

*A*udit  
*R*eport



YEAR 2000 CONVERSION OF THE AIRBORNE  
WARNING AND CONTROL SYSTEM

Report No. 99-017

October 19, 1998

Office of the Inspector General  
Department of Defense

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### **Acronyms**

AWACS	Airborne Warning and Control System
PMP	Program Management Plan
Y2K	Year 2000



INSPECTOR GENERAL  
DEPARTMENT OF DEFENSE  
400 ARMY NAVY DRIVE  
ARLINGTON, VIRGINIA 22202

October 19, 1998

MEMORANDUM FOR ASSISTANT SECRETARY OF THE AIR FORCE  
(FINANCIAL MANAGEMENT AND COMPTROLLER)

SUBJECT: Audit Report on Year 2000 Conversion of the Airborne Warning and Control System (Report No. 99-017)

We are providing this report for your information and use. This is one of a series of reports that we plan to issue on DoD efforts to achieve year 2000 conversion. Because this report contains no recommendations, no written comments were required, and none were received.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. Robert K. West at (703) 604-8983 (DSN 664-8983), e-mail <rwest@dodig.osd.mil>; or Mr. Robert W. Otten at (703) 604-8997 (DSN 664-8997), e-mail <rotten@dodig.osd.mil>. See Appendix D for the report distribution. The audit team members are listed inside the back cover.

A handwritten signature in cursive script that reads "Robert J. Lieberman".

Robert J. Lieberman  
Assistant Inspector General  
for Auditing



## Office of the Inspector General, DoD

Report No. 99-017  
(Project No. 8AS-0032.00)

October 19, 1998

### Year 2000 Conversion of the Airborne Warning and Control System

#### Executive Summary

**Introduction.** This is one of a series of reports being issued by the Inspector General, DoD, in accordance with an informal partnership with the Chief Information Officer, DoD, to monitor DoD efforts to address the year 2000 computing challenge. This report is also the first of three reports related to the Airborne Warning and Control System.

The E-3 Airborne Warning and Control System provides all-weather surveillance and command, control, and communication functions to commanders of U.S. tactical and air defense forces. Thirty-two U.S. Airborne Warning and Control Systems are located throughout the world.

The year 2000 problem is rooted in the way dates are recorded and computed in information technology. Computer systems typically use two digits to represent the year, such as "98" for 1998. The resulting ambiguity (1900 is indistinguishable from 2000) could create incorrect results when systems perform calculations, comparisons, or sorting when working with years after 1999.

**Audit Objectives.** Our objective was to determine whether the program office and the 552nd Air Control Wing effectively planned, executed, and coordinated year 2000 efforts for the Airborne Warning and Control System. Specifically, we reviewed actions taken to resolve date processing issues regarding the year 2000, as well as plans prepared to address year 2000-related system failures that could impact the ability of the Airborne Warning and Control System to perform its mission.

**Audit Results.** The Airborne Warning and Control System program office took an aggressive and proactive approach to address the issues under its purview and ensure continuity of operations is not disrupted by year 2000 related issues. Program office managers successfully planned, executed, and coordinated their year 2000 efforts with key organizations that support the Airborne Warning and Control System to ensure a smooth transition into the year 2000. As a result, Airborne Warning and Control System missions should not be disrupted by year 2000-related issues, provided that the operations and support infrastructure of the 552nd Air Control Wing and Air Force Air Logistics Centers are Y2K compliant.

The Year 2000 conversion efforts related to the Airborne Warning and Control System infrastructure by the 552nd Air Control Wing, Air Logistics Center Oklahoma City, and Air Logistics Center San Antonio will be discussed in separate reports.

**Management Comments.** We provided a draft of this report on September 9, 1998. Because this report contains no findings or recommendations, written comments were not required, and none were received. Therefore, we are publishing this report in final form.



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## **Part I - Audit Results**

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## Introduction

This is one of a series of reports being issued by the Inspector General, DoD, in accordance with an informal partnership with the Chief Information Officer, DoD, to monitor DoD efforts to address the year 2000 (Y2K) computing challenge.

