted that the press has had stories about "the possibility of catastrophic failures in such vital systems as air traffic control, telecommunications, and the utilities that make up our power grid." Rather than downplaying these risks, he cautioned that they could cause major disruptions in the financial system.

Within the banking system, Mr. Kelley worries about the "generation of misinformation and errors that would be labor intensive, slow and costly to identify and correct after the fact." Bad and corrupted data could be a nightmare for bankers, who could no longer trust their 1) general ledger, 2) funding position, 3) account balances of depositors and trading customers. This would have "disastrous consequences."

Mission Critical Assessment Is Critically Flawed!

In May, the Fed along with other bank regulators established two benchmark dates:

1. September 30, 1997. Banks were expected to have completed a thorough inventory of their mission critical applications and established a comprehensive plan and priorities for their renovation. Most banks have done so according to Mr. Kelley. This is the easy part.

2. December 31, 1998. Mission critical systems should be largely renovated with testing well under way so that the balance of testing and implementation could be accomplished in 1999. This is the hard part. The Chief Information Officer of a major regional bank recently alerted me to a serious flaw in the Fed's approach. The bank regulators never defined "mission critical." My concerned source wonders why the standard "disaster recovery" requirements have not been imposed on banks. Instead, each bank is left with too much discretion to determine which systems are mission critical.

Regression Testing

Mr. Kelley well understands the complexity of the Y2K challenge. He explains that testing is both crucial and time consuming. Each application must first be tested in isolation, then with related ones. System testing is then followed by regression testing, which checks each variable and all combinations of variables relied on by the various systems to see if any cause a problem. Then every internal application and system must be tested externally with each and every counterparty first on a one-on-one basis, then among multiple counterparties. There are no shortcuts!

"Risk Of Contagion"

Mr. Kelley told his audience that he is very concerned about the "risk of contagion." This can be avoided if recipients of misinformation identify it as such and reject it, according to the Fed's Y2K man. He said this situation is readily manageable, "but managed it must be." I think that this is a much

the misinformation that Y2K is bound to generate may be an impossible task, in my opinion.

Mr. Kelley warns that "operating outages" of information systems are possible. Such "crashes must be prevented from spreading." He also notes that "operating centers can not fall back to an earlier version of a software package because the earlier version itself may not have been readied for Year 2000." Another weak link in the Y2K remediation chain for banks and everyone else is vendors, who must provide compliant versions of programs. If they don't do so promptly, testing cannot proceed properly. Finally, Mr. Kelley is worried about the lack of progress among many foreign banks and the distractions caused by the introduction of the euro and financial deregulation in Japan.

II. Greenspan Sees "Inevitable Difficulties"

His First Y2K Q&A

During the Q&A portion of his February 25, 1998 Congressional testimony, Fed Chairman Alan Greenspan for the first time in public responded to questions about Y2K posed by Senator Bob Bennett (R-Utah). His answers showed that Mr. Greenspan, who did some computer programming in his younger days, is very aware of the risks. Yet, at the same time, he seems to be shockingly detached, perhaps because he will retire during June 2000.

Also, Fed Governor Edward W. Kelley, Jr. is the one responsible for managing Y2K issues at the Fed, and it is possible that the chairman prefers not to meddle. Too bad, because this problem could push the global economy into a recession and clearly requires the involvement of our top economic policy leaders, especially the highly respected Fed Chairman.

"Mea Culpa"

Mr. Greenspan's verbatim, unedited comments on Y2K are reproduced in the following table. He starts off by admitting that he contributed to the problem some 30 years ago, when he was a computer programmer. He clearly understands why it is so difficult to debug software programs for the Y2K virus. He notes how difficult it is to reconstruct the logic of old programs. He recognizes the difficulty of fixing a network of interacting software systems. He is well aware that even a very small number of non-compliers can cause "a very large problem."

Fedspeak

In his brief comments, he said that there is so much uncertainty about the actual impact of Y2K that we must "employ very substantial amount of resources to find means to reduce the probability of the inevitable difficulties

very difficult global recession is at least 40%.

Mr. Greenspan isn't willing to be as precise about what he means by "inevitable difficulties." He claims that there is no way to assess the economic impact of "breakdowns that may occur" or to estimate how long it will take to fix the problems. In other words, I guess, a deep and long recession is a plausible Y2K scenario, but the Fed with all its economists and resources has no way to anticipate what might happen!

Mr. Greenspan's Fedspeak has served him well over the years. In managing monetary policy, he has wisely kept his options open with statements that have as many meanings as Biblical scripture. It is time for the Fed Chairman to state clearly and unambiguously that Y2K could cause a very severe economic recession and that all national policy makers must work much harder to prepare for it so as to minimize its depth and duration as much as possible at this late date.

Federal Reserve Chairman Alan Greenspan
Selected Comments on Y2K
during Q&A of his Feb. 24, 1998 Congressional Testimony

I'll do a mea culpa, too. I'm one of the culprits who created this problem. I used to write those programs back in the '60s and '70s and was so proud of the fact that I was able to squeeze a few elements of space out of my program by not having to put 1-9 before the year. And back then it was very important. We used to spend a lot of time running through various mathematical exercises before we started to write our programs so that they could be very clearly delimited with respect to space and the use of capacity.

It never entered our minds that those programs would have lasted more than a few years. And as a consequence, they are very poorly documented. If I were to go back and look at some of the programs I wrote 30 years ago, I mean, I would have one terribly difficult time working my way through step by step. And to try to infer how one reads a program, when there are lots of alternate ways of doing things and all you've got is the code in front of you, is not simple. It, therefore, is a very difficult problem to get your hands around. We do know that if every individual institution were separate and not interrelated, we wouldn't care all that much.

The trouble is that there is a perversity of incentive in this type of problem in that you can be extremely scrupulous in going through every single line of code in all of your computer operations, make all the adjustments that are required, and get essentially a system, whether you are a bank or an industrial corporation, and say we have solved the 2000 problem, and then find that when the date arrives, all of the interconnects that are now built in start to break down. So, it's not an issue of getting--of being worried that there is a large number of non-compliers who haven't gone through the system....

We, nonetheless, have such a large, high degree of uncertainty about what actually is out there that we cannot but employ very substantial amount of resources to find means to reduce the probability of the inevitable difficulties that are going to emerge. In measuring the impact on the economy, we first try to evaluate the amount of resources which are being diverted from otherwise productive endeavors, especially in information processing, which must go to the

year 2000 problem, which means the productivity must be reduced.

People are doing things which are no longer productive and merely a sort of maintenance, and so that you get output in a sense but it's not increased productivity. It's not increased real standards of living. In that sense, we can measure the degree of these several hundred billion dollars which are involved in trying to resolve the year 2000 problem.

The difficulty is that we don't know what part of that several hundred billion dollars would have been spent anyway. A lot of it is on new equipment merely because the simplest way to resolve a problem which seems to be unsolvable with respect to programs is just rip out the whole business and stick in something new.

And so, it's hard to know which part of this is real lost effort. A good part of it is. How much we don't know. So, there is automatically before we reach the year 2000, an economic loss in the sense of the diversion of resources to non-productive endeavors. We do not know or cannot really realistically make an evaluation of what the economic impact is as a consequence of the breakdowns that may occur. We do not know the size. We do not know the contagion and interaction within the system. And we do not know how rapidly we can resolve the problem. I mean, for example, one of the things that we at the Federal Reserve are very acutely aware of is there is a two-pronged issue here. One, try to prevent the problem from happening. And two, what do you do when it happens?

I mean, for example, we had a very major bank in the city of New York a number of years ago, whose computer went out. And the New York Federal Reserve Bank had to lend them over $20 billion overnight. Now, if we weren't there, I can tell you that the system would have been in very serious difficulty. So, part of what we are trying to do is figure out what we can do to assuage whatever problems might arise. And that it's a difficult exercise because there is such a huge element of uncertainty in the nature of the problem itself. But we are trying to come to grips with it as best we can....

III. G10 Bank Officials Warn Of Global Chaos

Credit Crunch

The G10 Basel Committee on Banking Supervision sent a wake-up call to the global banking industry on September 8, 1997 in a memorandum titled "The Year 2000: A Challenge for Financial Institutions and Bank Supervisors." It advises bankers to move decisively and immediately to become compliant or face almost certain business death [http://www.bis.org/publ/bcbs31.htm].

It also warns bankers to closely examine the compliance of their loan customers. In other words, don't lend to businesses that might fail in 2000. This is good advice with potentially very bad economic consequences: Borrowers will certainly fail before that date if they are cut off from bank financing by their loan officers!

Dire Consequences

The Basel Committee observes that if a bank fails to fix the Y2K problem:

> Many calculations will either indicate that transactions have been open for nearly 100 years or produce negative numbers. New files may not be recognized as the most recent data, causing current files to be erased or archived as old data. These and other logic issues have the potential for causing problems for debt collection, aging of information, calculating interest rates, etc., and could significantly disrupt normal business operations. Also, when dates are compared, customer billings may change from charges to refunds and vice versa. Even building systems such as elevators or climate control systems may be affected because of embedded logic to facilitate maintenance and operations.

Complicating the problem for global banks is that they must also program their computer systems to deal with a brand new currency, the Euro. The Committee warns banks against taking on any new projects like merging with or acquiring a noncompliant bank. On the other hand, noncompliant banks are advised to consider finding a compliant buyer as "an approach to contingency planning."

Systematic Risk

Compliant banks must develop contingency plans in the event of "systematic issues," a.k.a., the domino effect. Weak links in the payment chains could "rapidly affect others if payments fail to move as expected."

Don't Take It To The Bank

The November 10, 1997 issue of *The New York Times* reported that a new survey by the Gartner Group, a management consulting firm, found that at least 50% of the nation's large banks were halfway finished fixing their Y2K problem. However, only 5% of big overseas banks had reached this stage.

The *Times* story also noted that an amazing 38% of the 1,100 computer industry executives worldwide interviewed by Gartner Group in September and October said they might withdraw their personal assets from banks and investment companies just before 2000!
[http://www.nytimes.com/library/cyber/week/111097year.html]

In the September advisory report, the Bank for International Settlements warned that "problems focused in a single location could rapidly affect others if payments fail to move as expected." The BIS G-10 bank supervisors committee has developed a survey sent to about 40 countries to collect better information on the state of readiness of banks in those major industrial economies. The findings will be released early in 1998.

In his November 4, 1997 testimony before the House Banking Committee, Fed Governor Edward Kelly, Jr. said that the "majority of foreign central banks are confident that payment and settlement applications under their management will be Year 2000 ready." But, then he added ominously, that all central banks, including the Federal Reserve depend on "compliant products from hardware to software suppliers and the *readiness of telecommunications service providers."* [Emphasis added.] In other words, if the phones don't work, all bets are off.

IV. Bankers Read Riot Act

To Whom It May Concern

The Federal Reserve Board's Division of Banking, Supervision and Regulation, sent a stern Y2K "guidance" letter to every bank CEO on November 12, 1997. The Fed's examiners have already started to assess the Y2K status of every bank subject to Federal Reserve supervision. This process is scheduled to be completed by midyear.

Any bank failing the first round will be required to submit a written Y2K compliance plan and monthly progress reports. If Fed officials conclude that the bank isn't acting fast enough, possible enforcement actions include "written agreements, cease and desist orders and civil money penalties." (I guess if that doesn't work, they'll break knee caps.)

Cooling The Urge To Merge?

One sure way to invite lots of Fed examiners to your bank is to announce a merger or acquisition. The Fed's guidance letter states, "In considering expansion proposals, an important element of the Federal Reserve's assessment of the financial and managerial factors will be an applicant's ability to ensure Year 2000 readiness for the combined organization."

Invitation To A Credit Crunch?

The Fed's guidance letter could trigger a credit crunch:

> ...banking organizations need to monitor and assess the Year 2000 readiness efforts of their corporate customers and, where appropriate, should give serious consideration to writing Year 2000 compliance provisions into their loan documentation or to other suitable steps to prevent undue credit or operational risk.

Don't Forget The Credit Cards

The Fed's letter reminds bankers that they are also obliged to fix their credit card processing systems to recognize the Year 2000: "As an example of affected consumer-oriented systems, banks operating open-end credit card systems should ensure that all date functions have been modified for Year 2000, so that the bank can continue to comply with the Truth in Lending Act (Regulation Z) subsequent to the century date change."

The Usual Suspects

The Fed's November 12, 1997 letter was followed by a December 17, 1997 "Safety and Soundness Guidelines" statement from the Federal Financial Institutions Examination Council (FFIEC), the joint committee of all federal regulators of financial institutions. [FFIEC includes the Office of the

Syetem, the National Credit Union Administration, the Federal Deposit Insurance Corporation, and the Ofice of Thrift Supervision.] It is addressed to the board of directors and officers of all such federally supervised institutions. It puts them all on notice that their asses are on the line. (Excuse my French, but it's the best way to convey the tone of the statement.) In other words, Y2K is a serious business risk that requires the complete and active involvement of directors and officers.

The FFIEC states that the board of directors must oversee its institution's Year 2000 effort. Senior management must manage the project on a day-to-day basis and provide the board with quarterly status reports at a minimum. Management must immediately alert the board if the project fails to meet critical benchmarks. The FFIEC statement lists all the specific details that management must provide the board about the Y2K project. The board's minutes must record all this and should be available for review by FFIEC examiners.

Don't Forget The Loan Portfolio

The FFIEC statement reinforces the Federal Reserve's warning to bankers to assess the Y2K risks to their loan portfolios:

> The approach of the Year 2000 creates potentially adverse effects on the creditworthiness of borrowers. Corporate customers who have not considered Year 2000 issues may experience a disruption in business, resulting in potential financial difficulties affecting their creditworthiness. Financial institutions should develop processes to identify, assess, and control potential Year 2000 credit risk in their lending and investment portfolios.

The statement notes that the bank regulators are preparing guidelines to help bankers assess and manage this risk. The implications of this are sobering. Later this year and in 1999, bankers may stop lending to companies that they believe won't be ready for the millennium date change. The credit crunch could kill many companies before their computers even have a chance to fail in 2000!

Stay Tuned For More

Eugene A. Ludwig, the Comptroller of the Currency and chairman of FFIEC, told a Congressional committee on November 4, 1997 that FFIEC has four planned issuances of guidance that will address:

1. Enterprise risk. The first-released on December 17, 1997, as discussed above-provides guidance to bank boards of directors on ensuring that senior management is addressing the effects of the year 2000 problem on their business.
2. Counterparty issues. This guidance will set forth the minimum due diligence process for financial institutions to follow in assessing how the year 2000 affects their large clients.
3. Vendor management. The vendor management guidance will outline the due diligence process that financial institutions that rely on vendors should follow in analyzing their vendors' ability to address the Year 2000 Problem.

what all financial institutions, large and small, should do to ensure that their systems are year 2000 compliant.

V. Senate Bill Mandates Y2K Disclosure

"Crash Protection Act"

On November 4, 1997, I testified in a Senate hearing on "Mandating Year 2000 Disclosure By Publicly Traded Companies," before the Subcommittee On Financial Services and Technology. ["The Year 2000 Problem: We Need Answers. Also see my article based on my testimony, "A Race Against The Calendar," *The New York Times*, Dec. 7, 1997.] On November 10, the chairman of this committee, Senator Bob Bennett (R-Utah), introduced the "CRASH Protection Act," the Computer Remediation and Shareholder Protection Act of 1997. This proposed legislation would require publicly traded corporations to disclose specific information about the Year 2000 readiness of their computer systems, and their ability to manage the business risks associated with possible failures after January 1, 2000.

In his press release, Senator Bennett states:

> The Year 2000 problem lies at the heart of our economy. In the 1970s, oil was the energy that ran our world economy. Today, our economy runs on the energy of information. To cripple the technological flow of information throughout the world is to bring it to a virtual standstill. To delay our efforts to address this problem is to be inexcusably reckless.

Mr. Bennett's bill will require the Securities and Exchange Commission (SEC) to amend its disclosure regulations pursuant to section 13 of the Securities Exchange Act of 1934 to require corporations to disclose the following information about Year 2000 readiness:

> 1) The corporation's progress in completing the five recognized phases of Year 2000 remediation--awareness, assessment, renovation, validation, and implementation--by division, department, or other appropriate business unit;
>
> 2) A summary of costs already incurred by the company in connection with the corporation's remediation efforts and an estimate of additional costs the corporation expects to incur in connection with future remediation efforts;
>
> 3) An estimate of expected litigation costs and litigation outlays associated with the defense of lawsuits brought against the corporation or its directors and officers as a result of Year 2000 computer failures, including breach of contract, tort, shareholder class action, and/or product liability suits;
>
> 4) The existence of insurance policies to cover specific Year 2000 computer failures as well as the defense of lawsuits brought against the corporation, its officers, and directors in connection with Year 2000 computer failures; and
>
> 5) Whether the corporation has developed contingency plans to ensure continued operation of its essential business functions in the event of a Year

2000 computer failure by the corporation itself or one of its vendors or business partners.

VI. SEC Responds To Y2K Pressure

More Y2K Disclosure For Investors

In June 1997, the SEC presented the "Report to the Congress on the Readiness of the United States Securities Industry and Public Companies To Meet the Information Processing Challenges of the Year 2000" [http://www.sec.gov/news/studies/yr2000.htm]. The report starts with the following chilling observation:

> It is not, and will not, be possible for any single entity or collective enterprise to represent that it has achieved complete Year 2000 compliance and thus to guarantee its remediation efforts. The problem is simply too complex for such a claim to have legitimacy. Efforts to solve Year 2000 problems are best described as "risk mitigation." Success in the effort will have been achieved if the number and seriousness of any technical failures is minimized, and they are quickly identified and repaired if they do occur.

Amazingly, despite this ominous message, the SEC concluded that the disclosure requirements were just fine and didn't need to be amended:

> The Divisions of Corporation Finance and Investment Management have examined whether it is necessary or appropriate to initiate rulemaking in order to assure adequate disclosure by public companies about Year 2000 activities, expenditures, and the risk of potential adverse consequences of failure to complete necessary remediation. They have concluded that current laws and regulations are sufficient to cover public companies' reporting obligations as they pertain to the impact, to the extent that it is material, of Year 2000 problems on operations and costs.

Staff Legal Bulletin No. 5

I am pleased to see that the SEC responded to pressure from Senator Bob Bennett (R-Utah) to require publicly traded companies to disclose more information about their exposure to Y2K risks and costs.

In my November 4, 1997 testimony before Senator Bennett's Subcommittee on Financial Services and Technology, I proposed that Congress should pass a bill to require full Y2K disclosure by company management. The Senator and I were on the same track: On November 10, he introduced just such a bill. In my December 8, 1997 *Y2K Reporter #9*, I wrote:

> Obviously, I support the legislation. The problem is that even if Senator Bennett is very successful in pushing the bill through the legislative process, it may not become law until the summer of 1998. The SEC, on the other hand, can move faster by adopting a rule that would mandate similar Y2K disclosure.

On October 8, 1997, the SEC issued Staff Legal Bulletin No. 5 which

was up to corporate management to decide if it is "material" information that shareholders need to know to assess the future prospects of the corporation. On January 12, 1998, the SEC revised the Bulletin, which represents the SEC staff's views rather than a rule or regulation [http://www.sec.gov/rules/othern/slbcf5.htm]. Nevertheless, it is likely to force companies and their accountants to disclose much of what I proposed in my testimony and would be mandated under Senator Bennett's bill [Indeed, the first footnote in the SEC Bulletin acknowledges Sen. Bennett's bill.]:

> Many companies must undertake major projects to address the Year 2000 issue. Each company's potential costs and uncertainties will depend on a number of factors, including its software and hardware and the nature of its industry. Companies also must coordinate with other entities with which they electronically interact, both domestically and globally, including suppliers, customers, creditors, borrowers, and financial service organizations. If a company does not successfully address its Year 2000 issues, it may face material adverse consequences. Companies should review, on an ongoing basis, whether they need to disclose anticipated costs, problems and uncertainties associated with Year 2000 consequences, particularly in their filings with the Commission.

