



United States
General Accounting Office
Washington, D.C. 20548

Accounting and Information
Management Division



B-277114

August 19, 1997

Mr. Robert Frye, Executive Director
Standard Systems Group
Maxwell Air Force Base, Gunter Annex, AL

Subject: Defense Computers: SSG Needs to Sustain Year 2000 Progress

Dear Mr. Frye:

On July 1, 1997, we discussed with members of your staff the results of our review of the Standard Systems Group's (SSG) efforts to address the Year 2000 computer problem. The 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 indicating the year. Unless corrected, this problem could cause the standard systems that SSG supports to malfunction or produce incorrect information when the year 2000 is encountered during automated data processing. Since SSG is the Air Force's largest automated information systems manager with responsibility for all standardized computer programs supporting base requirements in more than a dozen functional areas, the impact of these failures would be widespread, costly, and potentially debilitating to important Air Force missions.

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 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 SSG's efforts to correct the Year 2000 problems in the Air Force's standard systems and (2) whether SSG can ensure that standard systems under its responsibility are compliant in time to process year 2000 data.

RESULTS IN BRIEF

SSG managers have recognized the importance of solving the Year 2000 problem and that failure to implement successful solutions could seriously impact the

GAO/AIMD-97-120R Air Force SSG Year 2000 Effort

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Air Force's support mission. To its credit, SSG convened the Year 2000 Working Group in September 1995 to examine the Year 2000 problem and to develop a plan for managing it. From that effort, SSG set forth a strategy that is compatible with the Air Force's five-phased methodology, which has been adopted by DOD. The steps included in this methodology are also consistent with GAO's structured approach for planning, managing, and evaluating Year 2000 programs. In addition, SSG established its Year 2000 Project Office in February 1996, developed a management-level Year 2000 strategy, and completed the Year 2000 Project Management Plan to guide the effort.

SSG has demonstrated that it is capable of realistically planning and managing large information systems conversions, such as the Year 2000 resolution, through its successful implementation of an effective methodology for developing, maintaining, and supporting standard systems. While SSG has progressed considerably toward addressing the Year 2000 problem, we determined that it must further emphasize management and oversight of system interfaces to ensure successful implementation of Year 2000 compliant systems throughout its user community. Also, a number of SSG systems must use standard interface message formats to exchange data that are defined by external entities not under SSG control. Some of these message formats had not been finalized by the organizations responsible for their definition. Recently, SSG Year 2000 Project Office officials began addressing the interface issue. If effectively implemented by the project office, this effort should be a positive step toward preventing loss of operational capabilities between SSG's internal and external systems' interface message formats at the year 2000.

SCOPE AND METHODOLOGY

During our review, we compared SSG's ongoing Year 2000 activities to the tasks described in our Year 2000 Computing Crisis: An Assessment Guide,¹ DOD's Year 2000 Management Plan,² and the Air Force's Year 2000 methodology to assess the adequacy of SSG's efforts to correct the year 2000 problem in those standard systems used throughout the Air Force. We obtained documentation related to certification and testing policies and procedures, technical assessment guidelines, and database management practices. We used this information to assess efforts related to the multiple phases of managing the year 2000 solution implementation. To verify the extent of the work required to effectively address the Year 2000 problem, we also reviewed the systems inventory database

¹Year 2000 Computing Crisis: An Assessment Guide (Exposure Draft) (GAO/AIMD-10.1.14, February 1997).

²Department of Defense Year 2000 Management Plan (Version 1.0, April 1997).

information that the SSG Year 2000 Project Office provided. We reviewed the Project Office's integrated systems schedule to determine the reasonableness of the schedules and time frames associated with the appropriate phases of its Year 2000 plan. We used this information to determine whether SSG could deliver the affected software to its users prior to Year 2000 impact.

