

YEAR 2000 COMPUTING CRISIS

Hello Houston - I mean AMC - we have a problem! And the problem is approaching at a measured speed of 3,600 seconds per hour with impact due in less than 27 months. The date of impact will be approximately Friday, 31 December 1999 unless you haven't taken any measures to avoid the problem. In that case your computer will indicate the date, incorrectly, as Monday, 1 January 2000. And except for the fact that it is New Year's Day you will probably be at work.

The problem, known variously as the Year 2000 Problem, the Y2K Problem, or the Millennium Bug, has been described by computer industry experts as one of the most expensive problems in human history. The Gartner Group (a Stamford, CT, based international information technology consulting firm) estimates the cost of correcting the Year 2000 problem worldwide will be \$300 billion to \$600 billion. In a report titled "The Global Economic Impact of the Year 2000 Problem," Capers Jones, the Chairman of Software Productivity Research, states that for the United States more than four months of effort may be needed on the part of every software professional in the country to repair the Year 2000 problem, with repair costs that may exceed \$2000 for every working person in the United States. The Office of Management and Budget, which tracks the progress of Year 2000 conversions by federal agencies, recently (15 August 1997) increased the estimated government-wide costs for fixing the problem from \$2.8 billion to \$3.8 billion. Steven Hock, writing in the American Bar Association Journal, projects that the final tab for business disruptions and legal costs for Year 2000 system failures could reach a trillion dollars.

This "problem" arises from the convention of using six digits to represent calendar dates with just two digits for the year and the decade ("97", for example, for 1997). The century designation, which has remained constant since computers were invented, is always assumed to be "19". Originally this Convention saved limited processing memory. More recently, six digits were used by programmers out of habit or in order to assure that new software programs would interface with older programs using six digit date fields. A format using two digits to represent the year is limited to a span of 100 years with 00 as 1900 and 99 as 1999. When the millennium arrives and calendars roll over from 99 to 00, the date will not advance into the next century but will return to 1900 again. Unless fixed, computers relying on this cyclic calendar will repeat the twentieth century over and over again. Life for you

and your computer in this cyclic universe in which $99 + 1 = 00$, but $00 < 99$ will be tough. If, on or after the date 01-01-00, you decide to escape the problem by flying off to some non electronic, non computer oriented paradise you may discover that your flight has been canceled because computers in the airlines maintenance department have grounded all aircraft claiming they are 99 years overdue engine and airframe overhauls. It would also appear that the pilots have been on duty for 875,000 hours in violation of FAA rules. All this will abort your escape in which you planned to spend the almost 100 years of interest the bank has calculated as earned on the \$1,000 deposit you made into your account in late December 1999 (December 1999, subtracted from January 2000 = 01-00 minus 12-99 = -99 years 11 months or -36,465 days since you made the deposit). Since a negative period of deposit and a negative period of duty for the pilots makes no sense, computers will probably ignore the negative signs. While contemplating your spoiled vacation you can peruse the notice of some seriously overdue books you have received from the library and the credit card statement with late charges and interest for almost 1200 months.

What is the scope of the problem? The \$1 trillion tab for business disruptions and system failures mentioned above are based on a conservative 5 percent failure rate. According to Jon Newberry, writing in the ABA Journal, some experts place the likely failure rate for desktop computers - IBM Compatible machines - at 80 percent to 90 percent with a higher failure rate for mainframe computers. Los Angeles lawyer Vito Peraino, testifying before Congress in March 1997, characterized the Year 2000 problem as a "litigation catastrophe that will happen in just a matter of time." And don't limit your worry about the Year 2000 problem just to computer software. The problem can also exist in computer hardware (e.g., clocks in the BIOS code located on the PC (ROM) chips, in client/server environments and in embedded systems. The Year 2000 problem in imbedded chips arises from the fact that microchips with hard coded date logic reside as a component in many products. These date sensitive microprocessor "chips" may fail in elevator systems, security systems (such as time locks on bank vaults), communication equipment including the Global Positioning System (GPS), AND in the on-board computers in many weapon systems, ships, tanks, and military aircraft. Logistics systems and various command and control systems will also be affected by the Year 2000 problem. By way of an example, the 15 September 1997, issue of Government Computer News reported that the DOD Global Command and Control System crashed when the date was rolled over to the year 2000 during a Joint Warrior Interoperability Demonstration (JWID) conducted 7 July through 1 August 1997. Another built-in time bomb may be in