No Boilerplate, Please!

Companies that haven't even assessed their Y2K risks are advised by the SEC staff to disclose this fact. *Perhaps the most important message in the SEC Bulletin is that "disclosure must be reasonably specific and meaningful, rather than standard boilerplate."* I expect that quarterly and annual company reports in 1998 and 1999 will now include very long discussions of the risks and costs associated with Y2K.

Excerpt From SEC Staff Legal Bulletin No. 5

Analysis of Financial Condition. Companies should include disclosure in their "Management's Discussion and Analysis of Financial Condition and Results of Operations" if:

- the cost of addressing the Year 2000 issue is a material event or uncertainty that would cause reported financial information not to be necessarily indicative of future operating results or financial condition, or
- the costs or the consequences of incomplete or untimely resolution of their Year 2000 issue represent a known material event or uncertainty that is reasonably expected to affect their future financial results, or cause their reported financial information not to be necessarily indicative of future operating results or future financial condition.

Description of Business. If Year 2000 issues materially affect a company's products, services, or competitive conditions, companies may need to disclose this in their "Description of Business." In determining whether to

issue on each of their reportable segments.

Form 8-K.A company's Year 2000 costs or consequences may reach a level of importance that prompts it to consider filing a Form 8-K. At their option, companies would file these reports under Item 5 of Form 8-K. In considering whether to file a Form 8-K, companies should be particularly mindful of the accuracy and completeness of information in registration statements filed under the Securities Act that incorporate by reference Exchange Act reports, including Form 8-Ks.

Accounting Considerations. Accounting Considerations. The Emerging Issues Task Force considered the issue of how to properly reflect the costs of modifying computer software for Year 2000 projects in the financial statements. In July 1996, the EITF concluded that these costs should be charged to expense as they are incurred.

Specific Disclosure Considerations. If a company determines that it should make Year 2000 disclosure, the applicable rules or regulations should be followed. If a company has not made an assessment of its Year 2000 issues or has not determined whether it has material Year 2000 issues, the staff believes that disclosure of this known uncertainty is required. In addition, the staff believes that the determination as to whether a company's Year 2000 issues should be disclosed should be based on whether the Year 2000 issues are material to a company's business, operations, or financial condition, without regard to related countervailing circumstances (such as Year 2000 remediation programs or contingency plans). If the Year 2000 issues are determined to be material, without regard to countervailing circumstances, the nature and potential impact of the Year 2000 issues as well as the countervailing circumstances should be disclosed. As part of this disclosure, the staff expects, at the least, the following topics will be addressed:

- the company's general plans to address the Year 2000 issues relating to its business, its operations (including operating systems) and, if material, its relationships with customers, suppliers, and other constituents; and its timetable for carrying out those plans; and

- the total dollar amount that the company estimates will be spent to remediate its Year 2000 issues, if such amount is expected to be material to the company's business, operations or financial condition, and any material impact these expenditures are expected to have on the company's results of operations, liquidity and capital resources.

Wall Street's analysts will have much more of the information they need to assess the possible impact on earnings of Y2K. I believe that as Y2K issues are finally taken seriously by analysts, they will also be taken seriously by investors and creditors. I can't imagine that most of the Y2K disclosures will be good news for stocks.

VII. CPAs Will Disclose More

The CPAs Will Cover Their Butts

Chances are the accountants will force corporate managers to disclose more about Y2K as a result of the revised SEC Legal Bulletin No. 5. The Codification of Statements on Auditing Standards, issued by the American Institute of Certified Public Accountants (AICPA), contains procedures that an auditor must carry out in the normal course of an examination of a company's financial statements. Included in these procedures are several steps which should alert the auditor to the Year 2000 problem. The Codification does not specifically address the Year 2000 problem. However, auditing firms generally are aware that issuers must begin assessment and remediation of their financial reporting systems now in order to be prepared for the Year 2000.

On October 31, 1997, AICPA issued a 37-page report, "THE YEAR 2000 ISSUE--Current Accounting and Auditing Guidance" [http://www.aicpa.org/members/y2000/intro.htm]. Here are some of the key points:

1) Accounting for Costs. The Emerging Issues Task Force of the Financial Accounting Standards Board in EITF Issue No. 96-14, Accounting for the Costs Associated with Modifying Computer Software for the Year 2000, states "that external and internal costs specifically associated with modifying internal-use software for the year 2000 should be charged to expense as incurred." Y2K costs should not be accrued before they are incurred.

2) Revenue and Loss Recognition. "The Year 2000 issue also may create product-warranty or product-defect liability and product return issues for software and hardware vendors or software providers, as well as for other vendors that sell products containing software." So, "If a contract is expected to result in a loss, the vendor should record a provision for the entire loss in the period in which the loss becomes evident."

3) Possible Impairment Issue. "The Year 2000 Issue may be an indicator of the impairment of fixed assets containing software or hardware components (for example, microchips) and for capitalized costs of software developed or obtained for internal use that has not been modified to be year 2000 compliant. The Year 2000 Issue also could affect the estimated useful lives used to calculate the depreciation and amortization of these assets."

4) Other Disclosures. "Disclosure may be required in areas such as impairment or amortization of capitalized software costs, inventory valuation, long-term-contract accounting, warranty reserves, reserves for sales returns and allowances, or litigation if, based on the facts and circumstances existing at the date of the financial statements, it is reasonably possible that the amounts reported in the financial statements could change

statements.

VIII. Will Retailers Be On-Line?

Checking Check-Out Systems

Retailers are very dependent on computer systems. In recent years, many have added point-of-sale software and registers to manage their orders and inventory more efficiently. If these systems are not Y2K compliant, retailers could lose track of their merchandise. Their credit management systems must be ready soon to accept credit cards with expiration dates of 2000. Like every other business, retailers must also have payroll, financial, and accounting systems that will work in the year 2000.

The National Retail Federation (NFR) asked Keane, Inc. to conduct a survey of major retail industry software and hardware vendors. The results were published in the November 1997 issue of *Stores*. The two key findings are:

1) Only 13% of midsize retailers are currently using Y2K-compliant retail management systems.

2) Only 19 of the 55 versions of point-of-sale software are ready for the year 2000.

Upgrading By The Numbers

This is disturbing. The truly disturbing findings are in the details. Nearly 100% of respondents reported that their warehouse management systems, credit management systems, and financial and accounting systems are noncompliant. Retailers using integrated merchandising systems reported that 75% are not ready for the year 2000.

The survey summary observes:

> Of the nearly 2,000 retailers who are using noncompliant versions [of software], over 90% must upgrade 2 to 5 versions to achieve compliance. It is not known how many of these version upgrades will require sequential upgrades (e.g., version 2 to version 3 to version 4, etc.) versus direct upgrades (e.g., version 2 to version 5).

The NRF advises retailers to ask their vendors if the Y2K-compliant version of their software is more than one version up from the current version. If not, "can you migrate directly to the compliant version? Or, do you have to go through several upgrades?" Retailers should also ask value-added resellers what part of compliance is their responsibility versus the manufacturer's. These are some of the Y2K nitty-gritty details that show the kinds of hurdles faced by those brave runners in the Y2K marathon race against the clock.

Give Them Credit

The good news for retailers is that most of the vendors who provide point-of-sale systems already--or soon will--have Y2K-compliant versions. One manufacturer, NCR, has no plans to attain compliance for more than 50

transactions. Visa's Web-site observes,

> Whether your business is a restaurant, airline, supermarket, hotel, catalog company, department store, hospital, or any other business, your point-of-transaction staff will begin to see payment cards with expiration dates of 2000 or later. Unless you modify the software logic in your point-of-transaction terminals, payment cards with the year 2000 will be rejected or unnecessarily declined if your terminals miscalculate an expiration date of "00" as 1900 instead of 2000.

Visa advises retailers to get assistance from the software provider if credit cards are rejected. What is Visa doing to get ready for the new millennium? "Recognizing this issue in 1994, Visa has been diligently preparing its global payment network, VisaNet, to be ready for processing cards with expiration dates of 2000 and beyond."

Chapter 6

INTERNAL REVENUE SERVICE

I. IRS Sends Desperate SOS

A Flat Tax Rate In 2000?

The government may have to impose a flat tax-rate system in 2000. Why? Because it is increasingly likely that the federal tax collection, processing, and compliance systems will break down in that year. I realize this is a strong statement, but it comes directly from the IRS. The May 15 "Request for Comments for Modernization Prime Systems Integration Services Contract" is a distress call to private industry to bail out the taxing agency [http://www.ustreas.gov/treasury/bureaus/irs/prime/primerfc.htm]. They are already overwhelmed and simply don't have the resources to handle Y2K, a.k.a., Century Date Conversion: "A still greater and far-reaching wave of work in the form of the Century Date Conversion is cascading over the diminishing [IRS] workforce that is already insufficient to keep pace with historical levels of workload." The IRS is so desperate that they want to form "strategic partnership" relationships with private industry:

1) "The Request for Comments (RFC) aims to initiate the dialogue between the Service and its prospective private sector partners."

2) "The RFC represents only the beginning of the dialogue. Before finalizing and issuing the Request for Proposals (RFP) for the PRIME, the IRS plans a variety of activities with its prospective partners to refine plans and maximize the partnership's chances for success."

3) "Without exception, the IRS Modernization plan represents the largest systems integration ever undertaken by either the public or private sector. Success would be wholly dependent on partnering with the private sector."

4) "In general, the IRS seeks to create a business plan which shares risk with the private sector; incents the private sector to either share or assume the 'front-end' capital investment..."

Running Out

Aside from troubling confidentiality issues, the big question is whether there is even enough time for any prime contractors to fix the IRS. I seriously doubt it since the schedule in the RFC anticipates that prime contracts will be awarded no sooner than October 1, 1998. Most Y2K experts agree that any organization that doesn't begin to fix the problem by October of this year won't meet the unmovable and unforgiving January 1, 2000 deadline.

Big Brother, Big Mess

It turns out that Big Brother is totally and hopelessly disorganized, notwithstanding a modernization program during the 1980s and early 1990s--which in many ways exacerbated the situation. "Overall, the IRS computing environment evolved into an extraordinarily complex array of legacy and stand-alone modernized systems with respect to both connectivity and interoperability between the mainframe platforms and the plethora of distributed systems." The IRS has more than 62 million lines of computer code, three big mainframes, and 60 other mainframes in 10 regional offices. According to the RFC, "None of the mainframes are century date compliant, thereby necessitating immediate actions ranging from systems software upgrades to replacement." Thousands of applications systems are "undocumented," i.e., lost, if they ever existed.

There is no central data base. The IRS "neither maintains the source payment documents nor posts either detailed transaction-specific payment or tax case information to the Master Files. Instead, the detailed tax and tax case information is stored on stovepiped systems with stand-alone databases which, for the most part, are not integrated with either the Master Files or the corporate on-line system."

In 1988, the IRS implemented the Tax System Modernization (TSM) plan to upgrade and modernize the agency's technology. The program created stand-alone ("stovepipe") systems for the 10 service centers based on "the principles of distributed computer processing, an approach to computing en vogue during the late 1980s and 1990s." The numerous databases are difficult to synchronize and to manage. The system is breaking down. Y2K will break it for sure. The IRS observes:

> One of the more fundamental and wrong-headed myths concerning Tax Systems Modernization is the nature of the technical problem: to modernize legacy systems. Regrettably, the challenge is far more overarching: to modernize functioning but aged legacy systems which have been nearly

irreparably overlaid by and interfaced with a tangle of stovepiped distributed applications systems and networked infrastructures.

In 1995, the General Accounting Office reported that TSM was a disaster. The system's multiple computers and databases could not integrate with existing computers. It made the IRS even less efficient. Congress ordered the IRS to produce a new modernization plan by May 15, 1997. A seven-volume Blueprint for Modernization was produced and the Request for Comments was issued. (See the "Today/Target" flow chart.)

The Goal Is To "Stay In Business"

"Under the crushing time constraints of the millennium change," the IRS is working with its current contractors on interim Y2K fixes, but admits that it "lacks the capacities and capabilities to simultaneously manage the existing workload and effectively partner with the private sector to commence Modernization. Any reasonable strategy to move forward, therefore, would focus on managing the immediate crisis--'stay in business' while building capacity to prepare for future Modernization."

CIO Is Worried About Living On This Planet

According to the October 17, 1997 issue of the *Year 2000 Outlook*, an e-mail weekly service of the Information Technology Association of America (ITAA), Arthur Gross, the Chief Information Officer at the IRS, spoke at their industry gathering in McLean, Virginia [http://www.itaa.org/year2000.htm]. Apparently, he is as concerned about his agency's Y2K problem as I surmised from the RFC. He was quoted as saying, "Failure to achieve compliance with Year 2000 will jeopardize our way of living on this planet for some time to come."

1997 Taxpayer Relief Disrupts Y2K Fix

According to the ITAA account of his candid speech, "Mr. Gross used words like 'massive' and 'numbing' to describe a program which has jumped from three people to 800. With the IRS software inventory 'not fully fleshed out,' Gross said the Y2K accounting covers up to 70 million lines of code, 95,000 components, and 120 mission critical systems." Not only does the IRS have to achieve Y2K compliance, but also the agency must simultaneously change its software to reflect the 1998 and 1999 changes required by the Taxpayer Relief Act of 1997. He indicated that the IRS was also preparing worst-case contingency plans that probably "won't be shelfware." Mr. Gross said the IRS is in a "marathon race" to the Y2K finish line. This is perhaps "the last opportunity to fix the tax system as we know it. "

The IRS man's speech was also covered in the October 20, 1997 issue of *Federal Computer Week* in a story titled "CIO: Tax bill hampers IRS's millennium fix." As a result of this year's Taxpayer Relief Act, the IRS loses three months and the entire system will be tested during the final 12 months of the century. [http://www.fcw.com/pubs/fcw/1997/1020/fcw-polcio-10-20-97.html]

Countdown To Meltdown

The November 3, 1997 issue of *Insight*, a publication of *The Washington Times*, focused on all the problems at the IRS. One of the stories is titled "IRS Countdown to Meltdown." The story quoted Arthur Gross telling a congressional commission that "failure to identify, recode, and retest each of these date-based fields could result in the generation of millions of erroneous tax notices, refunds, bills, interest calculations, taxpayer account adjustments, accounting transactions and financial reporting errors. Put another way, the IRS' capability to carry out its mission could be jeopardized."

Editorial

Is anybody listening to Mr. Gross? He is saying that the IRS might fail to fix its Y2K problem and that the consequences of such a failure could be a calamity for the government and the economy. He is saying Congress dramatically increased the risks of such a calamity by legislating major tax law changes for 1998 and 1999--two very precious years for those who are trying to fix Y2K at the IRS. Maybe Congress should postpone at least the 1999 tax law changes. Maybe Congress should prepare a simpler back-up tax system just in case Mr. Gross puts up the white flag. Based on Mr. Gross' comments, I would advise you to fine-tune your 1999 tax withholding so that you won't be waiting for a refund check in 2000.

Chapter 7

GOVERNMENT SERVICES

I. Time Is Running Out

Chief US Auditor Sounds The Alarm

In Congressional testimony on July 10, 1997, Joel C. Willemssen--the Director of Information Resources Management of the Accounting and Information Management Division of the US General Accounting Office (GAO)--warned that federal agencies are running out of time to prepare for the new millennium [Joel C. Willemssen, "Year 2000 Computing Crisis: Time Is Running Out for Federal Agencies to Prepare for the New Millennium", General Accounting Office [T-AIMD-97-129], July 10, 1997]. The General Accounting Office, the investigative arm of Congress, performs audits and evaluations of government programs and activities and examines matters relating to the receipt and disbursement of public funds.

The GAO Director was also critical of the implementation of the federal government's Y2K strategy by the Office of Management and Budget (OMB). [OMB "Year 2000 Progress Report"] Mr. Willemssen stressed that there is an urgent need to accelerate agency Y2K programs.

> As we have pointed out in earlier testimony, if systems that millions of Americans have come to rely on for regular benefits malfunction, the ensuing delays could be disastrous. OMB's perspective that agencies have made a good start and that no mission-critical systems were reported to be behind schedule would seem to imply that there is no cause for alarm. On the contrary, we believe ample evidence exists that OMB and key federal agencies need to heighten their levels of concern and move with more urgency.

Four Pathetic Pitfalls

The GAO's top auditor proceeded to list four major shortcomings of the OMB's Y2K battle plan:

1) The agencies' reported schedules leave no margin for error for unanticipated delays. Of the 27 agencies, 16 expect to be Y2K compliant in either November or December of 1999. "This leaves only a matter of weeks, at most, if something should require more work...."

2) OMB is relying on agency self-reporting, which is not independently verified. "Indications are that agency reports may not be accurate...."

3) Every entity is free to interpret "mission-critical" as it sees fit. For example, the Army reports that only 7% of its systems are crucial and must be fixed. Yet the Defense Information Systems Agency considers that all 100% of its systems are critical.

4) Sit down for this one: The OMB, in its government-wide schedule, has established only ONE month--from December 1998 to January 1999--to complete validation. "The validation phase is critical for thorough testing of all converted or replaced system components to: (i) uncover any errors introduced during conversion or renovation, (ii) validate year-2000 compliance, and (iii) verify operational readiness. Without adequate testing, agencies can have no assurance that their solutions will actually work." After validation comes actual implementation, which OMB scheduled for the remaining 11 months of 1999.

Other Critical Issues

There are at least three other major issues that Mr. Willemssen worries about:

1) Agencies must work together to make their data exchange systems Y2K compliant. Otherwise, "information systems and databases may easily be contaminated by coding embedded" in noncompliant or incompatible Y2K systems.

2) Agencies must prioritize the importance of their systems because triage decisions will have to be made since agencies "will likely be unable to correct all noncompliant systems before 2000."

operating in the event systems fail.

II. OMB Issues Progress Report #3

Sense Of Urgency

The US Office of Management and Budget (OMB) oversees the government's progress on Year 2000 conversion. To assist in that effort, OMB requires agencies to report quarterly on their progress on the 15th of February, May, August, and November. In 1997, three progress reports were issued. In mid-December, the third report for the three-month period ending November 15, 1997 was released . OMB was clearly concerned about the slow pace of progress. So much so that OMB accelerated the government-wide target for completion of renovation from December 1998 to September 1998. The target for completion of the implementation phase was moved up to March 1999 from November 1999.

> Although the agency reports demonstrate good progress in some areas, overall it is clear that a vast amount of work remains. The original government-wide goals did not provide much room for slippage. In addition, it is important to assure that agencies have sufficient time to run fully implemented systems in a production environment. Finally, the sense of urgency should be clear to both our private sector suppliers and to those with whom we exchange data.

Next Report Could Be Shocker

OMB instructed agencies to describe in their February 1998 reports the steps they are taking to establish contingency plans for any system that is not expected to complete implementation by March 1999. In addition, agencies are to have in place a contingency plan for any mission critical system that is reported to be behind schedule in two consecutive quarterly reports and provide a summary of the plan to OMB.

FAA May Not Fly

The third report is certainly also full of attention-grabbing suspense and drama. It confirms my oft-stated concern about several government agencies, especially the Federal Aviation Administration (FAA) in the Department of Transportation (DOT):

1) As of mid-November, DOT had not completed the assessment phase for a number of its mission critical systems, including the FAA's Air Traffic Control (ATC) systems!

2) The FAA has completed assessments on only 38% of its systems.

3) "This does not include an additional 245 systems the FAA has just identified as mission-critical, but has not assessed. Moreover, it is likely that additional mission-critical systems will be identified."

because they find more systems that are mission-critical and in need of repair.

