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GAO

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General Accounting Office
Washington, D.C. 20548

Accounting and Information
Management Division

B-278104

October 21, 1997

Rear Admiral Donald E. Hickman, Commander
Naval Supply Systems Command
Mechanicsburg, PA 17055

Subject: Defense Computers: Technical Support Is Key to Naval Supply Year 2000 Success

Dear Rear Admiral Hickman:

On September 24, 1997, we discussed with members of your staff the results of our review to date of the Naval Supply Systems Command's (NAVSUP)[1] efforts to address the Year 2000 computer problem. NAVSUP is using the services of its primary central design activity (CDA)--the Navy Fleet Material Support Office (FMSO)--as a major component of its efforts to develop and implement Year 2000 systems solutions. The Year 2000 problem results from the inability of computer programs at the year 2000 to interpret the correct century from a recorded or calculated date having only two digits to indicate the year. Unless corrected, this problem could cause those systems under NAVSUP's responsibility to malfunction or produce incorrect information when the year 2000 is encountered during automated data processing. The impact of these failures would be widespread, costly, and potentially debilitating to important Navy supply missions, including NAVSUP's management and control over repair parts, components, and assemblies that are required to maintain the operations of ships, aircraft, and weapons for the entire Navy.

These discussions were based on work we performed as part of our review of the Department of Defense's (DOD) Year 2000 computer systems effort for the Chairman, Senate Committee on Governmental Affairs; the Chairman and Ranking

[1]NAVSUP is located in Mechanicsburg, Pennsylvania. NAVSUP's mission is to provide supply support to the U.S. Navy forces worldwide. FMSO, which is a major field activity of NAVSUP and also located at Mechanicsburg, Pennsylvania, provides information systems support for the functional areas under NAVSUP's responsibility.

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Minority Member of the Subcommittee on Government Management, Information and Technology, House Committee on Government Reform and Oversight; and the Honorable Thomas M. Davis, III, House of Representatives. During our review, we concentrated on determining (1) the status of FMSO's efforts to correct the Year 2000 problems in NAVSUP's standard systems and (2) whether FMSO can reasonably ensure that standard systems under its responsibility are compliant in time to process Year 2000 data.

RESULTS IN BRIEF

NAVSUP managers have recognized the importance of solving the Year 2000 problem and understand that failure to implement successful solutions could seriously impact the Navy's support mission. To ensure that the Year 2000 problem is resolved, NAVSUP is using the services of FMSO to aid in developing and implementing Year 2000 systems solutions and to supplement the Year 2000 management and oversight responsibilities of NAVSUP headquarters. FMSO has been assessed as a Capability Maturity Model (CMM) level 3 development organization,[2] which indicates that it can realistically plan and manage software development and maintenance projects, such as the Year 2000 project, across the organization.

At the time of our review, NAVSUP and FMSO both had made considerable progress towards addressing the Year 2000 problem in NAVSUP's corporate systems, including (1) developing a Year 2000 strategy, (2) assigning responsibility to Year 2000 project managers at both NAVSUP and FMSO, and (3) staffing a Year 2000 Project Office. FMSO has also developed and is applying a six-phased methodology to manage efforts to resolve Year 2000 computing problems. This approach is based on the generally accepted government five-phased methodology, which has been adopted by DOD. The steps included in this methodology are also consistent with our structured approach for planning, managing, and evaluating Year 2000 programs.

During our review, however, we determined that NAVSUP had not allocated sufficient resources to the FMSO Year 2000 Project Office to ensure that all systems interfaces were identified and adequately monitored for progress. Also, NAVSUP had not directed that risk assessments be performed or that contingency plans be

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[2]CMM is a process maturity framework developed by the Software Engineering Institute at Carnegie Mellon University with assistance from the Mitre Corporation. Its purpose is to help organizations identify areas of their software process that need improvement. There are five maturity levels in the framework. We have recommended that federal agency information technology organizations be at least a CMM level 2.

prepared at the system and functional levels. As a result of the concerns we raised, NAVSUP and FMSO officials have begun addressing system interface issues by assigning full-time staff to identify date-related data elements in interface files and ensure that date formats are compatible. These actions, together with NAVSUP's plans for requiring systems managers to perform risk assessments and develop contingency plans for critical systems, should help mitigate against the loss of operational capability at the year 2000. As NAVSUP progresses to the renovation, validation (testing), and implementation phases of the Year 2000 program, continued attention to these issues will be necessary to better ensure that the Year 2000 challenge is met.