## Audit Background

**The Airborne Warning and Control System (AWACS).** The E-3 AWACS provides airborne all-weather surveillance and command and control functions to commanders of U.S. tactical and air defense forces. The basic E-3 air vehicle is a militarized version of the Boeing 707 commercial jetliner air vehicle, and has been in service since 1977. Thirty-two U.S. AWACS are located throughout the world. In addition, the North Atlantic Treaty Organization and several foreign countries own and operate AWACS to support missions. The U.S. AWACS uses a variety of key features to complete its missions, including surveillance radar, identification friend or foe interrogator, datalink systems, voice communications, and electronic support measures.

**The AWACS Program Office.** The AWACS program office is the integrated Air Force Materiel Command organization responsible for cradle-to-grave military system management. The program office acquires, delivers, and manages the AWACS program. It is responsible for ensuring Y2K compliance for the entire AWACS program, including mission and support systems, avionics, air vehicles, external interfaces, test sets, and infrastructure. The AWACS program office reports to Air Force Materiel Command through the Electronic Systems Center at Hanscom Air Force Base, Massachusetts.

**The Y2K Problem.** The Y2K problem is rooted in the way dates are recorded and computed in information technology. For the past several decades, systems have typically used two digits to represent the year, such as "98" representing 1998, to conserve on electronic data storage and reduce operating costs. However, with the two-digit format, the year 2000 is indistinguishable from 1900. As a result of this ambiguity, system and application programs that use dates to perform calculations, comparisons, or sorting could generate incorrect results when working with years after 1999.

**DoD Y2K Management Plan.** In his role as the DoD Chief Information Officer, the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) issued the "DoD Year 2000 Management Plan" in April 1997. The DoD Y2K Management Plan provides the overall DoD strategy and guidance for inventorying, prioritizing, fixing or retiring systems, and monitoring their progress. The DoD Y2K Management Plan states that the Chief Information Officer has overall responsibility for overseeing the DoD solution to the Y2K problem. Also, the DoD Y2K Management Plan makes the DoD Components responsible for implementing

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the five-phase Y2K management process. The DoD Y2K Management Plan includes a description of the five-phase Y2K management process. The DoD Y2K Management Plan, For Signature Draft Version 2.0, June 1998, accelerates the target completion dates for the renovation, validation, and implementation phases. The new target completion date for implementing mission-critical systems is December 31, 1998.

In a January 20, 1998, memorandum for the heads of executive departments and agencies, the Office of Management and Budget established a new target date of March 1999 for implementing all corrective actions to all systems. The new target completion dates are September 1998 for the renovation phase and January 1999 for the validation phase.

**Air Force Y2K Management Strategy.** In November 1996, the Air Force published a "Year 2000 Guidance Package" (Air Force Y2K Plan) that designated the Air Force Communications Agency as the focal point for coordinating Y2K efforts. The Air Force Communications Agency is responsible for chairing the Air Force Y2K working group, sharing Y2K information, establishing a timeline for problem resolution, and tracking progress of those resolutions. The major commands are responsible for participating in the Air Force Y2K working group to ensure that all systems are inventoried and analyzed for Y2K compliance. The major commands require that all systems use the appropriate compliance strategies in accordance with DoD and Air Force policies and guidance. The Air Force Y2K Plan also includes a description of the five-phase Y2K management process. In April 1997, the Air Force updated the plan to include detailed information that had not been available for the November 1996 release on the validation and implementation phases.

**Air Force Y2K Guidance Plan.** The Air Force Y2K Plan includes the five-phase management process. Each phase represents a major Y2K program activity or segment. Completion dates for the phases range from June 1997 through December 1998.

**Awareness Phase.** The Air Force Y2K Plan dedicated a period to promote awareness of the problem throughout the Air Force. During that time, a project team should have been assigned and a program management plan developed to address the Y2K problem. The awareness phase was to be completed by June 30, 1997.

**Assessment Phase.** The assessment phase was dedicated to inventorying all existing systems; analyzing the systems to ensure Y2K compliance; determining whether the noncompliant systems should be kept, merged into another system, or terminated; prioritizing the systems based on mission criticality; identifying system interfaces and system owners; and developing a contingency plan to ensure continued operations if systems are not compliant by January 1, 2000. The assessment phase was to be completed by October 31, 1997.

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**Renovation Phase.** The renovation phase was dedicated to modifying each system that was not scheduled to be terminated by making it Y2K compliant. The renovation phase was to be completed by June 30, 1998.