Some Progress

There was some good news in the third OMB progress report. Almost all agencies had completed their assessment of the problem, and all were renovating code. The 8,589 mission-critical systems that agencies had identified was essentially unchanged from the number three months ago. Of those mission-critical systems, 27% were year 2000 compliant, up from 19% three months ago. Still being repaired were 55% of mission-critical systems; 11% were still being replaced, and 4% were retired.

On the other hand, 14 of the 24 agencies monitored by the OMB were planning to implement their Y2K fixes during the last three months of 1999. This did not reflect the acceleration in government-wide dates mentioned above.

Ready In 2019 For 2000

On December 11, 1997, US Congressman Stephen Horn, who chairs the House Government Management, Information and Technology Subcommittee, issued his findings based on the OMB's December 15 progress report. He warned that

> under current rates of progress, more than half of the Federal Government's major agencies will fail to fix their most important computer systems in time for the year 2000 date change. Another year has passed and the latest data show that the current work on the year 2000 problems in federal computers is unacceptable and potentially disastrous. Unless agencies make much faster progress soon, the Federal Government runs a serious risk of a massive electronic breakdown on January 1, 2000. If federal computers fail because they cannot understand the year 2000, the distribution of benefit checks could be disrupted, the air traffic control system could become gridlocked, and computerized records could be lost or damaged. At best, we may face a major headache; at worst, an electronic disaster.

According to Rep. Horn's report, 10 of the 24 major federal agencies claimed they will be done in time. Mr. Horn observed that based on current rates of progress, the remaining 14 agencies will have their mission-critical systems ready for the year 2000 by the following dates:

2019	Energy Department Labor Department
2012	Defense Department
2010	Transportation Department Office of Personnel Management
2005	Agriculture Department
2004	Treasury Department
2002	General Services Administration
2001	Health and Human Services Department Justice Department

Mid-2000	Education Department Agency for International Development Federal Emergency Management Agency (FEMA)
Early 2000	National Air and Space Administration

Wow, our government's emergency managers at FEMA might not be ready in time to deal with any year 2000 emergencies! Ed Yourdon observes that Mr. Horn's grim estimates are actually too optimistic because they account only for mission-critical systems that are being repaired, not those getting replaced: "Indeed, the problems and delays associated with these replacement projects aren't showing up in ANY reports, for all the usual reasons of politics and bureaucracy."

What If?

And what if some of the government's hardware and software vendors fail to deliver Y2K-compliant products by the millennium deadline? Of course, all vendors must deliver well ahead of January 1, 2000, so the agencies will have enough time to test the new products. What if they fail to do so? Prozac anyone?

Progress and Plans for Year 2000 Compliance of Mission-Critical Systems

(As of Nov. 15, 1997, and before any adjustments for accelerated milestones)

	Assessment	Renovation	Validation	Implementation
Gov't-wide Goal	6/97	12/97	1/99	11/99
Agriculture	**11/97**	9/98	9/99	9/99*
Commerce	3/97	12/98	1/99	10/99
Defense	12/97	12/98	6/99	11/99
Education	**11/97**	**12/98**	9/98	3/99
Energy	1/97	9/98	2/99	7/99
HHS	6/97	**9/99**	**10/99**	**12/99**
HUD	6/97	12/98	7/99	11/99
Interior	3/97	2/98	1/99	11/99
Justice	6/97	7/98	10/98	1/99
Labor	6/97	12/98	1/99	11/99
State	6/97	9/98	10/98	8/99
Transportation	12/97	12/98	7/99*	10/99*
Treasury	7/97	12/98	12/98	11/99
VA	1/98	11/98	1/99	10/99
AID	**11/97**	**6/99**	**8/99**	**9/99**

EPA	6/97	12/98	1/99	11/99
FEMA	6/97	12/98	1/99	11/99
GSA	6/97	12/98	1/99	10/99
NASA	8/97	12/98*	1/99*	11/99*
NSF	6/97	12/98	1/99	11/99
NRC	9/97	12/98*	1/99*	4/99*
OPM	6/97	12/98	1/99*	6/99*
SBA	9/96	12/98	12/98	12/98
SSA	5/96	9/98	12/98	1/99

Note: Bold dates are later than dates shown in the August 15, 1997 report; dates with asterisks are earlier than the dates shown in the August report.
Source: US Office of Management and Budget

III. OMB Issues Progress Report #4

No Good

The fourth progress report from the OMB, released March 10 for the three-month period through February 15, 1998, starts positively: "Overall, the federal government continues to make progress in addressing the Y2K problem." However, the OMB folks aren't giving any guarantees. Notice that they didn't use any adjectives like "good" to describe the progress. Deeper in the report, OMB admits:

> There will inevitably be some problems in the fixed systems. No matter how well tested they are, most actual Y2K fixes made to systems will not be operational until the date change occurs. Therefore, even for systems implemented early, there is some risk of failure. Where such a failure would have a significant effect on the agency, a contingency plan should be in place.

On March 4, using the data compiled by OMB, Congressman Stephen Horn, R-CA, released a report card grading the federal agencies on their Y2K efforts. The overall grade for the first quarter of 1998 is D-minus, "on the edge of failure" to quote Mr. Horn. Five of the 24 agencies received Fs and six received Ds. (See below.)

Drop Outs

The OMB reports that agencies identified 7,850 mission critical systems in February, down from 8,589 identified in November. What happened to those 739 systems that dropped out of the total? They were reclassified as non-

systems are less critical to the functioning of the agencies, but some are still quite important."

With less than two years to go, only 35% of agency mission critical systems are currently Y2K compliant. The remaining 65% are getting repaired, replaced, or retired. [OMB reports that 15% of mission critical systems will be replaced. Unfortunately, new systems have a very poor track record of being delivered on time.] In November, 29% of mission critical systems, excluding the drop outs, were compliant. So, in the latest three months, we gained 6 percentage points. A straight line extrapolation implies that 77% of mission critical systems will be ready by January 2000. [A straight line extrapolation may be too optimistic because human nature suggests that the hardest systems to fix will be saved for last.] We need 100%!

Flunkies

Which agencies are most likely to fail? The five that are at most risk are the Department of Education, Department of Energy, Department of Health and Human Services, Department of Transportation (DOT), and the US Agency for International Development. In DOT, only 5.7% of mission critical systems are ready for the new century. The OMB's discussion of the status of the Federal Aviation Administration is downright gut wrenching:

> The Federal Aviation Administration (FAA) continues to be at significant risk of system failure. Although FAA has completed its assessments, it identified 101 additional mission critical systems since the last reporting period. Considering its slow progress, the FAA needs to give significantly greater attention to contingency planning.

Contingency planning at the FAA? Give the controllers ham radios, binoculars, and pin maps? It gets worse:

> Of particular concern is the FAA's Host Computer System, which is the backbone of en route air traffic control centers. The FAA is continuing its assessment of the system's micro-code with the intention of resolving and testing any identified date issues, while at the same time purchasing and implementing new hardware before January 1, 2000. The costs and relative risks of this dual strategy have yet to be clearly determined.

The OMB is referring to the 40 IBM 3083 mainframe computers purchased by the FAA in the early 1980s. IBM discontinued making these computers about 10 years ago and warned the FAA in 1996 and earlier this year that they will probably fail to work in 2000 [*Y2K Reporter #12*, January 20, 1998].

Another important weak link in the federal government is the Treasury's Financial Management Service, which writes and mails many of the checks sent by the government. [A Y2K War Room has been assembled at the Treasury offering up-to-the minute information on the status of the Y2K conversion of all systems.] "Need greater progress in FMS," is the OMB's cryptic message. The Federal Emergency Management Agency may not be ready to manage Y2K emergencies: "Little progress in renovation since

schedule for meeting massive Y2K challenge." There is this bit of good news in the OMB's assessment: "Good progress made in IRS," it says without any additional comment. I hope so, but I'm skeptical.

New Guidance

On January 20, 1998, OMB issued a new guidance memo to federal agencies establishing accelerated schedules for the completion of Y2K work and revising the reporting requirements on which the progress report is based [OMB Memorandum 98-02, "Progress Reports on Fixing Year 2000 Difficulties"] . Agencies are now expected to have all of their mission critical systems Y2K-compliant by March 1999. In the previous progress report, 14 of the 24 agencies expected to finish in the last three months of 1999. At the current rate of progress, only 59% of mission critical systems will be fixed by the new deadline.

Horn Gives Federal Agencies D-Minus

Representative Stephen Horn (R-CA) is the Chairman of the House Subcommittee on Government Management, Information, and Technology. On March 4, 1998, he presented his second report card on the progress made by the federal government's 24 agencies based on data compiled by the Office of Management and Budget (OMB), and expected to be released in mid-March. He gave an overall grade of D-minus. The government of the United States of America is "on the edge of failure." Only three earned an A and six received Bs. Another 4 had Cs. There were six Ds and five Fs, including the Defense and Transportation Departments. (See table below.) The Congressman projects that at the latest rate of progress, "a large number of Federal computer systems simply will not be prepared for the date change...." There are nearly 8,000 mission-critical computer systems in the executive branch. At the current rate of progress, only 63% of those systems will be ready.

Year 2000 Progress Report Card For US Federal Agencies

Agency	Done At Deadline Percent*	Done Estimated Date *	Grade
Social Security Administration	100%	1999	A
National Science Foundation	100%	1999	A
Department of Veterans Affairs	100%	1999	A
Department of Agriculture	100%	1999	B
Department of Commerce	100%	1999	B
Environmental Protection Agency	100%	1999	B
Dept. of Housing & Urban	100%	1999	B

Office of Personnel Management	100%	1999	B
Small Business Administration	100%	1999	B
General Services Administration	85%	2000	C
Department of the Interior	88%	2000	C-
Department of Justice	75%	2000	C-
Nuclear Regulatory Commission	71%	2000	C-
Dept. of Health & Human Svs.	74%	2001	D
Nat'l Aeronautics & Space Admin.	73%	2001	D
Department of the Treasury	60%	2001	D
Agency for Int'l Development	58%	2001	D-
Department of Energy	66%	2001	D-
Federal Emergency Mgmt. Agency	77%	2001	D-
Department of Education	63%	2002	F
Department of Defense	36%	2009	F
Department of Transportation	33%	2003	F
Department of Labor	26%	2007	F
Department of State	40%	2014	F
Total	**63%**	--	**D-**

* At current rate.

Source: Representative Stephen Horn (R-CA)

Mr. Horn is most concerned about the Department of Defense, which has more than one-third of all the mission-critical computer systems in the entire Federal Government. Interestingly, he failed DOD even though the agency now reports a significant 228 decline in the number of mission-critical systems to 2,915. This "progress" occurred not because the systems were fixed, but because they were reclassified! How did they do that? Did they reclassify payroll systems as not critical?

by the Treasury's Financial Management Service, which must be fixed to avoid widespread problems.

What Does "Mission-Critical" Mean?

Mr. Horn noted that President Bill Clinton recently appointed a new task force, the Y2K Conversion Council, to take over the Y2K progress monitoring from the OMB. The congressman believes that a more centralized effort with the highest priority is needed in the short time that remains. I agree. It is currently up to every agency to determine the meaning of "mission critical." (Similarly, banking regulators are permitting banks to set their own criterion, which do not have to match the disaster-recovery standards currently in force!)

IV. Social Insecurity

Y2K Disability At SSA

The Social Security Administration (SSA) recently discovered millions of additional lines of code that need to be fixed in the Disability Determination Services (DDS) system [General Accounting Office, "Social Security Administration: Significant Progress Made in Year 2000 Effort, But Key Risks Remain, (GAO.AMID-98-6), October 1997]. DDS is operated by the individual states, but funded and overseen by the SSA. Private contractors hired by SSA to make 42 of the 54 state DDS systems Y2K compliant reported that these offices had at least 33 million additional lines of software code that must be assessed and renovated where necessary.

Ironically, SSA was the first major government agency to become aware of Y2K and to take steps to fix the problem. In 1989, a program projecting dates past 1999 malfunctioned. In response, SSA developed a tactical plan and a steering committee to coordinate the Y2K project. By 1997, SSA reportedly completed renovation of almost 80% of its software and expected its mission critical systems to be Y2K compliant by January 1999.

The state DDS was excluded from SSA's initial Year 2000 assessment. SSA contracted with the two vendors that originally installed software in 42 of the 54 state DDS systems to fix the Y2K problem. They explained that because the software has been modified over time to meet individual state needs, 42 different systems must essentially be assessed.

How The SSA Fixed Half The Problem

. The bottom line is that the SSA is on schedule to fix only half of the software code it needs to function in 2000. The other half was just discovered in 1997. *If it took 10 years--from 1989 to 1999--to fix the first 32 million lines of code, how are they going to repair the latest 33 million lines in less than two years?*

The January issue of DBMS OnLine, a tools and strategies website for IT professionals, reviews the complicated methods used by the SSA staff to fix the first 32 million lines of code. Almost a decade ago, SSA estimated that about 20% of the lines of assembler and Cobol code would be affected by the millennium change--one fifth of the more than 30 million lines of code in production at any given time.

> To help get a handle on the daunting task of finding the lines that need to be modified, the SSA used Viasoft's Estimate 2000, which identifies portions of code that contain date information and helps determine whether they will be affected by the turn of the century. Although tools such as Estimate 2000 highlight the actual lines of code that need to be reviewed as well as aid in calculating the time, effort, and costs involved in carrying out the modification project, **a programmer must still examine all of those lines, one at a time.** [Emphasis added.]

The SSA programmers changed two-digit year fields to four digits. Where appropriate, they also used windowing techniques, i.e., years between 00 and 50 are assumed to be in the 21st century. Once each change was made, it was tracked by CA-Endevor, a change- and application configuration-management product from Computer Associates. CA-Endevor identifies the changes made, helps manage software entities, provides security checks, and compiles information about the build process.

> SSA says that 80 to 85 percent of the mainframe code has been modified, regression tested, and is now running in production. But that doesn't mean the SSA's Year 2000 project is about to end. Still another problem is looming. Not only must the SSA's own programs be converted, but they must also work with a variety of other computer systems, such as those each state uses to compile information on disability insurance beneficiaries--data that is shared with the SSA. If the states don't bring their systems into Year 2000 compliance, SSA recipients could experience significant delays in receiving payments.

V. State Of The States

Win Some, Lose Some

There are 50 state governments in the United States of America. There are thousands of municipal governments and tens of thousands of state and local government agencies. Many will be ready for the century date change, but many won't be ready. They all share information with each other and the federal government. For example, state taxing agencies and the IRS exchange data all the time. The risk is that Y2K problems in some agencies could quickly corrupt many other government systems that are fixed in time.

Gov. Says Penn. Progressing Quickly

On January 28, Governor Tom Ridge of Pennsylvania announced that critical computer programs essential to the state agencies' personnel/payroll system have been fixed for Y2K fully five months ahead of schedule. The state uses a sophisticated program to track the corrections to 44,251 state agency

1998 deadline set for mission-critical systems and the December 31, 1998 deadline for all other systems ["Pennsylvania Progressing Quickly Toward Y2K Goal," *Government Technology*, Jan. 28, 1998]. Of course, "fixed" doesn't mean the same as "fixed and tested." I don't know if Pennsylvania has tested all the computers that have been fixed. Testing can be very time-consuming and might reveal numerous unexpected glitches.

Y2K Audit Finds Mass. Is A Mess

The February 4, 1998 issue of *The Boston Globe* reports that a state auditor's study found that state agencies in Massachusetts have done little to fix Y2K. As of October, 95% of surveyed state managers had not taken steps to protect their systems against Y2K. Only 27% had started to plan their Y2K-fixing strategy. Amazingly, 19% didn't even know the problem exists!

Texas Faces Y2K Alamo

The 513-person management information systems office in the Texas Department of Human Services had 65 vacancies in January. The department has considered training prisoners. The Texas Department of Information Resources told state lawmakers that more than 100 state agencies and universities–56% of the total–are not filing Y2K progress reports. This department had a 55% turnover rate last year among its computer specialist, who are doubling or tripling their salaries in the private sector [*American-Statesman*, Jan 27, 1998].

California's Officials Fear Lawsuits

The first-ever California Statewide Intergovernmental Summit on Y2K, sponsored by the California Department of Information Technology (DOIT) and Government Technology magazine, examined a wide range of issues, including external interface problems, testing, and liability related to the fast-approaching century date change problem. The fear of litigation against government agencies for problems caused by systems that malfunction occupied many of the discussions during the summit. Russ Bohart, director of the California Health and Welfare Agency Data Center, said litigation is the "most significant risk" surrounding the Y2K problem. "Although some states, like Nevada and Washington, have used legislation to protect them from Y2K liability and California has some similar bills moving around the legislature, we in government can still expect to be sued; there are no ifs, ands or buts about it." ["Litigation Big Concern at California Y2K Summit," *Government Technology*, Feb. 19, 1998]

Chapter 8

EMBEDDED CHIPS

I. Embedded Chips: Invasion Of The Body Snatchers

Stress Test?

Most news stories about Y2K focus on "legacy" mainframe computer systems. With a great deal of effort and expense, these can be repaired or replaced. However, the biggest and most widespread disruptions might be caused by a far tougher Y2K problem to fix, namely, embedded systems that are not Y2K compliant.

There are billions of embedded systems all over the planet. First the good news: Most are not date sensitive. But, some are, and no one can tell where they all are and how many of them might fail. All I know for sure is that they will be stress tested on January 1, 2000. This is one reason why I am certain that there will be Y2K disruptions, but uncertain about the magnitude of the trouble ahead.

What Are They?

According to the Institution of Electrical Engineers (IEE), embedded systems are devices used to control, monitor or assist the operation of equipment, machinery or plant ["The Millennium Problem In Embedded Chips"]. "Embedded" means they are an integral part of the system. Consequently, a casual observer won't see them and even a skilled technician might need to examine the operation of a piece of equipment for some time before concluding that an embedded control device is in there.

All embedded systems are computers. Some of them are very simple devices compared to a PC. The simplest devices consist of a single microprocessor chip which may itself be packaged with other chips in a hybrid or Application Specific Integrated Circuit (ASIC). Its input comes from a detector or sensor and its output goes to a switch or activator, which, for example, may start or stop the operation of a machine or may control the flow of fuel to an engine by operating a valve.

Where Are They?

They are everywhere. The linked table is a long, but not an exhaustive list prepared by the IEE of all the places these little gizmos reside. They are in elevators, traffic lights, and cars. The ones that are really worrisome are embedded in industrial, utility, telecommunication, medical, navigation, and military systems.

Can They Be Fixed?

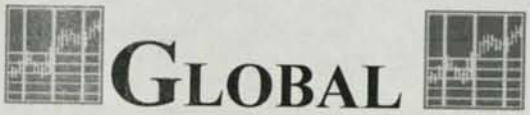
The thought of fixing/repairing/replacing embedded systems can make your head spin. First, you have to find them and determine if they have a Y2K problem. Engineers have reported finding chips performing the same function in identical equipment, yet some are Y2K compliant and others are

duplicate. The manufacturers of some are out of business or have been acquired by other companies that do not intend to upgrade an "out-of-print" chip. Replacing chips older than three years is almost impossible because they have a short technical life span.

When Might They Fail?

In embedded systems, the concern is often with intervals rather than with specific dates. An event might need to occur at 100-day intervals rather than on the 5th day of each month. *This implies that Y2K problems may occur both before and for some time after January 1, 2000 and not at all on the date itself.* On the other hand, there is a possibility that devices with cycles that are measured in hours, and minutes (or even seconds) may be affected by the problem because year numbers are the basis of time calculations. In such systems, the failure may not occur on the stroke of midnight but during the following 24 hours.

Chapter 9



I. Crisis Distracts Asians

Is It SAFE?

The January 14, 1998 issue of *The Wall Street Journal* reports that the crisis in Asia is distracting the region's bankers from fixing Y2K. Solving "the problem has now taken a back seat to the struggle for immediate survival." In other words, the Asian Banking Crisis Part I is likely to be followed by ABC Part II within two years!