At SSG headquarters, we met with the Technical Director of Information Systems and with officials from the Year 2000 Project Office responsible for the management of the Year 2000 systems projects to obtain an understanding of SSG's requirements for managing Year 2000 systems problems. We interviewed system managers and team members and reviewed the project plans and schedules for four specific systems which were in the renovation phase—the Standard Base Supply System, the Cargo Movement Operations System, the Core Automated Maintenance System, and the Precision Measurement Equipment Laboratory Automated System. We selected these standard systems after considering various characteristics, such as differing computer hardware platforms, the number and types of interfaces, and the systems' life cycle phases. We reviewed and evaluated the systems certification criteria and process established by the Year 2000 Certification and Accreditation Working Group which includes members from SSG's Year 2000 Project Office and Quality Assurance Division. We also reviewed the Project Office's requirements for systems risk analyses and contingency planning. To obtain information on the progress toward the testing, conversion, and operation of executive and application systems, we met with the Defense megacenter manager who is responsible for supporting SSG's Year 2000 systems maintenance and validation efforts. We used this information to assess SSG's efforts for completing each of the five phases in accordance with suggested tasks contained in our Assessment Guide, the Air Force's methodology, and the DOD Year 2000 Management Plan.

Our review did not include nonstandard computer systems applications which are developed outside the purview of SSG, such as systems which may be developed locally by Air Force base-level personnel. Also, we did not assess the adequacy of the activities and efforts by members of the SSG-supported functional communities to prepare for implementation of the converted systems. Neither did we review the actions that SSG is taking to ensure that components of its internal infrastructure, such as security and telephone systems, are Year 2000 compliant. While we used information provided by SSG to assess the adequacy of its efforts to address the year 2000 systems problem, we did not verify this information. We conducted our work from August 1996 through May 1997 in accordance with generally accepted government auditing standards.

The Department of the Air Force provided written comments on a draft of this report. These comments are discussed in the "Agency Comments and Our Evaluation" section and are reprinted in enclosure I.

BACKGROUND

SSG is a component of the Air Force Electronic Systems Center³ and is the central design activity for 137 standard computer programs. SSG manages standard information technology, software, hardware, and contracts used at all active and reserve Air Force bases and at many DOD agencies. SSG supports base requirements in over 12 different functional areas, including aircraft cargo loading and handling, air traffic control, munitions, accounting and finance, fuels, and maintenance. SSG also manages the information technology aspects of other programs such as security police operations, medical care, communications, supply, logistics, SSG office computers, civil engineering, and the commissary service. Included in the 137 standard computer programs under SSG control are 90 Air Force standard base-level computer systems⁴ which are at risk of failure due to the Year 2000 systems problems. These standard systems are made up of 21 million lines of code. The largest mainframe systems run on a Unisys platform and utilize a Unisys operating system that has been certified as Year 2000 compliant.

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 electronic data storage and reduce operating costs. However, with this two-digit format, the year 2000 is indistinguishable from 1900, as is 2001 indistinguishable 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.

Should SSG's computer systems fail because of the Year 2000 problem, many Air Force standard operations could be impacted by incorrect data processing. For example, some of SSG's logistics support systems process aircraft history, scheduling, and inspection data for the management of weapon systems worldwide. If these systems cannot correctly process date-sensitive data as the year 2000 approaches, the Air Force's ability to ensure wartime readiness and

³The Electronic Systems Center (ESC) is located at Hanscom Air Force Base, Massachusetts. Both SSG and ESC report to the Air Force Materiel Command located at Wright-Patterson Air Force Base, Ohio.

⁴Standardized systems are those which are developed, maintained, and supported by SSG and are used by multiple MAJCOMs or operating locations. Modifications to these systems cannot be made at any location other than SSG because SSG does not release the source code needed for making changes to these systems.

operational support of its aircraft, communications, missile maintenance, and support equipment could be significantly impaired. Further, in addressing the Year 2000 problem, SSG 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 whom SSG does business. Collectively, these systems are critical to carrying out the Air Force's mission.