SCOPE AND METHODOLOGY

During our review, we compared ongoing Year 2000 activities that were being conducted by NAVSUP and FMSO to the suggested tasks described in our Year 2000 Assessment Guide[3] and DOD's Year 2000 Management Plan[4] to assess the adequacy of efforts to correct the Year 2000 problem. To perform this assessment, we met with the NAVSUP and FMSO Year 2000 project managers to obtain an understanding of their requirements for managing Year 2000 problems. We reviewed FMSO's Year 2000 certification and testing policies and procedures, technical assessment guidelines, and database management practices. We also reviewed the Year 2000 Project Manager's Plan of Action and Milestones for the NAVSUP standard systems that FMSO supports to determine the reasonableness of the schedule and time frames associated with the appropriate phases of their Year 2000 plan.

In evaluating the process for correcting the Year 2000 problem, we reviewed FMSO's project plans and obtained detailed information about the strategy and plans for renovating, testing, and implementing NAVSUP's corporate systems. We also reviewed and evaluated the systems' century compliance and testing criteria established by the FMSO Year 2000 Project Office and reviewed the documented requirements for risk assessments and contingency planning. We discussed the Mechanicsburg Defense megacenter's[5] role in supporting Year 2000 systems

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[3]Year 2000 Computing Crisis: An Assessment Guide (Exposure Draft) (GAO/AIMD-10.1.14, February 1997).

[4]Department of Defense Year 2000 Management Plan (Version 1.0, April 1997).

[5]Defense megacenters are large computing facilities owned and operated by the Defense Information Systems Agency. FMSO relies on the megacenter at Mechanicsburg, Pennsylvania, to provide mainframe computing facilities and to support its mainframe operational and systems requirements.

maintenance and validation efforts to obtain information related to the progress being made towards the integrated and operational compliance of mainframe application systems. We used this information to determine whether FMSO could reasonably deliver the affected software to NAVSUP's user community prior to Year 2000 impact.

Our review did not include an evaluation of the actions that NAVSUP and FMSO are taking to ensure that components of NAVSUP's internal infrastructure, such as security and telephone systems, are Year 2000 compliant. We also did not review nonstandard computer systems applications, which are developed outside the purview of NAVSUP or FMSO, such as systems that may be developed locally by Navy base-level personnel or systems that FMSO supports for functional areas other than NAVSUP. We conducted our work between August 1996 and May 1997 in accordance with generally accepted government auditing standards.

We requested comments on a draft of this report from the Secretary of Defense or his designee. The Office of the Under Secretary of Defense (Acquisition and Technology) provided written comments, which are discussed in the "Agency Comments" section and are reprinted in enclosure I.

BACKGROUND

The Year 2000 problem is rooted in the way dates are recorded and computed in automated information systems. For the past several decades, systems have typically used two digits to represent the year, such as "97" representing 1997, in order to conserve on electronic data storage and reduce operating costs. With this two-digit format, however, the year 2000 is indistinguishable from 1900, or 2001 from 1901. As a result of this ambiguity, system or application programs that use dates to perform calculations, comparisons, or sorting may generate incorrect results when working with years after 1999. Accordingly, since NAVSUP computers use dates to perform a variety of complex operations, such as scheduling material deliveries, paying invoices, and processing stock orders, it is essential that dates are correct.

NAVSUP is the headquarters for 19 field activities responsible for the Navy's supply-related logistics and manages the Naval Inventory Control Point (ICP),[6] the eight

[6]ICP is headquartered in Philadelphia, Pennsylvania and consists of two sites located in Mechanicsburg and Philadelphia, Pennsylvania. ICP controls over 400,000 line items of repair parts, components, and assemblies that are required to maintain the operations of ships, aircraft, and weapons.