According to the *Journal*, many banks in Asia and Latin America use a software developed by IBM in the mid-1970s, i.e., System for Advanced Financial Environment, or SAFE. IBM stopped supporting it four or five years ago, but the Asian bankers still depend on it. Most current versions of the program are probably completely different than the original, and rewriting them to work in 2000 is a staggering task.

The Bank for International Settlement (BIS) is concerned that it may already be too late for banks to fix Y2K. The *Journal* story claims that the BIS warns "it's time for banks to determine what to do when, not if, their systems fail." Even banks that will be prepared for the year 2000, can't do much about the potential havoc that might occur if another bank sends it data from what appears to be a century ago.

Japan: Just-In-Time Flaw

The January 21, 1998 issue of the *Financial Times* reports that as a result of Japan's recent credit crunch, banks are reluctant to lend to smaller companies. Therefore, they lack the funds for upgrading their computer systems. The Ministry of International Trade and Industry (Miti), in a July 1997 survey, found that 39% of small companies didn't have any IT staff. So managers of these businesses are very dependent on outside IT vendors, and less likely to be well informed about Y2K issues. The *FT* story ominously observes:

> One risk is that problems at smaller companies may work their way up to affect larger companies, particularly manufacturing companies using a just-in-time supply system. The large companies themselves may be well prepared, but smaller suppliers may not. If glitches lead to administrative or production hold-ups at suppliers of key parts in 2000, big names could find production lines held up.

Reportedly, large Japanese companies are in a relatively good position to fix Y2K. Thanks to the tradition of lifelong employment combined with little use of IT outsourcing, the big companies still have the staff who developed computer systems in the 1970s. Nevertheless, there is still a shortage of programmers. Japanese firms are looking abroad for more help, especially in India. However, Japanese-language documentation limits the usefulness of foreign resources.

The Japanese use two dating systems: 1) the Western system used in dealing with the outside world, and 2) the Japanese system based on the year of the reigning emperor, e.g., Heisei 10. The domestic system clearly has no Y2K problem, but very few companies use it exclusively.

II. No Global Warming Over Y2K

Bug Spray

On November 4, 1997, Rep. Constance A. Morella, the Chairperson of the House Subcommittee on Technology, held a hearing on "The Global Dimensions of the Millennium Bug." In her opening statement, she said:

> It seems that the State Department had their Foreign Service Officers survey the governments where they were posted about the Year 2000 problem. One officer, in an unnamed country, asked the local officials there, how they intended to respond to the Year 2000 millennium bug. He was told, "Not to worry my friend. We are prepared to spray anywhere and everywhere."

Y2K Brain Drain

In his testimony, James Cassell of the Gartner Group suggested that the Y2K efforts of emerging countries are at risk: companies in developed countries are luring away their software programmers with big pay packages:

coming to the United States for 400% more pay.

- Brazilian programmers, paid $20,000, are in great demand in Portugal.
- Canadian programmers, making $25,000, are being offered 100%-200% raises to come to the United States and Great Britain.

The EMU Distraction

Also testifying before Morella's committee was Richard M. Kearney, a principal of KPMG. His firm is one of the largest professional service firms in the world, providing management consulting services on a global basis to a wide variety of clients in numerous industry segments, including systems integration, technology testing, software package implementation, and software quality assurance.

Mr. Kearney reviewed the recent Y2K experience of one of his clients, a major US financial services firm on Wall Street and "well-known throughout the world." This client began to address its Year 2000 issues over a year ago and carefully prepared a plan for addressing the company's Year 2000 Problem globally. "When they began to roll out this project to their offices in Europe they found a distinct distraction in the form of the European Monetary Unit (EMU) conversion." In Asia, the client's employees were surprisingly aware of the problem, but governments, central bankers, and regulators were not aware of its depth and breadth.

Y2K Denial At Bank Of Japan?

When Mr. Kearney and his associates requested to meet with the Bank of Japan to discuss their progress on the Year 2000 and any regulatory activities they had or were contemplating to implement, "our request was denied several times. This was taken very seriously by our client because of the dependence on the Bank of Japan by trading companies."

Clueless South Of The Border

"Later when we visited with their offices in Sao Paulo, Buenos Aires, and Mexico City, we were faced with a complete lack of knowledge or concern and were led to understand that the major banks and government agencies in those countries had barely begun to recognize, let alone address the problem."

Late In Europe

Another hearing witness, Harris N. Miller, president of the Informational Technology Association of America, focused on the lack of Y2K progress in Europe [http://www.house.gov/science/miller_11-4.htm]. The European

October 1997. To make matters worse, this body has limited authority to effect legislative or regulatory changes within its member states. Mr. Miller also reported that the Organization for Economic Cooperation and Development (OECD) is "acting as if there is no issue at all." [The OECD is a policy organization which is composed of the 29 most economically developed, technologically advanced countries in the world. OECD seeks member consensus on a range of vital international economic issues, including science and technology, international financial and fiscal policies, environment and social concerns.] "Our understanding from OECD officials is that the Year 2000 is not even on their list of priorities, with no member state--which includes our own--coming forward to lobby for its inclusion."

The shockingly unhurried attitude of European bureaucrats is mirrored by the business community. According to an October 16, 1997 Goldman Sachs report, just 43 out of Europe's 100 biggest companies have completed Y2K audits and "not one company claimed to be already fully compliant." The average start date for Y2K work from best to worst is 1993 (Sweden-1 company), 1994 (Austria-1 company), 1995 (Netherlands-8 companies), 1996 (Finland-2, Norway-1, UK-33, France-7, Germany-13, and Switzerland-7), 1997 (Spain-3, Italy-2, Portugal-1). The Goldman Sachs analysts conclude that "a number of European companies will fail to achieve Year 2000 compliance and incur exceptional charges." (Editorial: Is going out of business an exceptional charge?)

Chapter 10

THE Y FILES

I. Escape From New York

New York, New York

The September 11 issue of *Computer Weekly* reported that the governor of New York State banned all non-essential IT projects to minimize the disruption caused by the year 2000 bomb after reading a detailed report that forecasts the millennium will throw New York City into chaos, with power supplies, schools, hospitals, transport, and the finance sector likely to suffer severe disruption. Compounding the city's Y2K risks is the recent departure of the head of its year 2000 project to a job in the private sector. [http://www.computerweekly.co.uk/news/11_9_97/08598503239/A.html]

In July, a state official told the New York Year 2000 User Group that New

between $100 million and $185 million. New York City is spending $300 million to replace its non-compliant budget and accounting system and on fixing or replacing other systems. Despite these efforts and those being made in the private sector, an independent study of New York's infrastructure has estimated that the city still faces massive disruption for up to a month at the start of the year 2000.

The study, carried out by UK-based Corporation 2000, expects the city's hospitals to be reduced to accepting emergency cases only, and schools to be closed for up to a month. Power supplies and telecoms are only expected to be available at half their normal levels, and banks and the stock market will be shut for up to eight days. This story was also covered in the September 12, 1997 issue of the *Financial Times:* "New York City faces significant disruption at the turn of the century despite being among the best prepared of the world's cities.

II. Other Bugs

Y2K: The Movie

According to Variety.com (Jan. 22, 1998), Warner Bros. has purchased a pitch for "Y2K," a thriller about computer bugs that send the modern world awry at the dawn of the new century. (If you have any friends at the studio, ask them if Michael Douglas will play the Wall Street economist.)

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Return to Dr. Ed's Home Page.

Site Map

Queries and comments to yardeni@ix.netcom.com.

Last Updated: March 19, 1998

Year 2000 Press Clippings

Updated April 21, 1998 at 18:17 (UTC)

This page contains links to online news stories related to Year 2000 computing issues. If one of the links no longer works, or if you know of an article we have missed, please e-mail us the URL at links@year2000.com. Thanks!

If you have not yet signed up for the **Year 2000 Announcement List,** please use this link to sign up. It is free, and will provide you e-mail updates twice each month that includes a listing of URLs of some of the more interesting Y2K stories appearing in the press.

For the latest news releases directly from Year 2000 Solution Providers, please be sure and read our Late Breaking News page too.

And be sure to check out NewsLinx if you are interested in the latest breaking Internet news.

Current Articles:

April 21, 1998:

- Reuters: Computer Makers Seek to Limit Year 2000 Liability
- New York Times: Euro Changeover Makes Year 2000 Bug Look Easy (requires registration)
- The Australian: Millennium bug needs surgery
- Australian Financial Review: Small business poses big risk
- Australian Financial Review: Monash and law firm to offer Y2K audits
- Australian Financial Review: Super trustees warned to prepare systems for Y2K
- The Age: Monash joins Holding Redlich in Y2K venture
- The Age: Beware of the bug rates

April 20, 1998:

- BBC News: Firms 'not ready' for year 2000 bug
- Computer Weekly: Compaq offers free support through the millennium (requires free registration)
- The Australian: War chest to beat bug is 'too small'
- Computerworld: Tardy Y2K strategy irks users
- Computerworld: Y2K: Hospitals upbeat
- Computerworld: Year 2000 also involves noncritical systems

- Computerworld: Y2K fixes will hold up bank merger payoffs
- Chicago Tribune: Y2K In The Pits: You've Got Pork Bellies
- Business News of Dayton: Technology: Year 2000 bug is not likely to hurt the U.S. economy
- Miami Herald: Year 2000 problem could bug economy -- badly
- TechWeb: High-Tech Companies Lobby To Limit Year 2000 Lawsuits
- Contra Costa Times/AP: Committee to review measure to limit Millennium Bug suits
- The Daily Telegraph London: Clock in your hardware
- Washington Post: A Crash Course on the Year 2000 Glitch
- Computerworld: Retail Y2K tests poised to start
- Federal Computer Week: GAO's Willemssen monitors Y2K pulse: He tracks agency IT troubles, successes
- Computerworld: Y2K fix-it firms don't have a recipe for success
- The Business Journal of Milwaukee: Courting trouble: Year 2000 bug could trigger avalanche of lawsuits
- Atlanta Business Chronicle: Year 2000 bug bites state
- Atlanta Business Chronicle: You believe in Y2K?
- The Denver Business Journal: DIA flunks Year 2000 compliance test
- Business Review Weekly: Looking for a touch of millennium justice
- Australian Financial Review: Civil defence alert over 2000 bug
- Australian Financial Review: It's a $1 trillion jigsaw puzzle without borders
- Australian Financial Review: IT industry cashes in on looming catastrophe
- Australian Financial Review: Assessing the risk: sector by sector
- Australian Financial Review: Tax relief uncertainty for bug-fixing by business
- Australian Financial Review: Experts turn sleuth to track down embedded chips
- Australian Financial Review: Simple software tests provide no solution
- Australian Financial Review: Small business could face a very expensive update
- Australian Financial Review: Going to hospital is looking unhealthy
- Australian Financial Review: The West turns to India for cheap bug busting
- Australian Financial Review: Back from the hills of Nimbin to the big bucks
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Archive of Past Articles:

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BigiSoft

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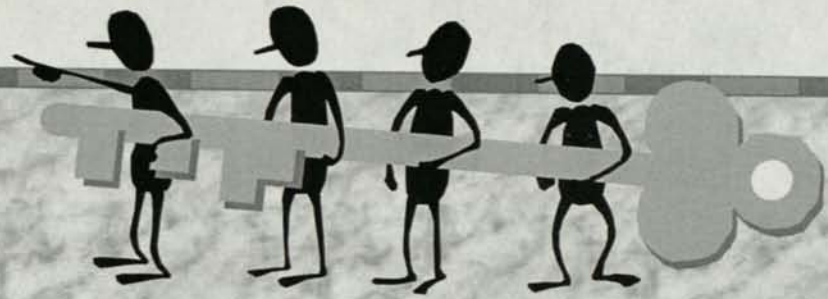
BigiSoft

Experienced Management Team



- Ron Brittian — Chairman and CEO
- Bob Bemer — Chief Scientist
- Roger Hughes — CFO and COO
- Chuck Harvey — Chief Technical Officer
- Dave Micek — Sr. V.P., Sales and Marketing
- Irv Overman — President of SSA (product development)

BigiSoft

Market Opportunity

- Cost of Y2K problem is broadly estimated at $200B - $1,000B
- Year 2000 Top 5 (projections in millions)
  - Citicorp $600
  - General Motors $410-$540
  - BankAmerica $380
  - AT&T $350
  - GTE $350

BigiSoft

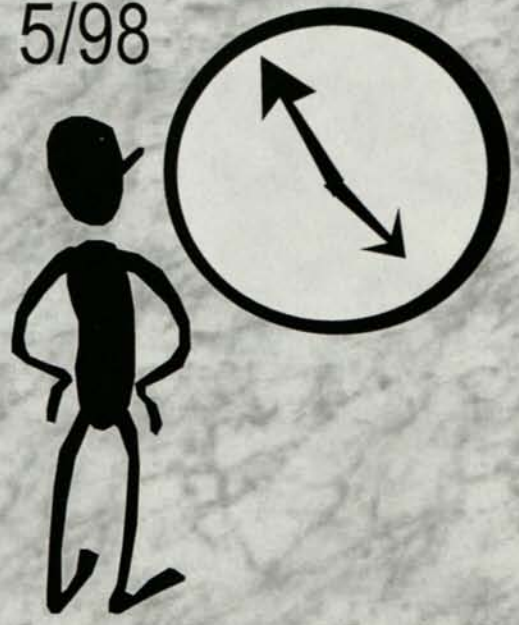
BigiSoft, Inc.

- Founded 1998 in Richardson, TX
  - Acquired assets of BMR Software
  - Unique, patent-pending technology
- Business Strategy
  - Indirect distribution
  - Outsource where possible
  - High quality image
  - Privately held for now
  - Lean and mean

BigiSoft

Availability

- ALPHA testing began 1/98
- BETA testing began 3/98
- Batch and CICS commercial release 5/98
- BETA opportunities available directly from BigiSoft
- Commercial contracts available through licensed distributors



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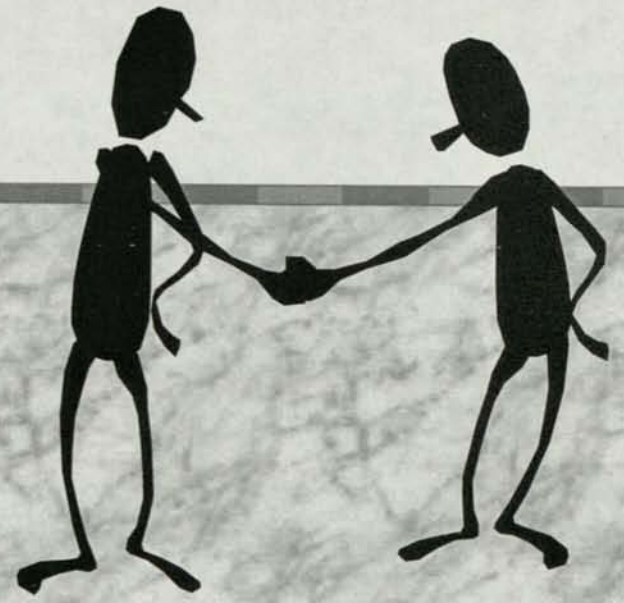
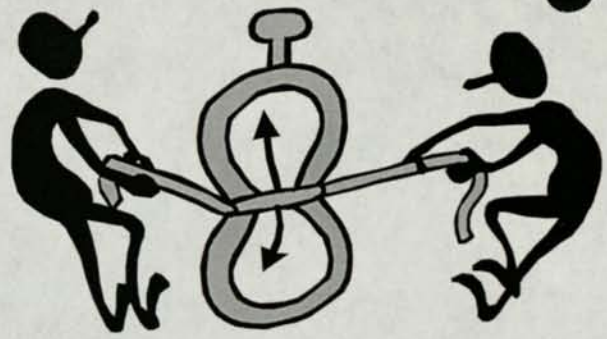
Pricing



- Per CPU group pricing
- Initial License, Quarterly fee
- Volume Discounts
- Pricing escalates over time
- Early Adopters receive additional benefits
  - Priority support
  - Priority on requested enhancements
  - Priority for user group meetings
  - Lowest prices

Bigisoft

Specifications

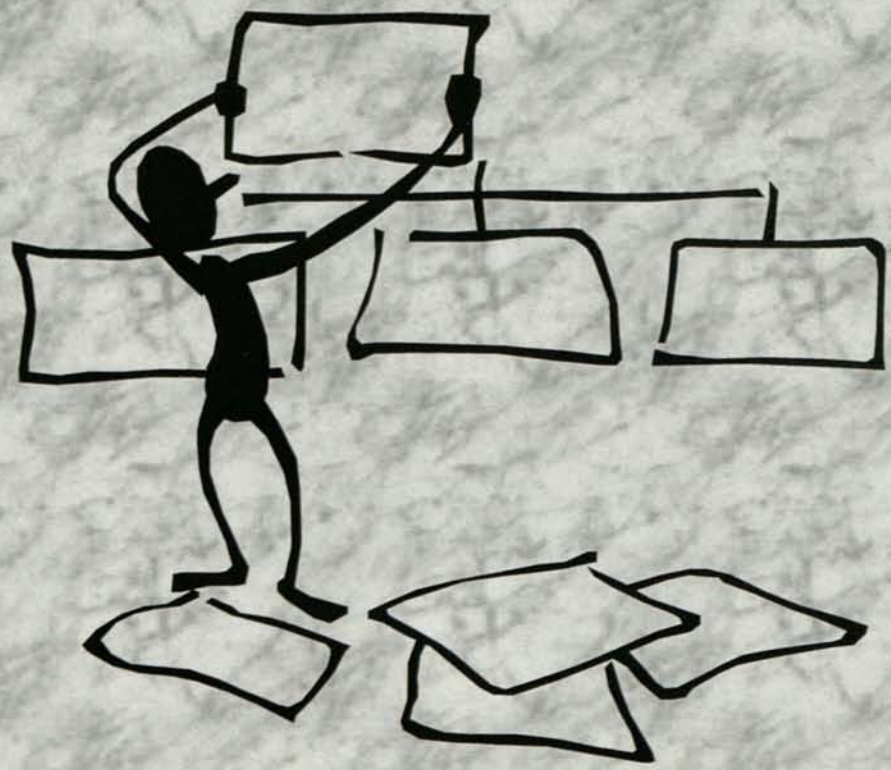


- MVS Mainframe Legacy Systems
  - BATCH, TSO or CICS
  - COBOL II
  - CICS release 1.7 or later
  - Database systems - IMS, VSAM, others
- Near Future Releases
  - OS/VS COBOL
  - IMS DC
  - Other Data Bases, common utilities

BigiSoft

Enterprise Solution

- **Vertex 2000™** hits at the heart of legacy mainframe applications



BigiSoft

Growing Industry Awareness

Vertex 2000™ is a nice solution that helps companies manage their well-written programs.

It buys a company time so it can get through the initial crisis of Y2K compliance...."