**Validation Phase.** The validation phase is dedicated to testing the systems in a controlled environment to ensure that the modifications correctly address Y2K issues and that other errors have not been introduced. The validation phase is complete when the system is certified as meeting all Y2K compliance requirements and was to be completed by September 30, 1998.

**Implementation Phase.** The implementation phase is dedicated to installing the systems that have successfully met all testing and certification requirements into production or operational environments. Because testing and production environments may vary, problems may still be encountered in the implementation phase. Therefore, the implementation phase also requires a period of user-acceptance testing and monitoring and a fallback-and-recovery plan. The implementation phase is to be completed by December 31, 1998.

**Air Force Materiel Command Y2K Management Strategy.** In January 1997, the Air Force Materiel Command published a "Year 2000 Program Management Plan" using the Air Force Y2K Plan as a template. The plan includes the five-phase Y2K management process and an Appendix D for certifying weapon systems as Y2K compliant. The Air Force Materiel Command has updated the plan monthly since September 1997.

**Recent Secretary of Defense Guidance.** The Secretary of Defense issued the memorandum "Year 2000 Compliance" on August 7, 1998, and stated that the Y2K computer problem is a critical national Defense issue. He also stated that effective October 1, 1998, the Military Departments, Commanders-in-Chief, and Defense agencies will be responsible for ensuring that the list of mission-critical systems under their respective purview is accurately reported in the DoD Y2K database, and for reporting and explaining each change in mission-critical designation to the Assistant Secretary of Defense (Command, Control, Communications and Intelligence) within one month of the change.

The Deputy Secretary of Defense issued the memorandum "Year 2000 (Y2K) Verification of National Security Capabilities" on August 24, 1998. The memorandum stated that the Heads of each Service and Directors of the Defense agencies must certify that they have tested the information technology and national security system Y2K capabilities of their respective Component's systems in accordance with the DoD Management Plan.

## **Audit Objectives**

The audit objective was to determine whether the program office effectively planned, executed, and coordinated Y2K efforts for the AWACS. Specifically, we reviewed actions taken to resolve date processing issues regarding the year 2000, as well as plans prepared to address Y2K-related system failures that could impact the ability of the AWACS to perform its mission. See

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Appendix A for a discussion of the audit scope and methodology. Although not directly related to the audit objectives, Appendix B discusses The Boeing Company and the AWACS program office actions to ensure that the Government of Japan is notified of potential Y2K issues with its 767 AWACS.

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## **Program Office Y2K Management Efforts**

The program office took an aggressive and proactive approach on the issues under its purview to ensure that AWACS continuity of operations is not disrupted by Y2K-related issues. Program office managers successfully planned, executed, and coordinated their Y2K efforts with key organizations that support AWACS to ensure a smooth transition into the year 2000. As a result, AWACS missions should not be disrupted by Y2K-related issues, provided that the operations and support infrastructure of the 552nd Air Control Wing and Air Force Air Logistics Centers are Y2K compliant.

### **Y2K Program Planning**

**Program Management Plan (PMP).** The AWACS program office wrote a comprehensive Y2K PMP that meets all the Air Force Materiel Command Y2K PMP requirements. The PMP addresses the following:

- goals and objectives,
- overall management strategy,
- five-phase management process,
- key responsibilities,
- timely completion of each Y2K phase,
- systems inventory and reporting requirements,
- test and contingency plans, and
- identifying and using interface agreements.

The AWACS program office wrote the first PMP in December 1995 and revised it as new requirements and information became available. We reviewed the PMP and concentrated our audit efforts on program status, contracts, contingency and test plans, depot automatic test systems, estimated Y2K costs, external data interfaces, and The Boeing Company Year 2000 assessment.

### **Program Execution**

**Program Status.** The program office plans to complete the five-phase management process before the target completion date of December 31, 1998, set by the Air Force Materiel Command. The program office strategy is to maintain Y2K awareness and to continually assess Y2K impacts on AWACS through year 2001. The program office completed the renovation, validation, and implementation phases by September 30, 1998, and the AWACS is scheduled to be Y2K certified by December 1998.