Fleet and Industrial Supply Centers (FISCs),[7] and FMSO. NAVSUP provides information systems support for the ICPs and FISCs through FMSO, which has responsibility for the design, development, and maintenance of NAVSUP's core computing infrastructure of 18 major corporate information systems supporting numerous activities in the functional areas of logistics, transportation, finance and accounting, and inventory math modeling. FMSO has responsibility for resolving the Year 2000 problems associated with those systems, which are used by U.S. Navy forces worldwide.

Should the NAVSUP computer systems that are supported by FMSO fail because of the Year 2000 problem, many Naval supply operations could be impacted by incorrect data processing. For example, FMSO provides systems support for ICPs that have responsibility for providing repair parts, components, and assemblies that keep ships, aircraft, and weapons operating. Further, in addressing the Year 2000 problem, FMSO also must consider the hundreds of computer systems that interface with, or connect to, its own systems. These systems belong to the military services, Defense components, and other federal agencies with which NAVSUP and FMSO do business. Collectively, these systems are critical to carrying out the Navy's mission.

FMSO operates as a fee-for-service CDA under the Navy Working Capital Fund.[8] As such, its functional owners fund most systems' development and maintenance through service-level agreements (SLAs).[9] FMSO officials told us that its fiscal year 1997 SLAs contained provisions for correcting Year 2000 problems. By ensuring that future SLAs are negotiated to contain similar provisions, FMSO should be in a better position to successfully address necessary Year 2000 changes.

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[7]FISCs provide a variety of logistics support services and products to the Navy and other military customers.

[8]The Navy Working Capital Fund, one of four working capital funds resulting from the reorganization of the Defense Business Operations Fund (DBOF), is a revolving fund that was created by the Under Secretary of Defense (Comptroller) on December 11, 1996. Under this funding concept, service providers are expected to have and use the visibility over costs incurred to deliver a product or perform a service at the least cost, and operating forces are expected to choose and pay for the level of service and support required.

[9]SLAs are components of the fee-for-service billing arrangement. SLAs represent contracts between FMSO (or any other development organization) and its customers. The number of hours spent on a task are tracked and the customer is billed at a standard rate per hour.

In February 1997, we published the Year 2000 Computing Crisis: An Assessment Guide, which addresses common issues affecting most federal agencies and presents a structured approach and a checklist to aid them in planning, managing, and evaluating their Year 2000 programs. The guide describes five phases–supported by program and project management activities–with each phase representing a major Year 2000 program activity or segment. The guidance draws heavily on the work of the Best Practices Subcommittee of the Interagency Year 2000 Committee and incorporates guidance and practices identified by leading organizations in the information technology industry. The five phases are consistent with those prescribed by DOD in its Year 2000 Management Plan. The phases and a description of what each entails follows.

- **Awareness**–Define the Year 2000 problem and gain executive-level support and sponsorship. Establish a Year 2000 program team and develop an overall strategy. Ensure that everyone in the organization is fully aware of the issue.

- **Assessment**–Assess the Year 2000 impact on the enterprise. Identify core business areas and processes, inventory and analyze systems supporting the core business areas, and rank their conversion or replacement. Consider contingency plans to handle data exchange issues, lack of data, and bad data. Identify and secure the necessary resources.

- **Renovation**–Convert, replace, or eliminate selected platforms, applications, databases, and utilities. Modify interfaces.

- **Validation**–Test, verify, and validate converted or replaced platforms, applications, databases, and utilities. Test the performance, functionality, and integration of converted or replaced platforms, applications, databases, utilities, and interfaces in an operational environment.

- **Implementation**–Implement converted or replaced platforms, applications, databases, utilities, and interfaces. Implement data exchange contingency plans, if necessary.

In addition to following the five phases described, the Year 2000 program should also be planned and managed as a single large information system development effort. Agencies should promulgate and enforce good management practices on the program and project levels.

CURRENT STATUS OF NAVSUP YEAR 2000 EFFORTS

NAVSUP has taken several steps to address the Year 2000 problem affecting systems that support the Navy's mission. In response to DOD's guidance calling for

individual components to implement their own Year 2000 programs, in April 1996, NAVSUP appointed a Year 2000 Project Manager with responsibility for setting overall policy, strategy, and priorities. NAVSUP's Year 2000 Project Manager is also to address funding issues, monitor progress, and respond to all external data calls and reporting requirements.