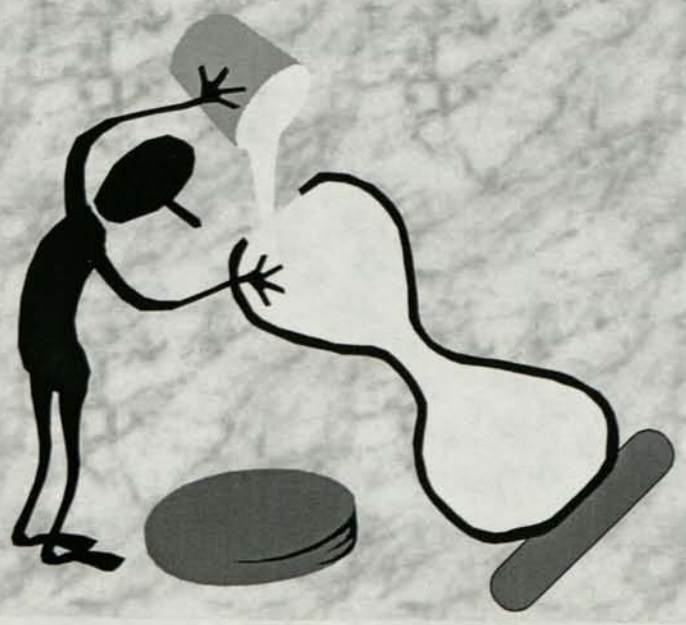
Jim Duggan, The Gartner Group

Bigisoft

Risk Reduction

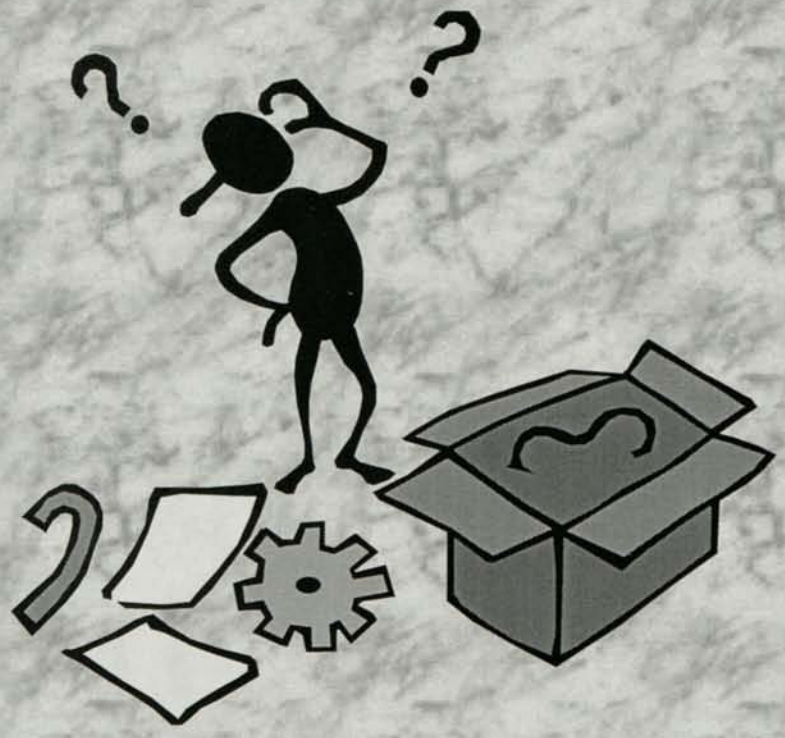
"[object code remediation]... has the advantage of not requiring any potentially hazardous changes to the aging legacy applications or to data bases."

Capers Jones



BigiSoft

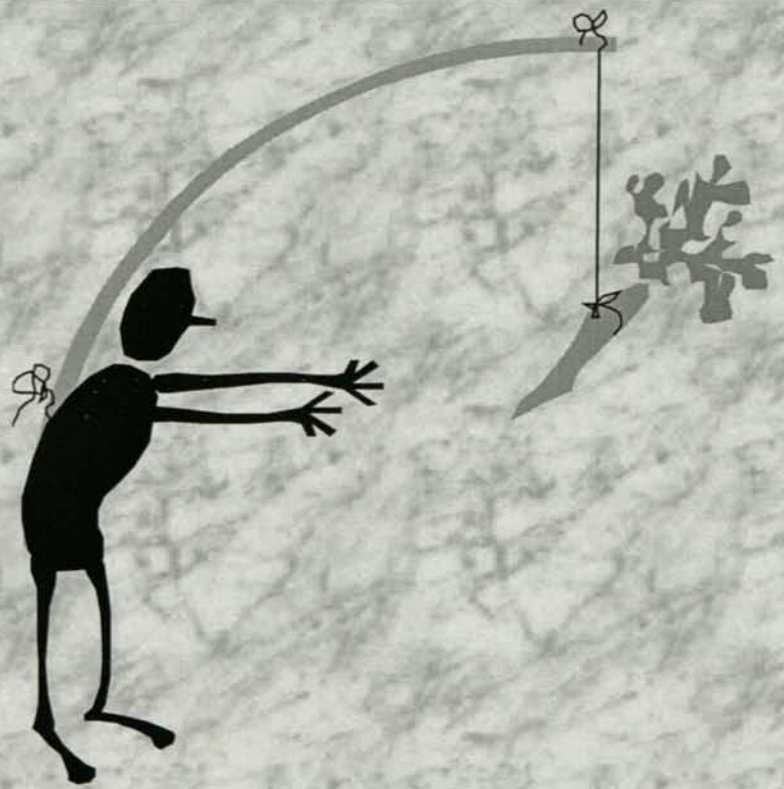
Source code missing?



Vertex 2000™ is the *only* option

BigiSoft

Programmer gone?



Vertex 2000™ is the *better* option

BigiSoft

Vertex 2000™ is "Deadline Insurance"

- Reduces the workload by ~90%
- Focuses resources on mission-critical systems
- Reduces deadline risk and testing time
- Postpones the deadline to fix non-critical systems
- Fastest available method

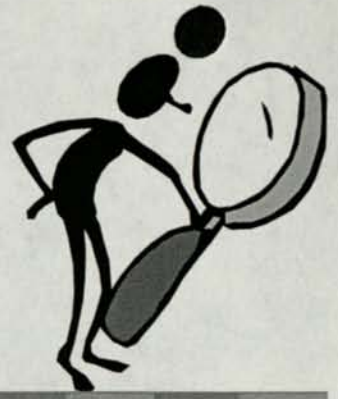
Bigisoft

Vertex 2000™ product contents

- **Utility set** (continued)
  - **General Information Document**
    - documentation for managers and executives.
  - **User Guide**
    - documentation for the implementor of the product.
  - **Installation Guide**
    - instructions for the installation and tuning of the Vertex 2000 product.
  - **Diagnostic Guide**
    - documentation to assist the user diagnose and remedy common errors

BigiSoft

Vertex 2000™ product contents



- **Utility set** (continued)
  - **Print Utility**
    - an automated converter of print files from bigitized data to print data.
  - **CICS Map Data Maintenance**
    - a CICS transaction used to help the user convert BMS maps to use bigits.
  - **Installation JCL**
    - all JCL needed to install and verify Vertex 2000.
  - **Sample JCL for all components**
    - all JCL needed to utilize the Vertex 200 product.

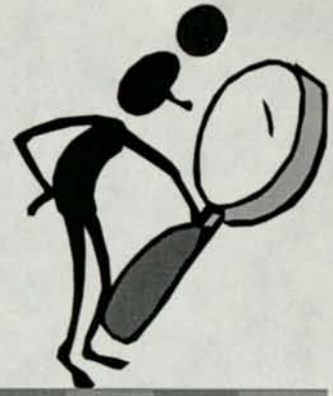
BigiSoft

Vertex 2000™ product contents

- **Utility set** (continued)
  - **Callable Bigit handler API**
    - the Application Programming Interface needed to convert non-COBOL languages and code to use bigit methodology.
  - **Replaced Instruction Table (RIT) Editor**
    - a tuning utility to remove replaced instructions that do not affect dates.

Bigisoft

Vertex 2000™ product contents



- **Vertex 2000** offers a user-friendly interface to run the fully functional utility set created to implement the Bigit solution.
  - **The Enabler for COBOL II**
    - the object-code scanner and instruction replacer.
  - **V2K Virtual Machine**
    - the runtime emulator that executes "Bigit" arithmetic.
  - **Bigit Encoder/Decoder Utility**
    - the "bigitizer" utility that converts 2-digit dates to bigits on user data files.

Bigisoft

Vertex 2000™ from 20,000 Feet

- **Ver**tical **Ex**tension makes 2 digit dates act like 4 digit dates, thus the name, **Vertex**.
- Vertex 2000 uses Bob Bemer's patented method of Bemer Digits (Bigits) which vertically extend the date
- A Bigit is a code placed in "wasted space" in the IBM computer definition of a number
- Vertex 2000 traps computer instructions that find "bigits" and computes the date correctly

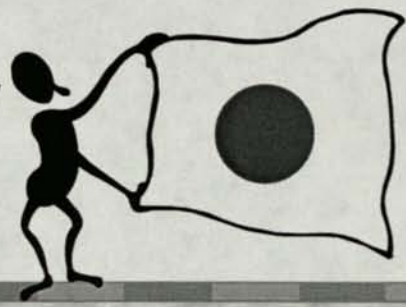
BigiSoft

"Your millenium problem is mine."

- Latin America
  - Skilled Mexican and Colombian programmers are moving to the US for 5X salary raises.
  - "A lot of [Latin American] countries are toast and don't even know it yet."
    - Dr. Ed Yardeni
- The "Third" World
  - "Don't worry. We are prepared to spray for it everywhere."
    - related to a US Foreign Service Officer upon inquiring of Y2K readiness in an unnamed developing country

Bigisoft

"A false sense of security"



- Asia Pacific -
  - Asian calendars cause a "false sense of security" e.g. it's 2541 in Thailand and 1987 in Taiwan
  - Most are suffering from reduced resources to repair due to recent financial reversals
  - "Asian companies are much less prepared. Their understanding of the problem is, 'It's not such a big deal, we'll cope with it at the end.' Now they have no options."

Peter Walker of AT Kearney Singapore

Bigisoft

It's a worldwide problem...

- USA
  - 80% of major companies have a plan, but few are nearing completion
  - If the bug bites Bolivia, the USA will feel it
- Europe
  - In Germany only 8% of major companies have a formal program
  - "The millennium bug is one of the most serious problems facing …the global economy today."

British Prime Minister Tony Blair

BigiSoft

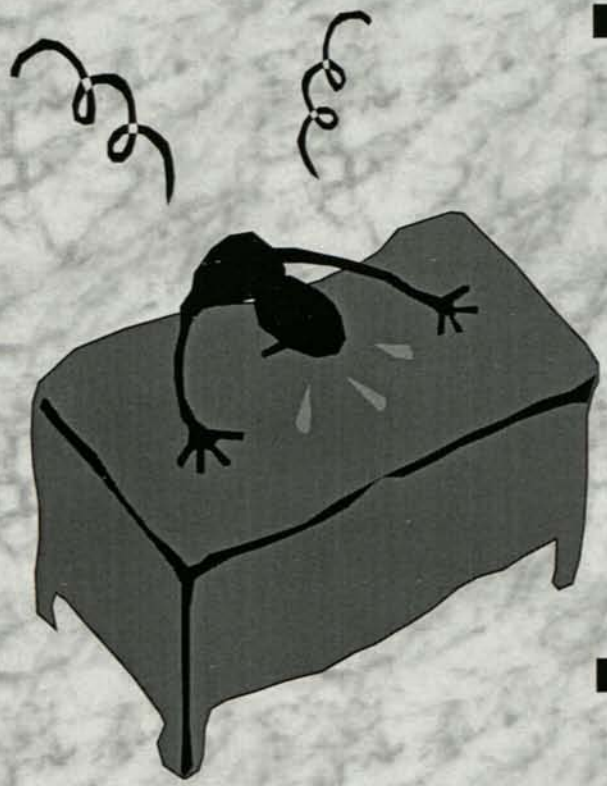
"Inevitable difficulties"

"We had a very major bank in the city of New York a number of years ago, whose computer went out. …the Federal Reserve had to lend them over $20 billion overnight. "

Alan Greenspan testifying before Congress, 2/24/98.

Bigisoft

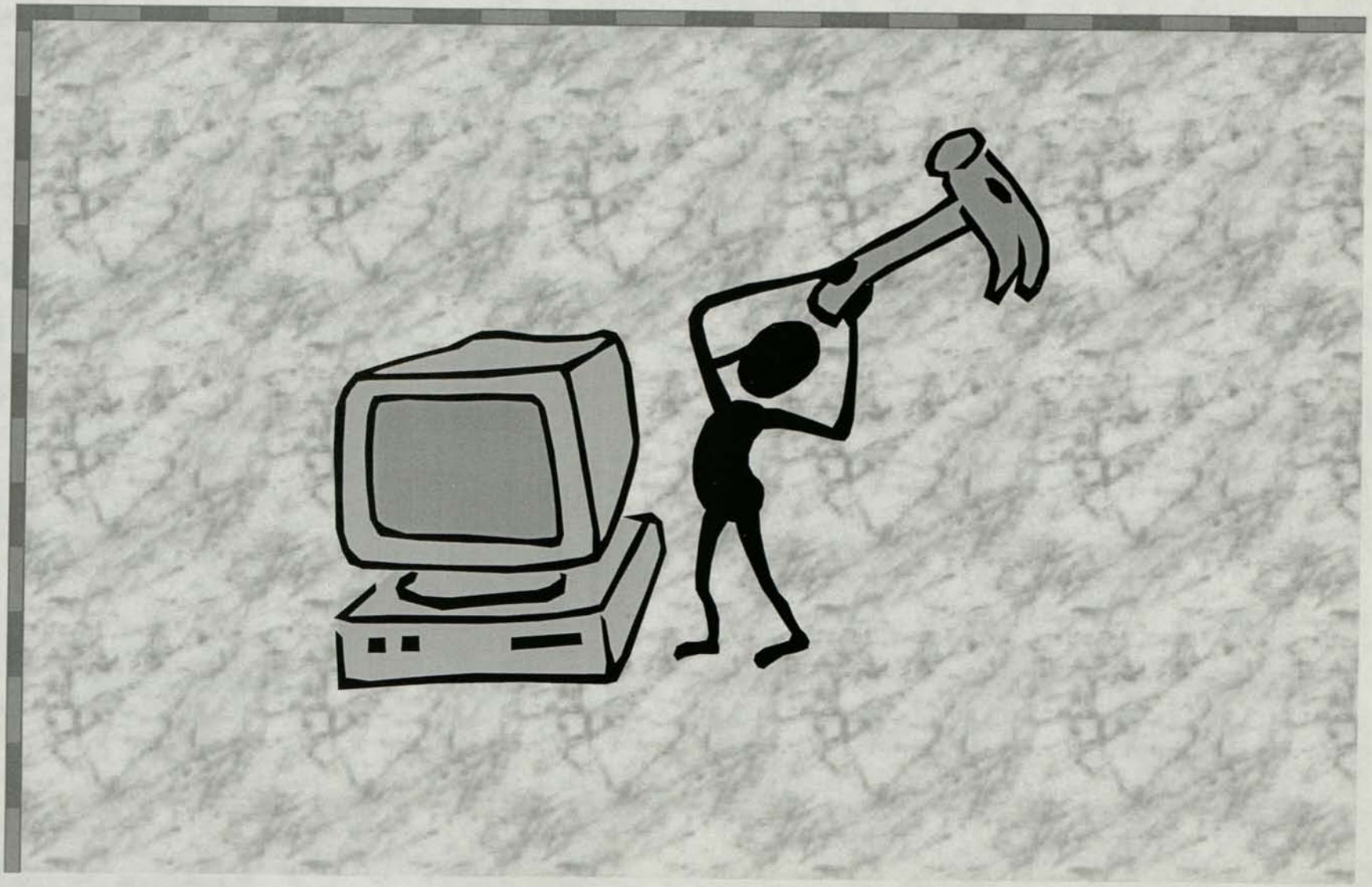
Classic case of guaranteed failure



- According to Dr. Yardeni, the US government approach has the following characteristics:
  - Decentralized
  - Uncontrolled
  - Undisciplined
  - Unaccountable
- As usual, they have appointed a committee.
- In other words, no help is available from Washington

BigiSoft

Will your customers remain loyal?



BigiSoft

It's a major business problem

- *Time is the issue….*
  - This deadline isn't movable.
  - We are already out of time to solve the problem using conventional techniques
  - Companies that fail to make the deadline will be "roadkill". (ABC News, World News Tonight)
  - Company officers may be held personally liable for failures.
- *Loss of public trust is a major risk.*

BigiSoft

Chaos coming?

"We fear that governments lag in assessing and addressing the problem. [Disruptions will result in] delays in welfare payments, the triggering of financial chaos by a breakdown in revenue collection and debt management, and malfunctions in air traffic control and defense systems"

Financial Times, 1/13/98

Bigisoft

It's April at the IRS

"The most compelling thing by far is fixing the computers so they don't stop working on January 1, 2000. If we don't fix (them) …the whole financial system of the United States will come to a halt."

Charles Rossotti

IRS commissioner

"USA Today" 4/2/98

Bigisoft

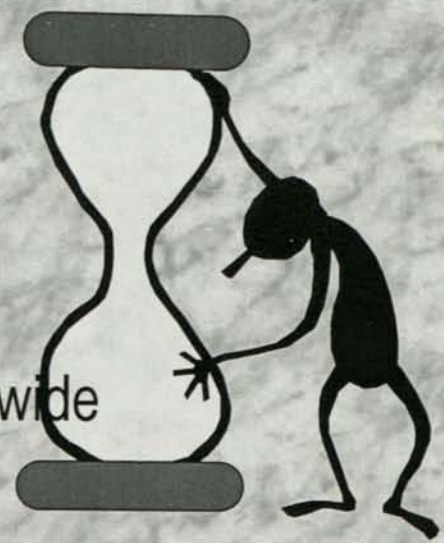
The Y2K Bug

- The Y2K Bug is everywhere.
- At-risk global networks include:
  - electrical power systems
  - telecommunications
  - manufacturing
  - retail and wholesale distribution
  - finance and banking
  - government services (including taxation)
  - military defense
  - international trade

BigiSoft

...with major consequences

- Trivial Problem?
  - For most software, hardware and microchip controllers the 00 representing the year 2000 is less than the 99 representing the year 1999
  - 2000 - 1999 = 1
  - 00 - 99 = -99
- Overwhelming Consequences?
  - Massive disruption of information flow worldwide
  - Consequent economic activity slowdown
  - The "domino effect" of corrupted information
- It's called "the Y2K or Millenium Bug"

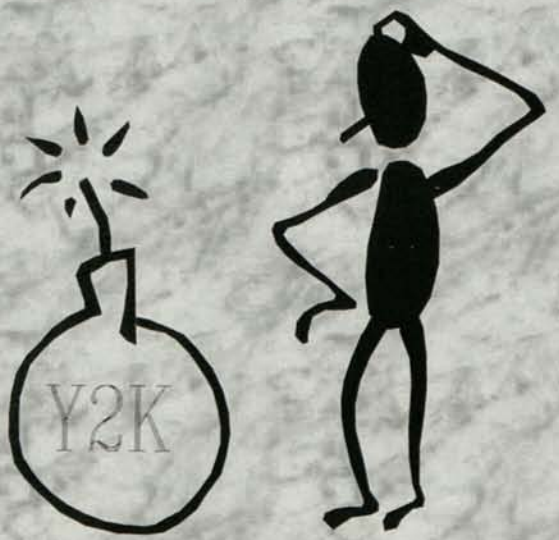


BigiSoft

We have a little problem....