## Program Office Y2K Management Efforts

**Contracts.** The AWACS program office did not modify all existing contracts to comply with the Federal Acquisition Regulations (48 Code of Federal Regulations Parts 39.002 and 39.106) that address Y2K compliance definitions and language. Program office officials acted promptly and responsibly when we brought this condition to their attention. The contracting officer wrote a letter to The Boeing Company, dated June 25, 1998, requesting that all existing contracts involving information technology be modified to address Y2K compliance in accordance with Federal Acquisition Regulations not later than September 1998. The contracting officer also stated in the letter that the Y2K requirement will be added to all future AWACS contracts.

**Contingency Plans.** The AWACS Y2K contingency plans did not address three general areas required by Air Force Communications Agency Y2K guidance.

- The contingency plans did not contain all AWACS mission-critical and mission-essential systems that process dates.
- The contingency plans primarily addressed risk assessment and did not identify specific actions to take during and after a Y2K failure.
- The contingency plans did not address several potential Y2K scenarios. For example, Y2K date problems that occur earlier than expected, or systems that are designated Y2K compliant but fail unexpectedly.

We brought these conditions to the attention of the program office and suggested several changes. The program office was highly responsive and took immediate action to make the necessary changes. We reviewed the revised contingency plans and consider the action taken to be satisfactory.

**Test Plans.** The AWACS test plans were comprehensive and met the requirements of the Air Force Materiel Command Y2K PMP guidance. The program office structured the testing and certification process in accordance with the "DoD Year 2000 Management Plan," Version 1.0, April 1997. AWACS tests were conducted primarily by The Boeing Company, the 552nd Air Control Wing, and the Warner-Robins and Oklahoma City Air Logistics Centers. The program office's assessment of AWACS showed that the air vehicle, and mission and operational software and hardware systems will be able to operate and correctly process mission data in the year 2000. The program office plans to certify AWACS by December 1998.

**Depot Automatic Test Systems.** The San Antonio Air Logistics Center is responsible for the AWACS automatic test systems used in depot-level maintenance and repair. The program office continues to monitor the automatic test systems to ensure that all Y2K issues are resolved. Two automatic test systems support AWACS at the depot level: the benchtop reconfigurable automatic tester and the AN/GSM-285. Every AWACS circuit card tested on the benchtop reconfigurable automatic tester or AN/GSM-285 requires unique

## **Program Office Y2K Management Efforts**

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diagnostic software that is part of the test program set. This unique diagnostic software is loaded and stored in the automatic test system computer. The diagnostic software must also be assessed for Y2K compliance.

**Benchtop Reconfigurable Automatic Tester.** The San Antonio Air Logistics Center requested that the 552nd Air Control Wing assess the benchtop reconfigurable automatic tester hardware. The 552nd Air Control Wing determined that the benchtop reconfigurable automatic tester was Y2K compliant.

**AN/GSM-285.** The Warner-Robins Air Logistics Center assessed the AN/GSM-285 for Y2K compliance. The Center determined that the AN/GSM-285 was not Y2K compliant, but operationally acceptable. Operationally acceptable means that an item can perform its functions in a Y2K environment and the only problems noted are cosmetic. In the case of the AN/GSM-285, the Y2K century date is shown on the top of a test report as 100. For example, June 30, 2000, is shown as 6/30/100. Since the power off date retention works properly before the year 2000, the user need only manually enter the year as 100 after the year 2000 for the system to properly function.

**Test Program Sets.** The Warner-Robins Air Logistics Center assessed the benchtop reconfigurable automatic tester software and AN/GSM-285 test program sets. The Center determined that the software test program sets were Y2K compliant.

**Estimated Y2K Costs.** The PMP stated that the program office intends to use a combination of cost metrics, developed by the Gartner Group and MITRE Corporation, to compute AWACS Y2K program cost estimates. The PMP requires cost estimates to be updated based on the actual cost to fix or replace a noncompliant item. The AWACS program office estimated Y2K costs to be \$860,000. As of June 1998, actual Y2K costs of \$808,000 were incurred.

**External Data Interfaces.** We reviewed the tactical digital information links that are used to communicate signals and data between AWACS and external users. The links send and receive messages to and from other aircraft and ground units. Tactical digital information link messages are defined in message standard documents. The program office conducted a Y2K key word search of data elements in tactical digital information link messages. The search did not identify any data elements involving a year or date.