In February 1997, we published the Year 2000 Computing Crisis: An Assessment Guide that 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 follow:

- **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 effect on the enterprise. Identify core business areas and processes; inventory and analyze systems supporting the core business areas; and prioritize 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.

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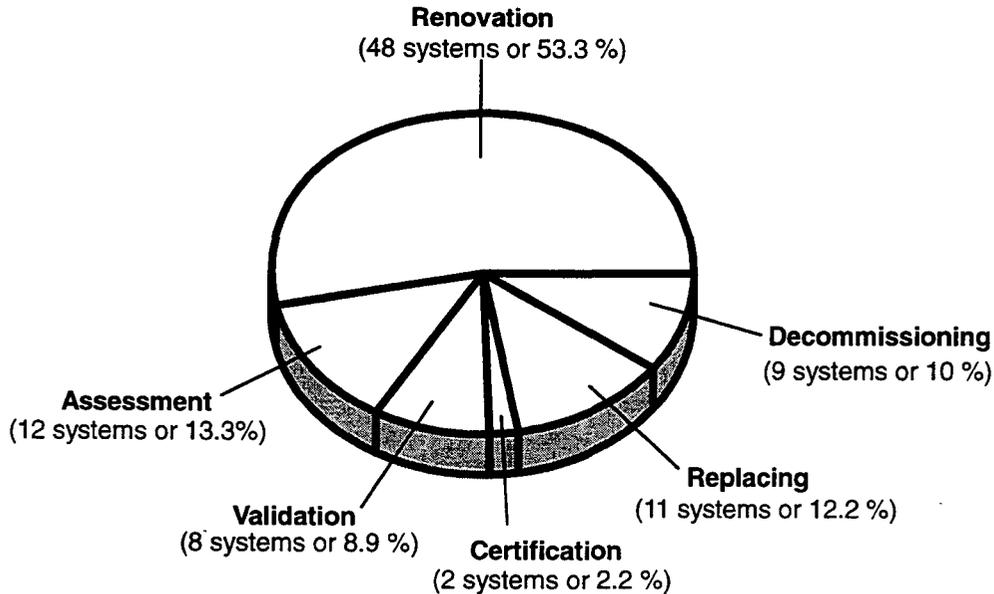
In addition to following the five phases described, the Year 2000 program should also be planned and managed as a single large information system development effort. Agencies should promulgate and enforce good management practices at the program and project levels.

CURRENT STATUS OF SSG
YEAR 2000 EFFORTS

To its credit, SSG convened the Year 2000 Working Group and began initial Year 2000 resolution efforts as part of normal systems maintenance during 1995. In response to DOD's guidance calling for individual components to implement their own Year 2000 programs, SSG also created a Year 2000 Project Office in February 1996. The Project Office is responsible for managing and overseeing the progress of efforts to correct problems associated with processing date-sensitive data in standard systems when the year 2000 is encountered.

By May 1997, SSG had completed an overall assessment of the Year 2000 impact on the standard base-level systems which it supports. Of the 90 standard systems which SSG officials determined to be impacted by the Year 2000 problem, they reported that 12 systems were in the assessment phase, 48 systems were in the renovation phase, 8 systems were in the validation phase, and 2 systems were certified as being Year 2000 compliant by the SSG's Year 2000 Project Office and Quality Assurance Division. Of the remaining 20 systems, 9 were being decommissioned and 11 were to be replaced prior to the year 2000. SSG's systems by Year 2000 phase are shown in figure 1.

Figure 1: SSG-Supported Systems by Phase



Note: Percents do not add to 100 percent due to rounding.

Source: SSG. We did not independently verify this information.

The SSG Project Office developed and is implementing a management-level year 2000 strategy based upon the Air Force's five-phased methodology,⁵ which is consistent with DOD's Year 2000 Management Plan, and has provided both business-related and technical guidelines to the system managers to help with decision-making processes. A Year 2000 Project Management Plan was completed by the Project Office in August 1996. Additional actions taken by the Year 2000 Project Office include:

- Developing an integrated master schedule and plan for the systems' implementations.