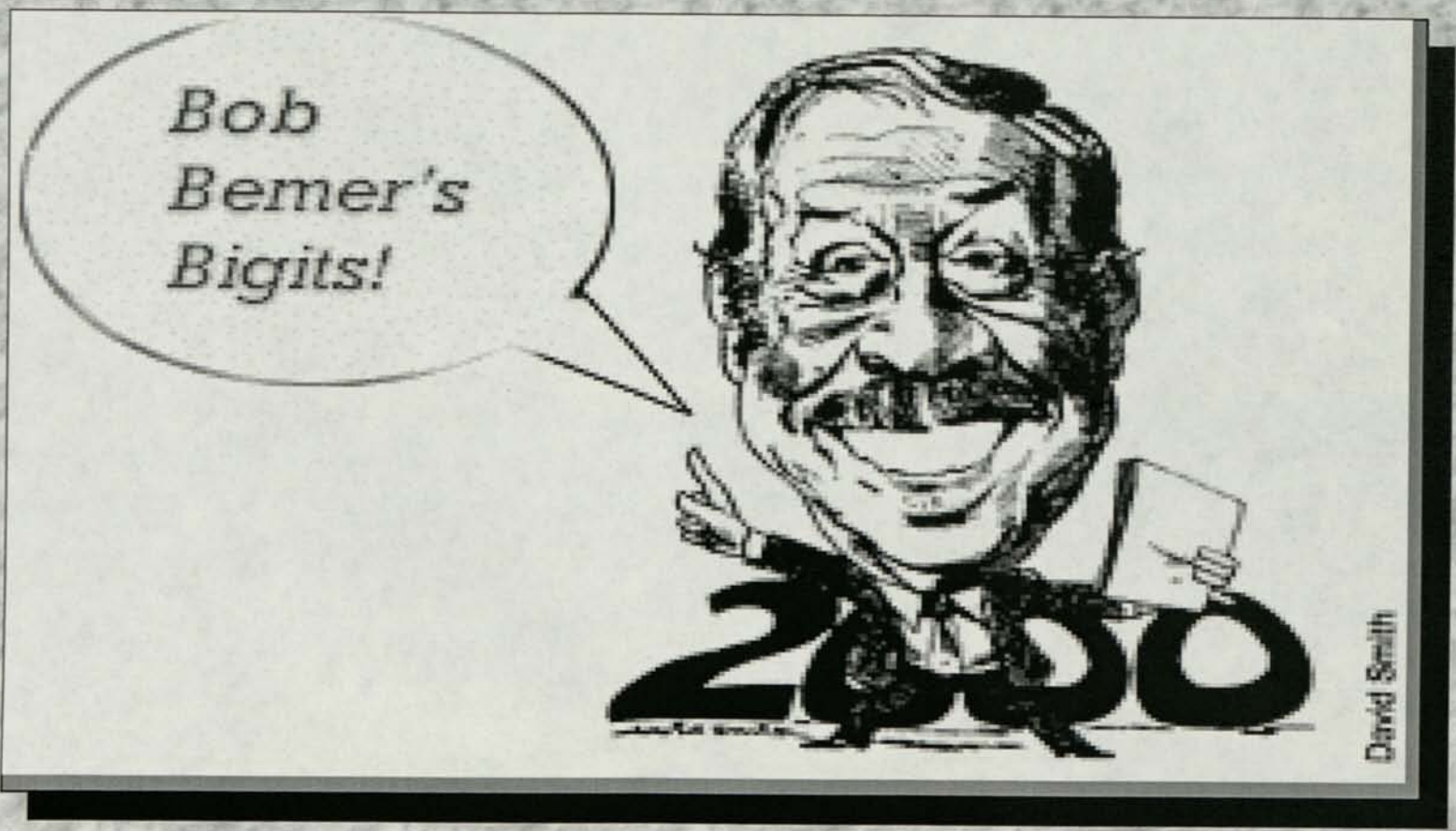
"We have an apparently trivial problem with overwhelming consequences."

Dr. Edward Yardeni
Chief Economist,
Deutsche Morgan Grenfell



BigiSoft

Vertex 2000™



WASHINGTON D.C. YEAR 2000 GROUP
P. O. BOX 9894, WASHINGTON, DC 20016
WDCY2K@BFWA.COM
HTTP://WWW.BFWA.COM/BWEBSTER/Y2K

THE ESTIMATED IMPACT OF THE YEAR 2000 PROBLEM IN THE UNITED STATES

A SURVEY OF THE MEMBERSHIP OF THE WASHINGTON D.C. YEAR 2000 GROUP

RELEASED 21 APRIL 1998

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ABSTRACT

A survey was sent via e-mail to the notification list of the Washington D.C. Year 2000 Group (over 700 e-mail addresses) in March of 1998. The survey asked the recipients to estimate the impact of the Year 2000 problem within the United States on an escalating scale of 0 to 10, with definitions given for each value, and to identify their type of organization (government, corporate, military, etc.) from a given list. The respondents could add optional comments. The survey was anonymous. Over 230 responses came back, of which 229 provided the requested data. The results show two-thirds believe that there will be at least an economic slowdown; over one-half think there will be a mild recession; over one-third think there will be a strong recession and local social disruptions; and a tenth believe there will be an economic depression and widespread failures in infrastructure, supply chain, and social cohesion.

THE SURVEY

On March 3, 1998, Bruce Webster sent out an e-mail message[1] to the notification list of the Washington D.C. Year 2000 Group (WDCY2K). This list contained at that time well over 700 e-mail addresses of individuals who are notified about the meetings and other activities of the WDCY2K. The overwhelming majority of these individuals deal with Year 2000 issues in their respective organizations at some level: workers, technical managers, high-level managers, consultants, vendors, lawmakers, and so on. The stated intent of the e-mail was to conduct a survey of the notification list membership as to what they thought the impact of the Year 2000 problem would be within the United States.

The survey asked the recipients to identify themselves as belonging to a particular category: corporate/business; government; military; educational; organization; consultant/analyst; Y2K vendor of products or services; legal; press; recruiter; other. (Due to sparse and ambiguous responses, "press" and "recruiter" were later merged into "other".)

[1] Complete text of the original survey is in Appendix A

The survey then asked the recipients to estimate what they felt the impact of the Year 2000 problems would be within the United States, using an explicit scale[2] of 0 to 10:

SCALE	IMPACT OF YEAR 2000 PROBLEMS WITHIN THE UNITED STATES
0	No real impact
1	Local impact for some enterprises
2	Significant impact for many enterprises
3	Significant market adjustment (20%+ drop); some bankruptcies
4	Economic slowdown; rise in unemployment; isolated social incidents[3]
5	Mild recession; isolated supply/infrastructure problems[4]; runs on banks
6	Strong recession; local social disruptions; many bankruptcies
7	Political crises; regional supply/infrastructure problems and social disruptions
8	Depression; infrastructure crippled; markets collapse; local martial law
9	Supply/infrastructure collapse; widespread social disruptions and martial law
10	Collapse of U.S. government; possible famine

[2] Impact scale derived from possible Y2K consequences outlined in "How Serious is the Year 2000 Software Problem", Capers Jones, 11/29/98.

[3] "social incidents" and "disruptions" have to do with demonstrations, work stoppages, strikes, organized vandalism, looting, and riots

[4] "supply/infrastructure problems" have to do with food shortages, fuel/heating oil shortages, disruptions in public utilities (power, gas, telecom), disruptions in transportation (airlines, trucking), and so on.

Table 1. Levels of impact in the WDCY2K survey.

The recipients had the option of appending any comments they wished to clarify or elaborate on their choice. They were told that their responses would be kept confidential, which they have.

The survey was sent out on March 4th to the e-mail addresses that then constituted the WDCY2K notification list. One week later, a follow-up message was sent, encouraging the recipients to respond to the survey. The survey was closed at the end of March. During that time, over 230 responses were received, 229 of which contained the requested information. In some cases, the category of a given response (government, etc.) was changed to more closely reflect the intent of the survey.

THE RESULTS

Table 2 (below) contains the responses to the survey. Each entry in the body of the table indicates how many individuals within that category (row) predicted a given level of impact (column). The right side shows the total number of respondents in that category and the average impact voted. The bottom rows show the number of respondents for each level of impact, what percentage of the total response that represents, and the percentage of the total who votes for that level of impact or higher. Where an individual gave a range of values, the lowest value was the only one tabulated.

WASHINGTON D.C. YEAR 2000 GROUP
MEMBERSHIP SURVEY ON YEAR 2000 IMPACT IN THE UNITED STATES

Last update:
4/1/98 12:00 PM

	Level of Impact (see scale)												
Respondents	0	1	2	3	4	5	6	7	8	9	10	TOTAL	AVG
Other				1						1	2	4	8.0
Legal		1		1			2	1		1		6	5.3
Educational				1		3	1		1	1		7	5.9
Organization			2	5	1	2	1	1		1		13	4.2
Military		1	4	2	4	7		2				20	4.0
Y2K Vendor			4	6	2	3	3	11	1	1		31	5.2
Government		1	6	7	4	9	4	3	3	4	1	42	5.0
Corporate	1	3	8	11	3	12	3	7	1	2		51	4.3
Consulting	1	1	3	8	8	14	6	10	2	2		55	5.0
TOTAL	2	7	27	42	22	50	20	35	8	13	3	229	4.8
Percent of response	1%	3%	12%	18%	10%	22%	9%	15%	3%	6%	1%		
Cumulative % (up)	100%	99%	96%	84%	66%	56%	34%	26%	10%	7%	1%		

Table 2. Results of the WDCY2K survey.

For example, Table 2 shows that eleven (11) people identified as belonging to corporations responded with a prediction that the level of impact would be 3; that there were a total of 51 corporate respondents, and that their average vote was 4.3; that 42 people voted for an impact of 3, which represents 18% of the total responses; and that 84% of the total response was for level 3 or higher.

ANALYSIS AND OBSERVATIONS

The most obvious conclusion from the survey is that the overwhelming majority of the respondents believe that the United States will experience a significant economic impact from the Year 2000 issue. Correlating Table 1 and Table 2, we find the following:

- 84% believe that it will trigger *at least* a 20%+ drop in the stock market—over 1800 points in the Dow Jones Industrial Average, given its current levels—and some business bankruptcies.

- Two-thirds (66%) believe that it will cause *at least* an economic slowdown, a rise in unemployment, and some isolated social incidents.

- Over half (56%) believe that it will *at the least* result in a mild recession, isolated infrastructure and supply problems, and some runs on banks.

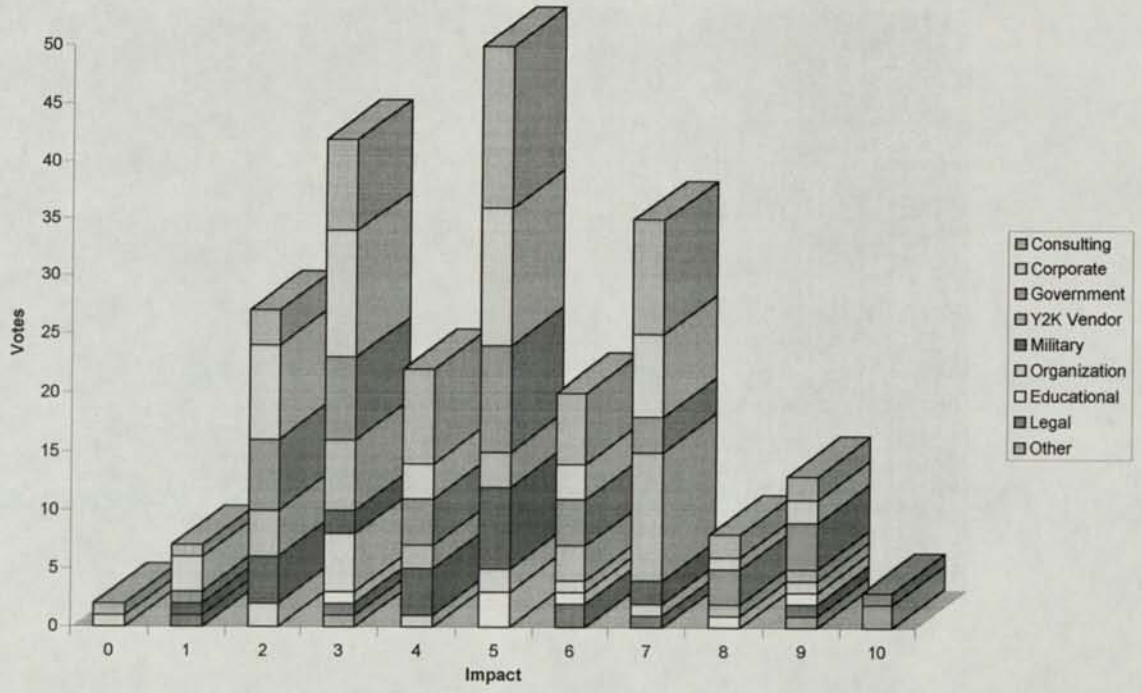
- One-third (34%) believe that it will *at the least* result in a strong recession, local social disruptions, and many business bankruptcies.

- One-fourth (26%) believe that in additional to all the above, the Y2K problem *will at least* result in political crises within the United States, regional supply and infrastructure disruptions, and regional social disruptions.

- One-tenth (10%) believe *at least* that the United States will suffer another depression (or worse), that financial markets will collapse, that the national infrastructure will be crippled, and that martial law will be declared in some local areas.

A graphical representation of the survey results can been seen in Figure 1 (below).

Figure 1. Year 2000 Impact Survey Results

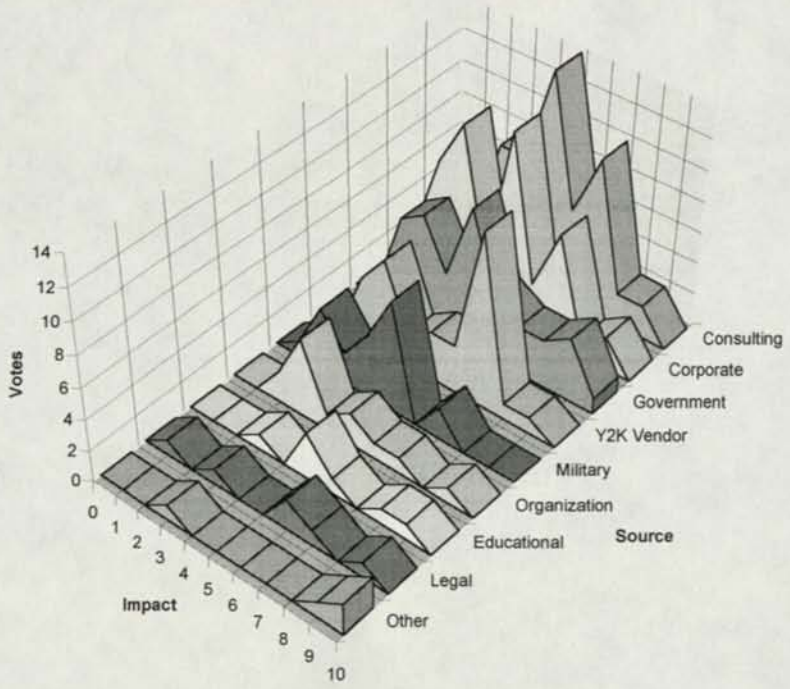


The overall shape of the graph roughly follows the bell curve of a normal distribution. One curious aspect of the results, though, is that there were relatively few votes for the 4, 6, and 8 levels of impact, while 2, 3, 7, and 9 were high. It is unclear whether this is due to the wording of the respective levels, a general propensity to focus on odd numbers rather than even numbers in a 0..10 ranking, or some other factor(s).

Appendix B has specific comments from the respondents. These comments are sorted by impact level and identify the type of organization to which the respondent belongs. To get a better idea of the organizations that these members represent, you can visit the list of attending organizations on the WDCY2K website (http://www.bfwa.com/bwebster/y2k/members).

Figure 2 shows the results broken down by category of respondent. This projection has been done to help show the distribution of votes for each category vs. the overall distribution of votes.

Figure 2: Year 2000 Impact Survey Results by Category



Due to the smaller sample size for each category, we must be careful in putting too much weight on a specific distribution of results. That said, we can make a few interesting observations:

- The military (including defense organizations) were the most "conservative" group in the entire survey, that is, the group predicting the least impact (average score was 4.0). Indeed, it was not until very close to the end of the survey period that anyone in the military category voted for an impact greater than 5.

- While vendors of Y2K products and services have a strong peak at 7 (one-third of the total vendor responses), roughly the same amount (another third) felt the impact would be a 2 or a 3, and less than 10% (2 out of 31) thought the impact would be higher than 7. This undermines to a degree the frequent claim than those who hype the consequences of Y2K are only those who stand to profit from it.

- Another curious observation that the single most pessimistic group was found among those involved in government work of some kind. Of the 24 respondents voting for an impact in the range 8-10, one-third (8) were in government.

- The responses from both corporate and consulting sectors followed a distribution very similar to that of the overall group, with the consultants being a bit more worried about the Y2K impact.

CONCLUSION

Those observations having been detailed, a caveat is now in order. Polls and surveys do not establish facts, predict the future, or fix probabilities. They merely report how the surveyed group of people happened to respond to the question(s) put to them. As such, the results above are not actual probabilities of the associated consequences. They are just the collective guesses of a particular group of people at a particular point in time.

What makes these results of interest, however, is that these people for the most part work on or otherwise deal with the Year 2000 issue day in and day out in a wide range of organizations, settings, and levels. Collectively, the respondents probably know as much or more about the realities of the Year 2000 situation than any other group of people one could assemble. In that light, these results—and the supporting comments volunteered by some of those surveyed, found in Appendix B—reflect as informed and broad-based an opinion on the subject as one is likely to get at this point in time.

In that light, it is clear that the United States faces potentially significant economic and social consequences from the Year 2000 problem. Therefore, appropriate steps must be taken by organizations—government, business, and social—at all levels to minimize those consequences and prepare for those contingencies that cannot be avoided.

It is our intent to conduct follow-up surveys of the WDCY2K Group in the future, both to track changes in opinion as experience increase and to capture the impact that this initial survey might have had upon the membership.

ABOUT THE WASHINGTON D.C. YEAR 2000 GROUP

The Washington D.C. region represents a unique and critical confluence of major government, military, educational, financial, technical, policy, and business organizations. All these enterprises have the potential to be heavily impacted by the Year 2000 issue; in many cases, that impact could ripple out through the rest of the country and even through the world.

The purpose of the WDCY2K Group is to bring together the leaders and decision makers from those groups who have Year 2000 responsibility or who are in a position to influence public and private policy on Y2K, so that we can share insights, problems and solutions. It is not a trade show, conference, or vendor exhibition, nor is it a commercial organization. It is being sponsored by the Fannie Mae Corporation as a service to industry and government in the Washington D.C. region.

The WDCY2K Group holds meetings monthly in Washington, D.C. There are currently about 1000 e-mail addresses on the WDCY2K notification list, and attendance at each meeting is about 250 people. For more information, visit the WDCY2K web site at http://www.bfwa.com/bwebster/y2k or contact Bruce Webster at bruce_webster@fanniemae.com or 202.752.3979.