In January 1996, NAVSUP also engaged the services of its primary CDA–the Navy FMSO–as a major component of its efforts to develop and implement Year 2000 systems solutions. FMSO has been assessed by an independent external entity as a Capability Maturity Model (CMM) level 3 development organization indicating that it has the capability to realistically plan and manage software development and maintenance projects across the organization, such as resolution of the Year 2000 problem.

FMSO began its Year 2000 program formally[10] by appointing a Year 2000 Project Manager in April 1996 and staffing a Year 2000 Project Office in January 1997. The Project Office is responsible for managing and overseeing the progress of efforts to correct problems associated with processing date-sensitive data when the year 2000 is encountered, including ensuring that performance metrics are developed and monitored. The FMSO Year 2000 Project Manager is responsible for the majority of FMSO's Year 2000 effort and has day-to-day responsibility for Year 2000 initiatives, including the conversion, testing, and implementation of the renovated systems along with providing technical support to the field sites.

As of May 1997, FMSO had completed an overall assessment of the Year 2000 impact on the 18 major corporate systems that it supports for NAVSUP. The assessment disclosed that 16 of the 18 systems would be impacted by the Year 2000 problem. Of the 16 systems, FMSO reported that 8 were in the assessment phase, 2 were in the renovation phase, 2 were in the validation phase, and 4 were being rehosted[11] or decommissioned. The remaining two systems were reported as Year 2000 compliant. NAVSUP has estimated that it will cost approximately $12 million

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[10]NAVSUP officials began addressing Year 2000 changes several years ago as it became evident that NAVSUP systems would need to process supply requisition and delivery dates that extended beyond the year 1999. These changes had been handled as part of FMSO's regular systems maintenance activities.

[11]Rehosting systems involves the movement of systems from one platform to another. Modifications are made to upgrade the rehosted systems to new technology–i.e., from mainframe to client/server environments, to new database structures, etc. The systems themselves are not modified for reasons other than compatibility with the new environment, and the functionality of the systems is not changed.

to convert the 16 systems, which consist of approximately 16 million lines of code, to meet Year 2000 requirements.

The FMSO Project Office developed and is implementing for NAVSUP a management-level Year 2000 strategy that is consistent with the five-phased government methodology, the DOD Year 2000 Management Plan, and our Year 2000 Assessment Guide. While FMSO's strategy includes the generally accepted five phases (awareness, assessment, renovation, validation, and implementation), it also provides a sixth system-level analysis and strategy development phase to be completed between the assessment and renovation phases. The system-level analysis completed during this phase is to result in a list of all the impacted date-related data elements for the systems along with the actions that must be taken to ensure that data elements will maintain their functional and operational integrity with Year 2000 dates. The FMSO Year 2000 Project Office staff included this phase to provide time to compile and study the information collected during the assessment phase. This information will be used during the systems' conversion phases.

At the time of our review, the FMSO Year 2000 Project Manager had begun visiting field sites in order to survey the computing environment and to educate field personnel about the impact of the year 2000 on their systems. As part of this effort, FMSO hoped to identify problems with hardware, commercial off-the-shelf software, locally- or contractor-developed programs, system software, and the facilities themselves. According to NAVSUP's Year 2000 strategy, assistance teams are to visit all field sites at least twice before the year 2000.

SYSTEM INTERFACES ARE A MAJOR FMSO YEAR 2000 PROJECT OFFICE ISSUE

Throughout the computing environment that FMSO supports, many Navy systems, including NAVSUP's, exchange data with both internal and external entities, including other DOD components. It is crucial that these data be compatible with both the sending and receiving systems to ensure the systems' operational capabilities. Conflicting interface message formats could potentially introduce and propagate errors from one system to another. Therefore, it is critical that, during the Year 2000 effort, agencies protect against this potential to ensure that interfacing systems have the ability to exchange data throughout the transition to the year 2000. This potential problem may be mitigated through formal agreements between interface partners that describe the method of interface and assign responsibility for accommodating the data exchange. DOD's Year 2000 Management Plan places responsibility on component heads or their designated Year 2000 points of contact to document and obtain system interface agreements in the form of memorandums of agreement (MOAs) or the equivalent.