⁵The Air Force's five-phase approach includes the awareness, assessment, renovation, validation, and implementation phases.

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- Providing assistance to system managers in identifying areas of noncompliance and risks, including conflicts between interfacing business partners.
- Resolving issues related to hardware and resource availability for system testing.
- Completing pilot conversion projects under four different scenarios. SSG is using the "lessons learned" from these pilots to help provide technical advice about implementing Year 2000 system solutions to the system managers.
- Completing a study of hardware platforms for Year 2000 problems in January 1996.

SSG operates as a fee-for-service central design activity under the Air Force Working Capital Fund.⁶ As such, its customers fund most systems development and maintenance through service-level agreements (SLAs).⁷ SLAs for fiscal years 1997 and 1998 between SSG and the Air Force logistics community include provisions for correcting Year 2000 problems. Other communities that SSG serves (the engineering and base support communities, for example) have also included Year 2000 resolutions in their upcoming SLAs for fiscal year 1998. Because this established funding mechanism is being used to address Year 2000 changes, SSG is relying on their customers to provide sufficient funding to successfully address the necessary Year 2000 changes.

SSG follows software engineering principles and methodologies, tailored to fit the needs of each system it supports, as prescribed in SSG's established software development methodology, the Systems Engineering Process (SEP). This software development methodology includes guidelines which must be followed for predevelopment, development, and postdevelopment activities.

⁶The Air Force 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.

⁷Service-level agreements are components of the fee-for-service billing arrangement. SLAs represent contracts between SSG (or any other development organization) and their customers. The number of hours spent on a task are tracked and the customer is billed at a standard rate per hour.

SSG's Year 2000 Project Plan incorporates the requirements of the SEP as part of the approach to managing the Year 2000 problem. The plan recognizes the configuration management and test and evaluation requirements of the SEP as effective processes for controlling and documenting system changes and for validating the systems' accuracy and completeness.

Also, SSG has developed a technical guide which establishes the relationship between SEP and the Year 2000 five-phased methodology. The guide includes year 2000 criteria—such as validation of SSG's Year 2000 business rules—and provides detailed checklists to be used as aids to ensure that the activities required to meet the Year 2000 management requirements are carried out within the SEP guidelines. For example, SEP needs analysis, project planning, and requirements and design activities are part of the Year 2000 assessment phase; software design, coding, informal test, and function and system test activities are part of the renovation phase; product assurance is accomplished in the validation phase; and customer support is included in the implementation phase of the Year 2000 methodology. Consequently, SSG managers responsible for system conversions are able to integrate the unique requirements for managing Year 2000 problem resolutions into SSG's standard procedures for systems development management. SSG has also been assessed by an independent external entity as a Capability Maturity Model (CMM) level 3 development organization,⁸ indicating that it has the capability to realistically plan and manage software development and maintenance projects across the organization, such as the Year 2000 resolution.

**SYSTEMS INTERFACES ARE A MAJOR
SSG YEAR 2000 PROJECT OFFICE ISSUE**

Throughout the computing environment which SSG supports, many systems interface with multiple internal and external entities, including the Air Force and other DOD components. Compatibility of data which are exchanged between these systems is crucial to ensuring their operational capabilities. Conflicting interface message formats could introduce and propagate errors from one system to another. It is critically important in the Year 2000 effort that agencies protect against this potential problem by ensuring that interfacing

⁸The Capability Maturity Model 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 which 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. SSG achieved CMM level 3 in May 1997.

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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 interface message formats and assign responsibility for accommodating the exchange of data. 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 (MOA) or the equivalent.

Many of the systems which SSG supports exchange data with other DOD components and with external partners. The system managers who are responsible for maintaining and supporting SSG's standard systems establish and control system interface messages with internal and external interfacing partners by means of MOAs. However, there are other interface message formats which are dictated by entities that are outside of SSG's and the Air Force's control. This factor could hamper SSG's progress towards completing programming tasks since the data formats are not controlled by SSG or its interface partners.