**The Boeing Company Year 2000 Assessment.** In November 1997, the program office tasked its integration contractor, The Boeing Company, to conduct a comprehensive Y2K assessment of the U.S. AWACS 707 air vehicle and mission systems.

Boeing found that none of the air vehicle digital processors had Y2K-related problems. In conducting the mission systems Y2K assessment, Boeing compiled an inventory of all hardware, software, and firmware that had (or potentially had) digital processing. The inventory included all support equipment and test and development software. Boeing tested each system with

## **Program Office Y2K Management Efforts**

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dates to identify Y2K problems. The tests were documented on checklists that Boeing or vendors (for subcontracted items) prepared. Boeing also obtained Y2K compliance information from the Internet for commercial-off-the-shelf products that are used to support AWACS.

The Boeing Company completed its Y2K assessment in July 1998. The results of the assessment supported the program office conclusion that none of the AWACS mission critical or mission essential systems have Y2K problems. Boeing did identify some minor problems (related to headers and footers in printouts) in the test and development software, and took immediate action to correct those problems. Further, Boeing and the program office have an ongoing effort to monitor Y2K compliance of commercial off-the-shelf products.

### **Inspector General, DoD, Technical Assessment**

The Inspector General, DoD, engineers met with Defense Contract Management Command, The Boeing Company, and MITRE Corporation engineers to assess the 707 AWACS air vehicle systems for potential Y2K impact. The engineers obtained and reviewed engineering schematics for five judgmentally selected air vehicle systems. The systems selected were the electronic support measures, digital auto pilot unit, standard central air data computer, altitude identification military system transponder, and airborne engine system. The engineers verified that although some of those systems contained digital processors, none of them had a Y2K impact. See Appendix C for the technical assessment of the AWACS air vehicle.

### **Program Coordination**

The AWACS program office has been very effective in coordinating Y2K issues to key organizations that operate and support the AWACS. To continue to support this effort, the program office disseminates Y2K information through the Executive Program Management Review; the Executive Program Management Review - International; the Systems Supportability Review; and the Computer Resources Working Group.

## **Program Office Y2K Management Efforts**

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**Executive Program Management Review.** The Executive Program Management Review meets quarterly and includes officials from the program office, the Air Combat Command, the 552nd Air Control Wing, and the Oklahoma City and Warner-Robins Air Logistics Centers. The purpose of the review is to identify the top ten problems in the AWACS program, propose solutions to those problems, and develop potential enhancements to the AWACS.

**Executive Program Management Review - International.** The Executive Program Management Review - International, meets quarterly and includes officials from the program office, NATO, the United Kingdom, France, Japan, Saudi Arabia, and The Boeing Company. The purpose of the review is to provide foreign customers with insights into near-term and ongoing upgrade programs and current or potential Y2K issues with the AWACS.

**Systems Supportability Review.** The Systems Supportability Review meets quarterly and includes officials from the program office, the Warner-Robins and Oklahoma City Air Logistics Centers, the 552nd Air Control Wing, and The Boeing Company. The purpose of the review is to discuss AWACS supportability, maintainability, and sustainability issues.

**Computer Resources Working Group.** The Computer Resources Working Group meets quarterly and includes the program office; the San Antonio, Warner-Robins, and Oklahoma Air Logistics Centers; the 552nd Air Control Wing; and contractors. The purpose of the group is to examine computer-related issues on software, hardware, firmware, trainers, simulators, and test equipment.

## **Conclusion**

The program office took an aggressive and proactive approach in managing the AWACS Y2K program. The program office should be commended for preparing and implementing a comprehensive PMP that addressed all Y2K critical program elements. In addition, the program office took immediate action in response to our suggestions to include adding the Y2K language to all Boeing Company information technology contracts and revising contingency plans to meet Air Force guidance. Also, the program office effectively coordinated the Y2K process with AWACS operators, maintainers, and supporters. As a result, the program office should meet its planned certification of AWACS by December 1998 and the system should not be disrupted by Y2K problems, provided that the operations and support infrastructure of the 552nd Air Control Wing and Air Force Air Logistics Centers are Y2K compliant. We will address AWACS infrastructure issues related to the 552nd Air Control Wing, Air Logistics Center Oklahoma City, and Air Logistics Center San Antonio in separate reports.