We found, however, that FMSO initially had not been identifying and monitoring the interfaces between the systems that exchange such data. Moreover, there are other interface message formats that are dictated by entities outside of FMSO's and the Navy's control. This factor could potentially hamper FMSO's progress towards completing programming tasks since the date formats are not controlled by FMSO or its interface partners. Recently, FMSO has increased its oversight of the interface issue, including directing the completion of MOAs for all systems affected by the year 2000, and has taken positive steps toward reducing the risk that interfaces will cause operational problems.

Prior to our review, the FMSO Year 2000 Project Office was not monitoring the status of individual systems interfaces and had not determined whether all interfaces had been identified. FMSO did not have a baseline inventory of system interfaces, and system managers had not identified or contacted their interface partners as part of their system assessments. Also, there are other issues associated with interface standards that are beyond FMSO's control. For example, some FMSO systems must accommodate military standards[12] for exchanging data. This situation is beyond FMSO's control since the military standards are defined DOD-wide. As such, the possible introduction of new military standards would result in devastating effects on the progress being made towards the Year 2000 problem resolution at NAVSUP and FMSO. The presence of this uncontrollable factor contributes to the necessity for proactive central oversight of interface conversion progress. Time must be available to allow for contingencies to mitigate these risks and to resolve conflicts between interfacing partners. Centralized oversight of these risks is necessary to ensure that contingency plans are established and agreed to if these message format requirements change without time to validate and implement compliant versions of the affected systems.

During our review, FMSO officials indicated that they had placed added emphasis on overseeing interface issues and directed the completion of MOAs with interface partners for all affected systems. The FMSO Year 2000 Project Office had begun to implement practices to help identify conflicts between interfacing systems and was planning to develop procedures to monitor progress towards successful resolutions. For example, FMSO is assigning responsibility over each affected system to full-time staff for identifying related interface files and the date-related data elements in those files. Once the assessment phase is completed and the system-level analysis and strategy development phase is begun for each system, FMSO staff plan to issue letters to the interfacing activities proposing a format that is compatible with the systems' internal processes. These actions, together with NAVSUP's plans for

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[12]Military standards are engineering and technical requirements for processes, procedures, practices, and methods that have been adopted as standard. They are created to serve the needs of designers and to control variety.

requiring risk assessments and contingency plans, which is discussed in the following section, should help mitigate the risk introduced by the concern that military standards could change before the year 2000.

NAVSUP HAS AGREED TO PERFORM RISK ASSESSMENTS AND PREPARE CONTINGENCY PLANS

During our review, we raised concerns that NAVSUP officials did not plan to require the performance of Year 2000 risk assessments or the preparation of contingency plans. NAVSUP officials contended that it would not be necessary to develop contingency plans since their critical systems had to be operational by the year 2000. While risk analyses are performed on a detailed data element level as part of FMSO's software development process, they were not being required at an infrastructure level or of the field sites, which use the FMSO-supported systems. The NAVSUP and FMSO Year 2000 project managers had begun to consider operational and technical alternatives for their systems and organizations in the event that the systems were not compliant by the year 2000, but they had not yet organized and documented these plans.

U. S. Navy forces worldwide depend upon NAVSUP to support logistics services, including supply operations and information systems that control prompt delivery of stock and supply orders. Without documented risk assessments and contingency plans to mitigate risks at every phase of the Year 2000 transition period, the Navy logistics community remains vulnerable to the loss of operational capability due to Year 2000 system errors. DOD's Year 2000 Management Plan and our Year 2000 Assessment Guide call on agencies to develop risk management and contingency strategies as part of their Year 2000 management plans. Contingency plans are necessary to ensure the continuity of core business processes and are important because they identify the manual and contract procedures to be employed should some critical systems miss their Year 2000 deadlines. Likewise, risk management policies are necessary to minimize the risk associated with time and resource insufficiencies during the transition period–i.e., the risk that system changes may not be completed on time. Agencies must also manage the risk that system failures may increase as the year 2000 approaches. These plans should be documented, distributed, and updated throughout the Year 2000 transition.