SSG Had Not Initially Addressed System Interfaces

Prior to our review, the SSG Year 2000 Project Office had not been identifying and monitoring the status of the individual systems' interfaces. As the management and resolution of interface issues is the responsibility of the system managers, the Project Office did not track the status of the individual interfaces apart from the status of the systems which send and receive the interfaces' messages. At the time of our visit, system managers for three of the four systems we reviewed had not completed identification of all interfaces or gained documented concurrence with interface partners regarding interface message formats. The remaining system—the Precision Measurement Equipment Laboratory Automated System—did not interface with any other systems.

More recently, the Year 2000 project manager identified problems and noted disagreements between some interface partners as to whether or not interface agreements had been completed or even existed. Also, in recognizing the importance of the interface situation, the SSG technical director implemented a requirement that all interface file names and transactions be identified. As a result of these events, the Year 2000 Project Office initiated measures directed toward more careful oversight of the individual interfaces.

Some Interface Formats Are
Beyond SSG's Ability to Control

While SSG has begun dealing with interface issues, there are other issues associated with interface standards that are beyond its control. For example, some SSG systems must accommodate military standards⁹ for exchanging data, and some systems process electronic commerce/electronic data interchange transactions (EC/EDI). The Year 2000 date format standards for the EC/EDI transactions and the format for some Military Standard Transportation and Movement Procedures (MILSTAMP)¹⁰ transactions had not been finalized at the time of our review. These situations are beyond SSG's control since EC/EDI standards are defined by a large external community¹¹ and since the MILSTAMP formats are defined DOD-wide. Thus, these situations introduce the risk that SSG may not be able to complete programming changes for some systems as quickly as it could if these issues were under its direct control or if date format decisions had already been made. These issues also increase the risk that system interface programs will require modification at a later date. The presence of these uncontrollable risks contribute to the necessity for proactive central oversight of the progress of interface conversions. 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 are not finalized in time to validate and implement compliant versions of the affected systems.

⁹Military 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 and minimize variety.

¹⁰MILSTAMP transaction formats are defined according to military standards.

¹¹EC/EDI formats are determined by a committee which is accredited by the American National Standards Institute (ANSI). This committee is called the Accredited Standards Committee (ASC) X12, and has responsibility for ANSI standards for electronic data interchange. It is composed of representatives from private industry, finance, and governmental entities, etc. Various subcommittees develop new standards that become recommendations to the full ASC X12 membership. The approximately 1,000 members, according to a formal procedure, vote on changes to established data formats.

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SSG Officials Have Begun
Addressing Interface Issues

During our review, SSG Year 2000 Project Office officials indicated that they have placed added emphasis on overseeing interface issues by assigning staff with experience in quality and performance measures to monitor the progress of the Year 2000 systems interface resolutions. The staff is specifically responsible for establishing reporting requirements and measurable performance indicators as part of SSG's interface management and oversight plans. Project Office staff are also to become involved with interface negotiations if system managers are unable to contact external entities or if they are unable to reach agreement with interface partners. These efforts should help to ensure that interface message formats are established and documented.

We are encouraged by SSG Year 2000 Project Office officials' recent efforts to address the systems interface issue. If effectively implemented by the Project Office, these efforts should help prevent the loss of operational capabilities between SSG's internal and external systems' interface message formats at the year 2000. SSG has an established, disciplined process in place for effectively developing, maintaining, and supporting the Air Force's standardized systems and has established an approach to handling Year 2000-specific problems. Therefore, SSG should be better able to deal with the systems-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. SSG officials will need to (1) maintain the same level of effort and discipline that they are currently directing towards managing the Year 2000 problem and (2) continue to improve their management approach as new or unanticipated issues arise.