APPENDIX A: TEXT OF YEAR 2000 IMPACT SURVEY

Below is the complete text of the e-mail sent out to the WDCY2K notification list on March 4, 1998. Note that though the text estimates that there are some 400-500 addresses on the notification list, an actual count made in early found almost 1000 addresses on the list—which means that there were probably well over 700 addresses at the time of the survey.

```
From: Bruce Webster <g8ubew@fanniemae.com>
Date: Wed,  4 Mar 98 12:59:44 -0500
To: WDCY2K@fanniemae.com
Subject: WDCY2K SURVEY: Estimation of Year 2000 consequences

To the WDCY2K Group:

For some time, I've wanted to repeat formally a survey that I did informally back
in the October meeting, a poll to see what you think the impact of the Y2K issue
is likely to be here in the United States. In light of Sen. Bennett's visit and
some of our subsequent planned meetings, I'd like to get as complete a feedback
from all of you as I can, so please take a minute to respond to this message.

Recognizing that this is a multi-dimensional and global issue, I'm nevertheless
going to limit it to the United States and squeeze it down to a 0..10 scale, this
time with the definition of each level spelled out a bit more and escalating a bit
more quickly. I'm adapting these consequences from the table of Year 2000
consequences given in Capers Jones's white paper, "How Serious is the Year 2000
Software Problem?" (Nov 29, 1997; contact www.spr.com for more details). I've set
up the scale to produce what I think will be a normal (bell curve) distribution,
so it'll be interesting to see the actual results.

NOTE: I _know_ these levels are arbitrary and that you may foresee a different mix
of events, but do your best to pick what you think is the best representation of
what you think the impact will be. Recognize that each level assumes the relevant
consequences of all lower levels. Based on response and interest, we may do a
later survey that lets you choose level of impact for each of a series of areas
(political, economic, infrastructure, etc.) and that addresses global issues.

What I ask from each of you is just two pieces of information: a categorization of
your background from the list provided (the survey will be anonymous; I will
delete each e-mail response after logging the information) and the level from 0 to
10 representing your best guess as to the overall impact. You may add optional
comments to expand or clarify, but keep them clear and concise, please.

INSTRUCTIONS: reply to this message, but please delete all extraneous text that's
copied in (everything up to the line below); likewise, delete all the categories
and consequences except the relevant one for each. Add any comments or
clarifications. Send it back.

When this is done, I will compile and distribute the results. We have between 400
and 500 people on our WDCY2K notification list, the vast majority of whom deal
with this problem daily, so I think the results of this survey carry some weight.
Thanks!  ..bruce..

Bruce F. Webster, CTO, Object Systems Group
Member, Fannie Mae Year 2000 Team
Chair, Washington DC Year 2000 Group
email: bruce_webster@fanniemae.com
voice: 202.752.3979
pager: 800.516.3358
web:   http://www.bfwa.com/bwebster/y2k
```

```
====================== DELETE UP TO THIS LINE ============================
CATEGORY (pick one; delete the rest):
Corporate/Business (non-Y2K)
Government
Military
Educational
Organization (e.g., a .org domain)
Y2K Product/Tool/Services Vendor
Consultant/Analyst/Consulting Firm
Legal
Press
Recruiter
Other

IMPACT IN UNITED STATES (pick one; delete the rest; see notes below):
0  No real impact
1  Local impact for some enterprises
2  Significant impact for many enterprises
3  Significant market adjustment (20%+ drop); some bankruptcies
4  Economic slowdown; rise in unemployment; isolated social incidents
5  Mild recession; isolated supply/infrastructure problems; runs on banks
6  Strong recession; local social disruptions; many bankruptcies
7  Political crises; regional supply/infrastructure problems, disruptions
8  Depression; infrastructure crippled; markets collapse; local martial law
9  Supply/infrastructure collapse; widespread disruptions, martial law
10 Collapse of US government; possible famine

COMMENTS (be concise and clear):

====================== END OF SURVEY ============================
NOTES:
-- "supply/infrastructure problems" have to do with food shortages, fuel/heating
oil shortages, disruptions in public utilities (power, gas, telecom), disruptions
in transportation (airlines, trucking), and so on

-- "social incidents" and "disruptions" have to do with demonstrations, work
stoppages, strikes, organized vandalism, looting, and riots
```

A week later, a second e-mail was sent out, making a "last call" for survey results and asking specifically for responses from those were not inclined to do so. The message indicated the number of responses to date by category, but gave no indication as to what the nature of the responses had been. While we did not keep specific track of the responses before and after this second request, we observed that the subsequent responses were more "conservative", that is, they tended towards the low end of the impact scale. A total of 148 responses had been received before the second call; another 85 were received afterwards. A few of the responses didn't give usable answers and so were not counted in the table above, resulting in a total of 229 tallied responses.

APPENDIX B: COMMENTS FROM SURVEY RESPONDENTS

In the Year 2000 Impact survey, the respondents were given the option of including anonymous comments to explain their answer or otherwise make observations on the Year 2000 issue. These comments are given below, sorted according to the estimated level of impact (0..10). Some reformatting has been done for purposes of minimizing document length, and spelling has been corrected.

LEVEL 0: NO IMPACT

Consultant/0: This issue has become the focus for free-floating anxieties relating to software (and perhaps to the millennium). However I am glad you are taking the survey and look forward to your results.

Business/0: Our business acts in a tenant/landlord relationship in most of the airports both nationally and internationally. We do not present a threat economically, except to our employees, we have 197 sites and over 22,000 employees. We have taken the necessary steps in preventing business disruption, but find ourselves very dependent on the airlines, FAA, airport authorities, utility companies etc. Our business has a marginal profit margin to begin with, and we seem to be completely dependent on the government agencies (airport authorities, FAA etc.) that are not Y2k compliant and will not be until after the year 2000. The government negligence could cause a rippling effect to our company's profit margin, and not to mention, unemployment factor. If the airport authorities have not yet address the seriousness of the year 2000, and airports close due to safety failures, it impacts our business directly. We are "sitting ducks" at the bottom of the priority and mission critical list for many airport authorities, not to mention dependencies on suppliers of produce, FAA etc.. Would our company be in a position to sue the government agencies for Y2K negligence? Would this also apply toward the airline industry and the FAA?

LEVEL 1: LOCAL IMPACT FOR SOME ENTERPRISES

[No comments]

LEVEL 2: SIGNIFICANT IMPACT FOR MANY ENTERPRISES

Government/2: I do not speak for my organization, simply for myself based on my observations. The strong, prepared enterprises will do well and profit from the mistakes of others. Some businesses will fail, but businesses fail every day for various reasons. Some government organizations will be unprepared, but critical functions will go on. We will not be cowering in the dark and cold. We may find some unexpected inconveniences, but nothing that our social structure can't cope with. Business as usual in that there will be lots of scrambling to take credit for success and assign blame for problems.

Government/2: I believe that we will experience significant impact on all information technology related aspects come year 2000. Systems that were developed 5 years ago might be OK. Systems that were developed 10, 20 years ago are probably undergo extensive re-engineering works to be compliant.

Corporate/2: Impact will be substitution of automated processes by manual processes which will cause a slowdown in some industries.

Vendor/2: If the U.S.A. is one of the leading countries in meeting the Year 2000, yet we must operate in a global economy, what role can/should the government of the U.S. play to mitigate the impacts as well as drive the other countries to take more action to reach compliance in time?

Military/2: Recently retired from DoD. My opinion may not be consistent with present consulting company position. Does not imply doing nothing. Y2K characteristic of future information technological environment adjustments and management challenges. The biggest threat is intemperate, capricious litigation.

Corporate/2: I believe that inside the US, there will be enough financial motivation/forces to ensure that widespread, major disasters do not occur. I believe there will be isolated problems, ranging from inconveniences to near-disasters. I do not believe that any lives will be lost but I do believe that some companies will experience greater negative impacts than others, due to their own doings and/or the doings of those with whom they deal/interface. I also believe that some 'systems' will experience undesirable behavior, in some cases to the detriment of the owner of those 'systems'.

Government/2: I think it's pretty difficult to predict the impact accurately. This is a unique problem, past experience doesn't help much. While I think if the Y2k problem "surprised" the US economy we'd have very serious problems, in fact, this is a clearly foreseeable problem. I'd assume that most organizations have strong incentives to "fix the problem" and that most will. As always, there will be some organizations that fail and that may lead to bankruptcies, but they occur all the time so the impact of a few more is hard to predict. I'd expect a reduction in economic growth and a probable recession between now and 2001 due to all the resources that will be spent on Y2k and draw away from other productive IS work. Still, I think serious social problems are unlikely. Recessions are common (although) less so than in the past but don't lead to social disintegration. Long term Depressions sometimes do.

NOTE: I think your list of choices is confusing. While I do think a recession is likely, I don't feel like that must to be linked with a 20% market reduction. You should make them separate choices! Similarly, I do see a moderate recession but not "runs on banks" or "local social disruptions." Again, I see those as separate choices. I'd choose a "recession" but not the other outcomes you assume they will predict. The last run on banks came during a VERY severe Depression.

Consultant/2: Modified 2. I'd give it a 4. I expect some infrastructure problems - power and telecomm distribution grid, transportation - air and rail in particular. Some security and emergency services problems - 911, police, fire, hospital embedded systems, etc. I consider embedded systems the greatest risk in both the public and private sectors. A lot has to do with what is done to "set the mood". It also depends on what else is happening in the world - i.e. are we at war with Iraq etc. It would be easy to exacerbate the problem. I expect the problems to be more significant outside the US because they are not addressing it yet.

Organization/2: Predictions of impending doom are made from the present perspective and using linear projections of current trends, assuming constant progress and a constant level of remediation. In real life, everything goes in cycles, and the predicted catastrophic course turns out to be a tangent emerging from the true curve of happenings. Also in real life, when things get bad enough, they get more attention, common sense kicks in, and something is done about the matter. When the public's "threshold of pain" is exceeded, priorities change. We'll have disruptions, but life will go on. Most of the hype comes from those who are making a living from disseminating it.

LEVEL 3: SIGNIFICANT MARKET ADJUSTMENT (20%+ DROP); SOME BANKRUPTCIES

Legal/3: Although the problem will be rather severe at the outset, it will likely be resolved for most of the critical resources and functions rather quickly. However, it is likely that some companies will not recover from their failure to adequately plan for this contingency.

Consultant/3: Remember the Titanic!

Consultant/3: I believe there will be some adjustment to the marketplace, but that adjustment may be somewhere between 10 & 15 percent.

Military/3: I think there may be some runs on banks due to the fear of money "disappearing" on 1 Jan 2000. I think this can be avoided with some public education or by banks printing statements on 31 Dec for concerned customers, etc. If the current frantic media coverage continues, large numbers of banking customers are going to want to withdraw their funds prior to Dec. 31 to avoid losing their savings. I hear comments of this nature regularly.

Corporate/3: The outcome might be a bit like the great flood- it will wash away a lot of our dependencies upon systems that we don't fully understand and allow us to start afresh.

Educational/3: I think there will be many bankruptcies and unemployment, but few if any social incidents.

Corporate/3: There is a reasonable possibility of the others 2 or 3 on either side of my answer. The big question, I think, is whether the utilities (electricity, water, telephone) and food distribution systems will work, and we should know that within 6 months according to last month's speakers.

Consultant/3: I think people are starting to get the major issues tackled enough that the world will keep turning.

Consulting/3: Would call this a 3+ rating - difficult to discern between the two rankings-Believe that most companies are underestimating the impact. Also believe that the panic mongers are exacerbating the problem.

Consultant/3: The "impact" categories are too drastic. I think the scale should include only the items you have up to the seventh one, which is probably the "doomsday" scenario. Scenarios 8, 9 and 10 will not occur - the establishment cannot afford to let it occur.

Corporate/3: I see a drop in the market coming as soon as this spring due to the falling value of unprepared companies. I see lots of complete outsourcing of DP by large companies. I see lots of mergers and consolidations among business competitors. By 2001 I see a strong increase in efficiency and an upturn due to 1) economies of scale gained by larger merged companies and 2) the increased use of packaged software which will replace expensive to maintain custom software. But, I see major backlogs in government services until about 2002. I see no increased unemployment at all.

Corporate/3: Businesses which don't effectively address the Y2K problem with the products they sell will be subject to lawsuits, loss of sales. and loss of jobs. I don't believe individual, group and corporate investors are tuned into the risks that their investments have due Y2K problems.

Corporate/3: The impact of Y2K may be even stronger in the rest of the world, particularly Europe and the more advanced developing countries of the world. This in turn may have a negative effect on world trade and world financial markets.

Corporate/3: I believe that this issue will have a significant impact, but that it will be short-lived. Most of the impact will be felt and corrected in the first month, but firms that are poorly prepared are at risk for going out of business. This will also cause an adjustment to the stock market.

Corporate/3: Prediction: The last month of 1999 will represent the most volatile period of financial turmoil the world has ever seen as people scramble to ensure their assets are safe by selling or withdrawing them from institutions. The first week of 2000 will represent the most dynamic market the world has ever seen as those assets flood back into the institutions able to withstand that massive short term cash flow problem. Although some suffering will occur in selected areas, history will record it as an amusing moment, unfortunately discounting the yeoman efforts of the countless professionals world wide who toiled under adverse and stressful conditions to save the world as we have come to know it. In 2000, I suspect many of the unknowledgeable will speculate whether there really was a problem anyway.

Organization/3: Lots of workarounds; people will have to be resilient.

Consultant/3: The significant business slowdown will be problems in exchanging electronic data, even among compliant systems. These problems will be solved on a case-by-case basis, as they fail. It should take

about a year to correct these problems. As a Y2K professional, I am personally staying away, as best as I can, from any devices with embedded chips from December 28, 1999 to January 2, 2000.

Government/3: Foresee significant failures/bankruptcies in small business, especially banks, that have failed to timely implement Y2K remediation strategies. Given our global economy, have major concerns with overseas financial markets that do not seem to have aggressive strategies (especially the diverse communications networks that traverse the globe) for dealing with the Y2K matter. Should be an item of concern that perhaps should be raised at the United Nations.

I also feel that the real danger of Y2K is the strong probability that members of the executive branch will use it as an excuse to ignore the various restrictions placed on them by numerous legal documents. The internet is rife with rumors that the executive branch has already implemented regulations declaring that anyone who prepares for disaster is a "hoarder" and by definition a criminal. True or not, this is exactly the kind of thing we don't need. People should not be punished for taking care of themselves without recourse to a government nanny.

Government/3: There will be a significant impact on the US economy - people are still in 'denial' mode with respect to this problem and its effects. So there will be chunks of the public and private sector which will cease to function in a normal manner.

Other/3: Local disruptions due to power outages and some telecom outages, but not a massive blackout. Some imports could be disrupted that depend upon shipping.

Vendor/3: Not much real data yet on actual tests of problem programs and applications. Seems like a lot of speculation.

Military/3: Am not sure how to respond as far as format is concerned, but here is my response: I feel the impact will be 3 and 7, but not necessarily everything in between. The recovery can be very quick or very long depending on the emotional state of the country. Although these are extreme examples, this is due to the following reasons:

There is a significant amount of hysteria being generated by various speakers, the media and other groups regarding the impacts of Y2K. It makes for sellable newsprint. I recently received a call by an individual who could not sleep at 2AM because of another friend explained there would be a total collapse on a worldwide basis of all electricity, computers, business and banking systems. This individual wanted to know if they should take all their savings and move out to the country. Whether it is real or perceived, this will influence what the public will do before Y2K.

There can be potential for significant political impact if these problems become excessive. There is a very high potential for vulnerability to terrorist/information warfare impacts if they timed problems in conjunction with the Y2K changeover. The terrorists could be long gone before the source of the problem was discovered. Some concerns have been raised regarding missile systems or nuclear systems accidentally firing based on an internal clock going to 000000. Assumption is these issues have been evaluated and this will not have an impact.

LEVEL 4: ECONOMIC SLOWDOWN; RISE IN UNEMPLOYMENT; ISOLATED SOCIAL INCIDENTS

Corporate/4: Due to our current global economy (consider the "Asia crisis" going on now), I am especially concerned with the effects of other countries ignoring this problem.

Consultant/4: Y2K doesn't yet seem to be taken as the most important issue facing industry, or even facing data processing. The choice seems to be risking over-reacting, or risking under-reacting. Most votes seem to be for the latter -- otherwise known as denial. Results will be delivered in about 21 months. Stay tuned...

Organization/4: I think that most big companies will have coped; most government agencies are incapable of coping. There will be bankruptcies, primarily in small businesses; there will be major problems in hospitals and universities. Many small businesses will be badly hurt, even the ones that manage to survive. The non-profit community, for the most part, does not seem to be taking the problem seriously enough. Embedded systems (cash registers, elevators, pacemakers, heart-lung machines) will create havoc.

Vendor/4: Panic in the first half of 2000: among the public who depend on Government support (Social Security Benefits, Unemployment Benefits etc.); among the retired veterans/public who have invested their life savings on stocks, bonds and other avenues. High anxiety due to imaginary and in some cases reported ill-consequences in travel, medical treatment and other vital areas. Severe Unemployment in general labor categories due to mild recession, Business closures, and temporary lay-offs. Temporary shortages of fuels, utilities and the like, resulting in sharp price increases. Chaos in the service industry. Weakening of US Dollar against currencies of nations who have vital natural raw-materials, strong service base and high-end skills. Very sharp increase in market price of skilled technical labor - both domestic and immigrant - until some of the major relevant Y2K problems are solved. Shortages of commodities, consumables and essential goods required for day to day living. Pattern of hoarding and price escalations by a series of business houses. To some degree, upsurge in anti-social elements, crime, arson and very difficult law-enforcement situation. And many more....

Military/4: I hope 4 is the worst.

Military/4: In light of the barely perceived ripple-effects of the Canadian/Northeastern US ice storms, and similar disasters in California's mud-slides and Florida's tornadoes, I think there will be impacts that won't generally be perceptible until the economists analyze the situation and tell us about he overall slow-down and shifts in hot and cold markets. I don't foresee many if any social incidents due the diluted aspect of the events.

Consultant/4: I expect major failures starting in the second half of 1999. I expect most major problems to be solved or worked around by second half of 2000. I expect annoying problems until 2002 or so. The widespread, basic error is a programming statement that includes a logic or arithmetic operation between two dates with unexplicit, different centuries.

Government/4: Economic slowdown for y2k firms after 01 Jan 00. Rise in unemployment of COBOL programmers. Isolated social incidents of Yuppies/Baby Boomers whining that their cell phones don't work

Government/4: Comment on impact - a conservative choice

LEVEL 5: MILD RECESSION; ISOLATED SUPPLY/INFRASTRUCTURE PROBLEMS; RUNS ON BANKS

Consultant/5: When there is thoughtful preparations for 10 and all events listed below then reactions to the event will be dampened as people will know that the plans have been made and widespread panic will not occur.

Government/5: Major political impact on all incumbents and citizen opinion of effectiveness of Federal and State governments – a Libertarians dream come true.

Consult/5: Could easily be a 6 or 7 instead, depending on market psychology more than "reality".

Consult/5: This is a tough call. I'm somewhere between 5 and 8; went with the lower in an attempt to be conservative and not categorize myself as a 'doomsayer'. Also gives me more wiggle room for later. Certainly, there will be some level of disruption, and we just won't know until weeks (or even months) after 'the day' hits.

Consultant/5: I believe Euro conversion will cause major financial problems to Europe & U.S. Y2K will cripple them.

Corporate/5: The government and regulators have an obligation to strongly address the issues in public and quasi public entities. For example: 1) we know today that utilities have an inherent problem in their distribution systems, but no one is doing anything to fix the problem; 2) We know that government agencies are behind in their Y2K projects, additional resource should be applied.

Military/5: I believe that the military will experience isolated problems depending on its defense posture at the time (engaged or not-engaged). If, the military is engaged in action, the impacts could be severe and numerous. Lives could be jeopardized by Y2K issues. The military is doing well in looking at unit and system level items, however the weakness is in its testing of the whole enterprise. Supplier\vendor issues will place a significant burden on its ability to supply and sustain itself. Contingency planning is weak due to the nature of the imposed deadline Dec 1998 placed upon themselves. There is much activity toward putting fixes in place and disregarding contingency planning. However, it is very likely that this will be the focus in 1999.

The level of commitment in the leadership is high and the organization is clear on the mission. The area of greatest focus has been in the weapons system arena. The embedded chips in ammunition, tanks, aircraft, ships, are numerous and there are additional outside influences that impacting them. If they are not fully tested (at unit, system and enterprise levels), a critical device may be impacted and lead to a safety concern or a failed mission.

Consultant/5: Like any catastrophe, those that are prepared will get through with minimal damage, those that are unprepared will suffer greatly. We (USA) are a resilient people; and as there are incidents of catastrophes, as earthquakes, floods, widespread power outages, etc. we as a nation cope very well I believe. This situation, due to the widespread nature and the level of global integration of economies, will bring about a level of cooperation amongst partners and competitors alike that is unprecedented. At least, this is what I hope.

Consultant/5: An urgent need for Y2K labor & materials will be discovered by remiss organizations -- nearly all at the same time, when skilled resources are already committed/exhausted.

Military/5: I believe there will be many supply/infrastructure problems.

Government/5: The recession will be industry specific; some industries will actually benefit from Year 2000. No run on banks. There will be a major backlash against the programming industry which ignored and then profited from the problem. Fortunately, it won't effect their paychecks.

Educational/5: I think there will also be a number of major bankruptcies.