As a result of the concerns we raised, NAVSUP officials have agreed to require system managers to perform risk assessments and to prepare contingency plans for critical systems. NAVSUP officials solicited an internal management cadre for assistance with developing organizational- and systems-level Year 2000 contingency plans. They indicated that contingency plans will be prepared at the functional, systems (including interfaces), and management levels to help ensure that operational capability is not compromised due to problems associated with processing date-sensitive data. NAVSUP has also developed a Year 2000 risk

management plan that includes requirements for risk analyses to address several areas of concern, including corporate strategy, human resources, project management, and systems implementation. The risk management plan recognizes the risks associated with interfacing with third parties that are not Year 2000-compliant and with supplier-provided software that may not be Year 2000-compliant. If NAVSUP successfully manages the risks inherent in the Year 2000 problem resolution and implements its requirements that both functional- and system-level contingency plans are developed, the likelihood that operational capability will be lost due to problems created by Year 2000-related system errors should be minimal.

CONCLUSIONS

We are encouraged by the NAVSUP and FMSO Project Office officials' efforts to address the systems interface, risk assessment, and contingency planning issues. If effectively implemented by the project offices, these efforts should be positive steps toward preventing the loss of operational capabilities at the year 2000. FMSO has an established, disciplined software process in place for effectively developing and maintaining NAVSUP's standard supply systems and has established an approach to handling Year 2000-specific problems. Therefore, FMSO should be better able to deal with the system-related problems associated with the transition to the year 2000. However, the remaining phases–the validation and implementation phases–of the Year 2000 transition period will introduce new risks and challenges to the effective management of this problem. NAVSUP and FMSO Year 2000 officials need to maintain the level of effort and discipline that they are currently directing toward managing the Year 2000 problem and to continue to improve their management approach as new or unanticipated issues arise.

AGENCY COMMENTS

The Department of Defense concurred with a draft of this report.

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We appreciate the courtesy and cooperation extended to our audit team by NAVSUP and FMSO officials and staff. We are providing copies of this letter to the Chairmen and Ranking Minority Members of the Senate Committee on Governmental Affairs; the Subcommittee on Oversight of Government Management, Restructuring and the District of Columbia, Senate Committee on Governmental Affairs; and the Subcommittee on Government Management, Information and Technology, House Committee on Government Reform and Oversight. We are also sending copies to the Honorable Thomas M. Davis, III, House of Representatives; the Secretary of Defense; the Deputy Secretary of Defense; the Acting Under Secretary of Defense (Acquisition and Technology); the Acting Under Secretary of

Defense (Comptroller); the Acting Assistant Secretary of Defense (Command, Control, Communications and Intelligence); the Secretary of the Navy; the Commander, Fleet Material Support Office; the Director of the Office of Management and Budget; and other interested parties. Copies will be made available to others upon request.

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If you have any questions on matters discussed in this letter, please call me or John B. Stephenson, Assistant Director at (202) 512-6240. Major contributors to this report are listed in enclosure II.

Sincerely yours,

Linda D Koontz

for Jack L. Brock, Jr.
Director, Defense Information and
Financial Management Systems

COMMENTS FROM THE DEPARTMENT OF DEFENSE

OFFICE OF THE UNDER SECRETARY OF DEFENSE
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ACQUISITION AND TECHNOLOGY

07 OCT 1997

Mr. Gene L. Dodaro
Assistant Comptroller General
Accounting and Information Management Division
U. S. General Accounting Office
Washington, DC 20548

Dear Mr. Dodaro:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "DEFENSE COMPUTERS: Technical Support is Key to Naval Supply Year 2000 Success," dated September 26, 1997 (GAO Code 511625/OSD Case 1471).

DoD has reviewed the GAO report on the Naval Supply Systems Command's (NAVSUP) efforts to address the Year 2000 computer problem. DoD concurs with the report.

DoD appreciates your interest in helping to assess the Department's Year 2000 problems. The DoD primary action officer for this case is Dr. Elizabeth Rodríguez-Johnson at (703) 681-4541.

Sincerely,

Patricia Sanders
Director, Test, Systems
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