AGENCY COMMENTS
AND OUR EVALUATION

In written comments on a draft of this report, the Air Force concurred with our findings. The full text of the Air Force's comments are provided in enclosure I.

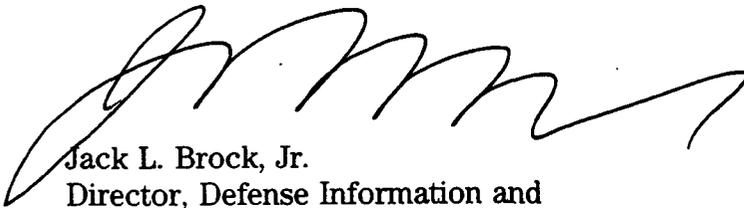
We appreciate the courtesy and cooperation extended to our audit team by SSG officials and staff. We are providing copies of this letter to the Chairman and Ranking Minority Member of the Senate Committee on Governmental Affairs; the Chairmen and Ranking Minority Members of the Subcommittee on Oversight of Government Management, Restructuring and the District of Columbia, Senate Committee on Governmental Affairs, and the Subcommittee on Government

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Management, Information and Technology, House Committee on Government Reform and Oversight; the Honorable Thomas M. Davis, III, House of Representatives; the Deputy Secretary of Defense; the Acting Under Secretary of Defense (Comptroller); the Assistant Secretary of Defense (Command, Control, Communications and Intelligence); the Secretary of the Air Force; the Commander, Air Force Materiel Command; the Director of the Office of Management and Budget; and other interested parties. Copies will be made available to others upon request.

If you have any questions about this letter, please contact me at (202) 512-6240, or John Stephenson, Assistant Director, at (202) 512-6225. Major contributors to this report are listed in enclosure II.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'J. Brock, Jr.', with a large, sweeping flourish at the end.

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

Enclosures

COMMENTS FROM THE DEPARTMENT OF THE AIR FORCE



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, DC



05 AUG 1997

MEMORANDUM FOR DIRECTOR, DEFENSE INFORMATION AND
FINANCIAL MANAGEMENT SYSTEMS
GENERAL ACCOUNTING OFFICE

FROM: HQ USAF/SC
1250 Air Force Pentagon
Washington DC 20330-1250

SUBJECT: GAO Draft Report, DEFENSE COMPUTERS: SSG Needs to Sustain Year 2000
Progress (GAO Code 511620)

Thank you for the opportunity to review your draft assessment of Year 2000 (Y2K)
efforts at the Standard Systems Group (SSG). We concur with your findings as written.

Some of your findings verify similar findings identified by the Air Force Audit Agency
(AFAA) in their report, Inventory Status for the Year 2000 Program, Project 97066018. Like
you, AFAA auditors highlighted the need for Air Force organizations to not only assess and fix
internal systems interfaces, but also to coordinate with other organizations to ensure external
interfaces are addressed. Fixing the Y2K problem is the Air Force's top software sustainment
issue--fix it before we fix anything else. Our objective is to fix Y2K problems by 1 Jan 99, so we
have a year to wring out the interfaces with other systems and work last minute issues.

My point of contact for this draft report is Ms. Cynthia Crutchfield, CIO Support Office,
(703) 695-1667. E-mail: ccrutch@af.pentagon.mil.

WILLIAM J. DONAHUE, Lt Gen, USAF
Director, Communications and Information

cc:
SAF/PA
SAF/LLR
SAF/IGI
AFAA/DO
AFIA/CVS

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MAJOR CONTRIBUTORS TO THIS REPORT

ACCOUNTING AND INFORMATION MANAGEMENT DIVISION, WASHINGTON, D.C.

Ronald B. Bageant, Assistant Director
Carl M. Urie, Technical Advisor
Brenda A. James, Senior Information Systems Analyst
Cristina T. Chaplain, Communications Analyst

ATLANTA REGIONAL OFFICE

Teresa F. Tucker, Evaluator-in-Charge
Christopher T. Brannon, Evaluator

(511620)