Corporate/5: The media attention being given to the impending Year 2000 impact on daily life will create a self-fulfilling prophecy. This includes runs on financial institutions as citizens follow the advice of the experts to have cash on hand for several months survival. During the months to come there will be an increasing burden placed on all institutions to deal with requests for information about how the organizations are preparing to stay in business for the year 2000. This is being promoted by more than one television program on a regular basis, for example, The 700 Club. We must do all we can to proactively educate the people and continue to work on the fixes and the contingency plans to prevent REAL catastrophes that might be possible.

Military/5: I expect most (many) of the embedded systems to be found and corrected (or at least work-arounds in place) but some will be missed and some will be corrected wrong. The closer the date comes, the more concerned management will be that most will err on the side of caution for the first days. They will realize, some too late, that failure to adequately address the problem in one part of a larger system can have serious repercussions elsewhere. I think that failure at the interface (point of interconnectivity between systems) will be most significant.

Military/5: I'm not sure if I am hoping it is no worse, or simply believe it will be no worse. I believe the government will take strong steps to assure the basic services are available, or at least unavailable for a short period of time. I think there will be pockets in most cities that do not have basic services for an extended time. I believe that there are still people who don't think this is a problem. I don't necessarily believe that doing patches on old programs (windows, bridges, etc.) is a good way to fix the problem. I think we may be increasing our problems in which case the impact "status" of 5 would rise quickly to 7 or 8. Some articles I have seen recently are saying people are not allowing enough time for testing. This is a concern.

Government/5: Six months ago, I would have chosen about an 8, but I am very impressed with the level of awareness now and the efforts being made across many industries, particularly in the large corporations. The key is to accelerate the rate of repair across all size companies. I still remember the time when the country ran itself without automation. I hope that the people running the organizations today can recall what it was like and what they may have to go back to in the event of a shutdown of their systems. That alone should jolt the remaining naysayers to action.

Government/5: I would have gone higher but I expect more impact on economy than on society

Corporate/5: I believe that there will be an supply/infrastructure problem due to the fact that we cannot fully integration test our products through our third parties prior to 1/1/2000. I do not think that we are alone in this problem and thus, it will be a wide spread clean up effort. If we keep finger pointing to a minimum then we can work together and get things cleaned up quicker for the good of the whole.

Consultant/5: I believe there is a significant lack of awareness of the scope of the Y2K problem in small and mid size businesses that are not located in major markets. As an example, I recently spoke to the IS staff of a mid sized manufacturing company in Roanoke, Va. They had decided, without doing a thorough assessment, they had no Y2K problem and therefore had no remediation plans. They had overlooked some of the most basic things such as the PC BIOS issue, and COTS compliance. They had done some testing by changing system clocks, but had done no data aging or regression testing. They had no idea if their suppliers were going to be able to continue to fill their orders and had no contingency plan. Awareness is slowly spreading but for some businesses it will be too little too late.

Corporate/5: Based on personal forecast as well as recent Business Week cover story on the impact of Year 2000 on the nation's economy.

LEVEL 6: STRONG RECESSION; LOCAL SOCIAL DISRUPTIONS; MANY BANKRUPTCIES

Vendor/6: I'm an optimist. My pessimistic side pushed for me to select 7 or even 8.

Government/6: The unknown interrelationships between business areas and market sectors will cause dire consequences. In my role as a government agency Y2k testing coordinator I see a new and different way to "solve" the problem almost every day, yet no one is sponsoring or supporting true interface testing. The side effects of changes will be more harmful than the original problem. Once the media blows the Y2K problem out of proportion, like only the media can, there will be panic that will cause any small problem to be magnified so as to cause total mistrust of technology. This will not be a happy time.

Consultant/6: I am a pessimist. I am also seldom disappointed. I believe the Y2K problem, which could be addressed rationally and solved in the time remaining, will instead be politicized and that the efforts of business and government will be less than effective. Many brave speeches...little impact.

When this is combined with current trends of "It's not my fault...It's their fault...Punish them!" and the higher emotional charge (historically called Millennial Fever) I believe there will be substantial breakdowns in certain areas and that some people will try to take advantage of the confusion for their own gain or sport. For example, many of the people involved in the violence and destruction of the Los Angeles riots would not have recognized Rodney King if they tripped over him.

Consultant/6: I do feel that it is time for programmers to be paid what they are worth. Also some job security after the year 2000. For many of the past few years we have not had many rights in the workforce and have been under appreciated. How long do you think it take for the teamsters to strike if they were not getting time and a half for overtime. Yet for many years no programmer that I know has gotten this and they are expected to put in extra hours. Without us right now working on this problem then most of the worlds computers and programs will have problems. This would most likely mean the collapse of major stock markets and many banks. This would lead to a collapse in the economies of many countries.

Corporate/6: I'm not sure that there will be many bankruptcies, but there will be failures and several distressed companies where layoffs will be required because of distribution, manufacturing or cash flow problems

Consultant/6: The strongest impact will be on those mid sized companies which do not (did not) have the budget or forethought to resolve their Y2K issues. We rely so heavily on those organizations and I do not feel companies are making enough contingencies to protect them from this potential issue. Additionally companies who interface with or rely on international organizations will have a tremendous challenge. Government is not placing enough emphasis or budget on this issue and this will impact the nation as a whole.

Consultant/6: FYI, Usenet newsgroup comp.software.year-2000 has been running a quarterly survey, the results average about 7-8 on your scale. I'd guess that WDCY2K comes in with the same range.

Government/6: Too many uninformed key people not taking any action. The stock market reacts to what it perceives as the future in 6 month not the actual events. Embedded systems are everywhere including 20% of US power plants and are extremely difficult to fix. Communication between Y2K COMPLIANT and non-COMPLIANT computers on a world wide basis is going to fail in many critical areas. ONE POSITIVE factor the internet will be up and running carrying commerce and communication and will be Y2K compliant.

Educational/6: Slow down with Social Security, all retirement funds, and IRS will negatively impact all.

Vendor/6: The infrastructure will be affected by supply shortages of fuels, lack of power (Spotty/localized), inability of local governments to prioritize most needs because of the largeness of the emergency. The durations of services that may be out and the ability of law enforcement to keep a handle on the chaos that results. An inability of most to visualize Y2K as a global problem that will affect everyone in the industrialized world.

LEVEL 7: POLITICAL CRISES; REGIONAL SUPPLY/INFRASTRUCTURE PROBLEMS AND SOCIAL DISRUPTIONS

Government/7: I believe that the expected power grid collapse on the East coast will have a domino effect that will have the stated impact. Americans have experienced no electricity before, however only locally and for short periods of time. This expected blackout will result in a negative effect on each person in America. How long will it be before food spoils in the fridge resulting in food shortages, how long before the car runs out of gas resulting in transportation problems , how long can you work without computers, telephones, lights and heat resulting in no money if you could find what you need. Just stop and think how electricity touches our everyday lives. Without the power grid, life as we know and expect it will not continue after 1/1/2000. However, this is America. We will pull together and attack and fix this problem. We will get back on our feet and many people will be promptly fired and sued for ignoring the problem to a point that allowed the expected temporary grief to happen in the first place. Smile if you wish, I am preparing for self sufficiency!

Corporate/7: Depends on what the FAA is able to do in the next 6 months and if research agencies (Metagroup, Gartner, Forrester) are wrong about utility and Health industry. Disruptions, even if only for a few weeks or months, in these infrastructure areas will cause chaos and panic.

Vendor/7: Our clients range from being very much in control and in time to fix the problem to people who have yet to tackle the bulk of the situation. It is unclear how the situation will play out at the last minute, but if things keep going at the rate it is going now, the U.S. will be severely impacted. The sense of urgency is still not there.

Vendor/7: On the one hand, the US currently runs quite well on computers with an infinite number of existing bugs. On the other hand, these bugs aren't the same one and they didn't occur at the same time, requiring the same limited skill set to resolve. Year 2K is a PEOPLE MANAGEMENT PROBLEM. And it will end cause more problems than it should, mostly because both Government and Industry are dealing with it as though it's normal project - to be evaluated slowly, carefully, taking into consideration all the vendors, making them go through all the normal motions, etc. IT'S TOO LATE FOR THAT! IT'S AN EMERGENCY!

The government should consider immediately forming an agency that immediately hires the thousands of needed skilled resources and vendors, at COMPETITIVE RATES and APPROPRIATE INCENTIVES, to have them available to any government organization who needs them.

Government/7: Where was "all of the above"? Political crises will come in the shape of some of the Defense infrastructure problems. Also, it will "overshadow" the inaugural events of 00, but a plus because this person will be "exhibit" the leadership skill to pull things together nationally after "pockets" of social unrest are isolated. Regionally supply chain problems will occur because "smaller" links will be scrambling to repair/exist/exit infrastructure.

Consultant/7: The government has not yet reached awareness!

Consultant/7: Nothing I can say that can't be sung...

Conslutant/7: Lots of creativity and effort, but too little too late and the utilities and government are in the worst shape.

Corporate/7: What is the government doing to ensure financial market systems will be compliant? (exchanges, broker-dealers, banks, etc.).

Consultant/7: We estimate that no more than 50% of the US companies have a sufficient Y2K activity to make it through the year 2000. From our observations, there are still 20-35% who have not addressed the problem and more than 60% have yet to begin remediation activity. In addition to the software/hardware problems which get the most press, embedded systems will have the most impact. There are too many unknowns in their use and application to everyday things to be effectively corrected in time. Even if the US was able to be 100% compliant, the rest of the world, which we have to interface with, will not be able to provide or receive reformatted data on January 1, 2000.

Consultant/7: Although I do not yet believe that the Y2K software crisis will mean the "end of the world as we now know it", I foresee regional impacts of a severe nature. Those regions most vulnerable are the most densely populated areas, where the supply-chain/infrastructure will be absolutely stretched over a relatively short span of time. I'm reminded of a physics problem where a Heaviside function (abrupt, huge stimulus occurs) and the effects attenuate over a significant period of time (but not immediately). I am becoming more convinced that the unknowable side of the Y2K problem - embedded systems - will be the litmus test of how well or how badly our country fares in the first half of 2000 A.D.

Military/7: The problem is we don't KNOW the magnitude of the problem! Americans are very good problem solvers - once the problem is identified concretely. This problem is an example of chaos theory in practice. We do not have a command economy - the last 30 years of infrastructure - technical, social, financial, etc. were not designed and planned, they grew - organically in response to market opportunities.

The market as it stands - dominated by "quick buck" experts - rewards "first" more generously than "best." "Best" will survive the shakeout better, but the "first" management will learn nothing from it! Sigh.....

Consult/7: Historically, due to the emphasis on dialogue, our political system does little to prepare for impending problems unless the crisis is imminent. The imminence of this crisis will not be fully appreciated until a major infrastructure disruption occurs which affects life or fiscal stability; thereupon political interference will add to the magnitude of the problems and introduce its own dimension. If it were not for this, I would have chosen choice 6 instead of choice 7.

Consultant/7: The harder I work, and the more people I talk to in this industry, the more pessimistic the response ... I waffled between 7 & 8.

Consultant/7: Opinion surveys are interesting, but models of failure scenarios would be more compelling. Particularly in the government, where progress appears to be slow and truth elusive.

Legal/7: As part of the industry team working feverishly to thwart a real crisis, by generating responsible vendor behavior, modifying customer (especially Fed Gov, large institutional [e.g.-bank, investment, telecom, aviation]) expectations and response, and generally avoiding the Bruce Hall/ Lou Marcocio chicken little outcomes, my HOPE is that we are successful and that the real result is somewhere in the 3-4-5 range.

But, as I look at US Gov posture, the naivete of many large corporate I/T users, the European readiness posture, and other tea leaves, I really fear that the outcome will be "worse than 5". Given the cascading nature of phenomena like runs on banks--the herd mentality/feeding frenzy nature of our culture, until the media infrastructure collapses, hysteria will come, "isolated" runs on a few small banks will breed wholesale panic, and with the collapse of confidence in the financial infrastructure will come distribution/transportation failure, which, as the President's Commission blithely points out, will paralyze the rest of essential services of government, health care, etc. and THWACK, you've got a "millenium"--or, put another way, anything 5 or worse won't stop till 9 or 10.

So, we need drastic measures NOW, [emergency supplemental Appropriation for essential government systems {beyond national security, otherwise only the soldiers and cops will have functioning systems}, furlough of thousands of government employees who can't be put to work writing Social Security checks, a PLAN for air traffic, rail traffic, bridges, highways, food supply, pharmaceuticals, electrical power, telecom, etc.] because by the time things get bad enough that the featherbedders in Congress do something about it, they'll be "tits up in the Potomac." I love Sen. Bennett for his foresight, but he's working inside a system that is part of the problem. Where do ya think two digit date fields came from--look at War Department ledgers for supplies during Custer's Campaign!

Consultant/7: Still too soon to evaluate because the awareness level is so low and so few assessments are underway for embedded systems. I expect significant regional power interruptions/reductions in grid supply due to loss of nuclear plant supplies. Impacts in military-industrial complex could be significant. Federal agencies are feeling no sense of urgency for Y2K embedded systems in my opinion.

Vendor/7: a. Expect regional telecommunications outages on the order of days (1-5), regional electrical power distribution outages on the order of weeks (1-5), and air transportation impacts on the order of months (1-5, maybe years). b. Expect items in a. above will interact with one another and drive high demand for repair resources. c. Pray we have a mild winter.

LEVEL 8: DEPRESSION; INFRASTRUCTURE CRIPPLED; MARKETS COLLAPSE; LOCAL MARTIAL LAW

Consulting/8: I foresee the US government instituting a military style draft for IT professionals to assist in the software remediation process. Although it would be politically dangerous, Mr. Clinton, AT THIS TIME, should declare a state of national emergency. Al Gore, the father of the "Information Super

Highway", will soon find that it will dead end on a very high cliff. He will ultimately inherit the blame for the chaos that will undoubtedly occur soon. Why wasn't he on top of Y2k back in 1992-1993?

Corporate/8: How do you declare martial law when the military systems also fail?

Corporate/8: I see this as worst case, but am leaning more and more this way as time goes on and not enough is being done by government to avert the inherent dangers. Additionally, the large majority of people in the United States are still completely unaware of the problem, and if aware, have no idea of the full impact on our lives--especially the effect of the failure of the utilities companies, etc. This will greatly exacerbate the situation and will result in panic and social incidents/disruptions (which I added to the # 8 list).

Organization/8: For want of two digit repairs well tested, the application was lost; for want of the application, the systems were lost; for want of the systems, the EDIs were lost; for want of the EDIs, the networked enterprises were lost; for want of many public and private enterprises, much of the cyber kingdom was lost.

Government/8: Fooling ourselves into believing a "magic bullet" exists only exacerbates the problem. I suspect we are going to be in denial until the end of this year when a lot of systems will start failing.

Government/8: At all levels and all enterprises, Y2K is pretty much a case of "too little, too late" that is going to affect everyone, even those who have completed their own Y2K projects. "Six Degrees Of Separation" is even more true now than when the play was first performed. Nothing the government can do at this point will completely resolve the expected downturn before it happens. I believe that at this point the best thing the Feds can do is encourage decentralized disaster recovery efforts (by decentralized, I mean at the neighborhood level, with the local firehouse or school as the rally point), with the full admission that outside help may be late in arriving if at all. Given the recent performance of FEMA, anything less will not be believed, and giving more money to FEMA is *not* the answer. This is definitely going to be a case where the "Six P's" apply, and the sooner we do the "Prior Planning" the lower the "Poor Performance" level will be.

Vendor/8: I do not think nobody is serious about fixing the problems. As long as we can charge on our plastic cards, we are happy. We think developing countries (Do NOT call them third world countries) have more problems. It is not so. People in those countries know how to write books and do simple arithmetic without much fuss. It is here where we depend on computers so much we face disasters. We have lawyers to make it worse.

LEVEL 9: SUPPLY/INFRASTRUCTURE COLLAPSE; WIDESPREAD SOCIAL DISRUPTIONS AND MARTIAL LAW

Corporate/9: Proper English aside, I cannot tell you how badly I want to be mistaken. FEMA or other gov't agency should be mobilized to begin contingency planning and disaster recovery for basic infrastructure, food and water distribution.

Other/9: Y2K will be a seminal event of the 20th century of the same importance as the two World Wars and the Great Depression. It will be the principal accelerate in the advent of the Information Age which will alter society and government in ways as profound as the American and French Revolutions. Y2K will be a wild ride.

Consultant/9: I think some areas will be infrastructure-wise intact with possible exceptions of petroleum based products might be rationed heavily and shortages there; those areas reliant upon wood generated and hydro-electric utilities that are prepared might be best off. I would have liked to have picked 8.5 or 8.75 as the number I feel is more likely the average. I hope I'm wrong. But available evidence points towards what I picked.

Government/9: I have seen many lies and half truths on this issue in the government agency that I worked as a contractor for until recently. Nobody is really working on the problem the way it needs to be worked on. This is going to be a disaster. Goodbye FDIC.

Consultant/9: Unless the president mobilizes the energies or this country then I believe their is not a chance for the above not happening. The Chief Executive Officer of this country must take responsibility to alert the populace NOW and then allocate resources to ensure that all basic services will work. I sent the President a email saying "that their was no mention of the Y2K problem in the State of the Union message thereby giving a false impression that their IS NO PROBLEM. I strongly suggest that the Federal government make it the only priority of national importance that a clear and precise focus is applied to the testing of basic services in the United States." It is also clear that once the populace believes their is a problem their will be a problem. Think of the economic impact if everyone decides NOT to fly from December 1999 to February 2000. What will happen to the economies of Puerto Rico, Hawaii, and Alaska without air travel? Need we even ask the fail safe status of missiles? The fail safe status of our electrical distribution complex? etc. etc. I have over 35 years of experience in the computer industry and would welcome the opportunity to be of assistance wherever and whenever the country mobilized to address the Y2K problem.

LEVEL 10: COLLAPSE OF U.S. GOVERNMENT; POSSIBLE FAMINE

Other/10: As one who spent an entire year working with Congress and the executive agencies on Y2K issues I have come face to face with complete irresponsibility and fecklessness in the US government. Federal agencies define "mission critical systems" as meeting their own payrolls, not the public's health, safety and well-being. Congress is unable to repair its own million+ lines of code, a direct indication of the paralysis of that institution which is unable to act even to preserve its own ADP capability. The so-called champions of Y2K in the Federal government agencies are mere sloganeers looking to surf on a wave. They believe that they can leap from this wave before it crashes like a tsunami on the beaches. In fact they can no more escape this on-rushing tide than the natives of Vesuvius could escape the volcano that covered their area in a matter of hours, burying it for 20 centuries under an ocean of lava. The Federal government seems poised to be buried as deeply and for as long as Pompeii and Hurrculeaneum. The waste of time during the last year by the Federals is as great a Folly as if the leaders detonated the nuclear weapons stock and unleashed the feared, horrific nuclear winter. Thanks to the Folly in 1997 millions of humans will suffer and die.

Other/10: We're just not ready, and we won't be. It's like "kinda pregnant". No, either you are or you're not. Same goes here, either the world will be ready or it won't.

OTHER RESPONSES

Consultant/11: "11" is a cop out perhaps, but it has a formal meaning: The data leads to conflicting conclusions. It's *not* "don't know" or "no opinion". It might be considered a subset of "insufficient data", but I think it's more like "This does not compute!" (But 0, it's *not*.)

Other/NA: 1. Significant widespread impact for some enterprises (particularly those doing business in Asia and Eastern Europe). 2. Local impact for many enterprises. 3. Some market adjustment (15% - 20%, dropping initially but rebounding when the actual scope becomes clear); the biggest hit will come from international markets. 4. Some economic slowdown but no recession; this will be due as much to the incipient need for another major "correction" as to the actual Year 2000 problem. (In other words, it may happen anyway.) 5. The US government will be embarrassed, but – in spite of the fantasies of certain parts of the political spectrum – will NOT collapse. 6. Maybe a comet will be spotted heading for Earth. That way, Peter de Jager will still be able to shout, "The sky is falling....!" (Sorry – couldn't resist.)