the firmware of the satellites of the Global Positioning System. The satellites keep track of the date by counting the weeks since 6 January 1980. The count has a maximum range of 1,024 weeks. It follows that on 21 December 1999, the counter will roll over and GPS receivers will think it is 1980 all over again. Vito Peraino testified that the embedded chip problem is one of the least publicized and most legally significant aspects of the Year 2000 problem. Another facet of the Year 2000 problem may be the application program interface (API) used by systems to communicate with each other. If a system's API includes a date with the year then modification of that system to correct the problem will change its API. As a result, each system using that API must now be modified to accept and use the changes. The solution for one system affects all systems with which it interfaces. Although the Year 2000 problem may not be a virus, it can "contaminate" a computer system. On Wednesday, 8 January 1997, the Coast Guard's proprietary software operating system, called CTOS began to act in a bizarre manner. The standard spreadsheet program would not run on certain days of the week but would run on other days. The problem originated in the interaction between software elements that comprise the CTOS and the manner in which dates were handled after the new year began. The crash of DOD's GCCS, mentioned above, was caused in part by running Year 2000 non-compliant applications on a Year 2000 compliant operating system. It should be noted that similar problems can occur if two systems intended to interface are made Year 2000 compliant using different techniques that are incompatible.

The Gartner Group has estimated (with a probability of 0.7) that approximately fifty percent (50%) of the companies with a Year 2000 problem will not become compliant in time and will have all or part of their computer systems shut down or start producing incorrect data on or after 1 January 2000. The General Accounting Office (GAO) has released a report (GAO/T-AIMD-97-129) on the Year 2000 Computing Crisis titled "Time if Running Our for Federal Agencies to Prepare for the New Millennium." The GAO Report outlines the five phases of the Office of Management and Budget's strategy of best practices for federal agencies for addressing the Year 2000 problem. The second of five milestones in the strategy, Assessment, was supposed to be completed in June 1997. The Office of Management and Budget Report to Congress on 15 August 1997, states that DOD is only sixty percent (60%) complete in the Assessment Phase. Further, in the report DOD claims that it will complete the final phase, Implementation, in November 1999, one month before the millennium arrives. However, Fiscal Year 2000 starts

1 October 1999.

Now that we know the enemy, what can we do and when must we do it? This brings up another facet of the problem. There are in excess of two thousand software programming languages in existence, with perhaps five hundred programming languages in current usage. Some of those languages use high order digits ("99"), particularly in the date field, to cause special "exception" logic. In this situation "99" usually meant either the end of a file, the field is blank, or no date was available. This means that 1 January 1999 (01-01-99) or 9 September 1999 (09-09-99), may be drop dead dates. We can fix the problem in our contracts prospectively by using the recommended Year 2000 contract language on warranties furnished by the Interagency Year 2000 Committee. This language may be found on the Army Year 2000 homepage. See Internet URL <http://imabbs.army.mil/army-y2k>. When crafting the warranty provision you must remember to include some language covering program interface with other applications. At least, if the contractor is put on notice that interface with other applications may be required, implied warranties of merchantability and fitness for a particular purpose may apply (if you are buying a commercial product). If the software is non-commercial in nature, a Year 2000 non-compliant program that crashes may be considered "defective" (contemplate an argument by the government that the calendrical change to the new millennium on 1 January 2000 was unanticipated and not easily discoverable and is, therefore, latent or listening to a contractor try to explain that he didn't know a new millennium would occur on 1 January 2000 and he didn't intentionally deliver a product that he should have known would fail). One thing is certain, if the agency simply proceeds to correct the Year 2000 problem without first making a claim against the contractor, it is likely that any remedies will be waived. Other sensitive issues will likely be potential violations of license agreements, copyright infringement, and disclosure of proprietary information whether the government makes the modifications to software itself or uses a support contractor.

All the information in this article was downloaded from the Internet. The Defense Information Systems Agency (DISA) homepage at <http://www.disa.mil/cio/y2k/cioosd.html> and the Army Year 2000 homepage at <http://imabbs.army.mil/army-y2k> are good places to start. You can access all the information you ever wanted to know about the Millennium Bug and more, much more. You will become convinced that the Year 2000 problem is extremely serious and in need of immediate attention. As for me, I'm not worried. After all on 28 December 1999, I will be sixty years old, having been born in 1939. On 1 January 2000, I will be only 39 years old (00-39 = -39) and since my computer tells

me that is a Monday, I will be especially happy that it is a holiday and I don't have to work.

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