## **Part II - Additional Information**

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## Appendix A. Audit Process

This is one of a series of reports being issued by the Inspector General, DoD, in accordance with an informal partnership with the Chief Information Officer, DoD, to monitor efforts to address the Y2K computing challenge. For a listing of audit projects addressing this issue, see the Y2K webpage on IGMNET at (<http://www.ignet.gov/>).

### Scope

**Work Performed.** We reviewed the efforts taken by the AWACS program office to ensure that operations of the AWACS would not be unduly disrupted by Y2K problems. Specifically, we:

- interviewed key personnel from organizations supporting AWACS, including the program office, operational commands, depots, and the integration contractor;
- obtained and reviewed applicable Federal Acquisition Regulations and DoD and Air Force policy and guidance on Y2K program management and reporting; and
- evaluated the program management plan, contingency plans, contracts, test plans, test reports, and other planning and execution documents for AWACS Y2K efforts.

**DoD-wide Corporate Level Government Performance and Results Act Goals.** In response to the Government Performance and Results Act, the DoD has established 6 DoD-wide corporate level performance objectives and 14 goals for meeting these objectives. This report pertains to achievement of the following objectives and goals.

- **Objective:** Prepare now for an uncertain future.
- **Goal:** Pursue a focused modernization effort that maintains U.S. qualitative superiority in key warfighting capabilities. **(DoD-3)**

**DoD Functional Area Reform Goals.** Most major DoD functional areas have also established performance improvement reform objectives and goals. This report pertains to achievement of the following functional area objectives and goals.

- **Information Technology Management Functional Area.**  
**Objective:** Become a mission partner.  
**Goal:** Serve mission information users as customers. **(ITM-1.2)**

- **Information Technology Management Functional Area.**  
**Objective:** Provide services that satisfy customer information needs.  
**Goal:** Modernize and integrate the Defense information infrastructure. (ITM-2.2)
- **Information Technology Management Functional Area.**  
**Objective:** Provide services that satisfy customer information needs.  
**Goal:** Upgrade technology base. (ITM-2.3)

**General Accounting Office High-Risk Area.** In its identification of risk areas, the General Accounting Office has specifically designated risk in resolution of the Y2K problem as high. This report provides coverage of that problem and of the overall Information Management and Technology high-risk area.

## **Methodology**

**Use of Computer-Processed Data.** We did not use computer-processed data to perform this audit.

**Use of Technical Assistance.** The Inspector General, DoD, Technical Assessment Division provided engineering support for this audit. The support consisted of a technical analysis of the Y2K impact of digital processors and associated software to judgmentally selected AWACS air vehicle systems.

**Audit Type, Dates, and Standard.** We performed this program results audit from April through August 1998, in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD.

**Contacts During the Audit.** We visited or contacted individuals and organizations within DoD and held discussions with Air Force contractors. Further details are available upon request.

**Management Control Program.** We did not review the management control program related to the overall audit objectives because DoD recognized the Y2K issue as a material management control weakness area in their annual statements of assurance for FYs 1996 and 1997.

## **Summary of Prior Coverage**

The General Accounting Office and the Inspector General, DoD, have conducted multiple reviews related to Y2K issues. General Accounting Office reports can be accessed over the Internet at <http://www.gao.gov>. Inspector General, DoD, reports can be accessed over the Internet at <http://www.dodig.osd.mil>.

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## **Appendix B. Other Matters of Interest**

### **Government of Japan 767 AWACS**

The Government of Japan purchased several AWACS on the Boeing 767 air vehicle platform as direct commercial sales from the Boeing 767 Commercial Airplane Group. Japan purchased the mission systems through the AWACS program office as foreign military sales.

The Boeing 767 Commercial Airplane Group performed functional area Y2K assessments on 12 major air vehicle components of the 767, including the flight management system, fuel systems, propulsion system, and mechanical and hydraulic systems. The Boeing Commercial Airplane Group uses an all-operator telex, an Internet web site, and service bulletins to disseminate Y2K technical information to 767 customers, including the Government of Japan. In addition, Boeing Commercial Airplane Group representatives attend industry meetings, Y2K conferences, model operator conferences, and operator maintenance conferences. These meetings and conferences are used to disseminate 767 air vehicle Y2K information.

The AWACS program office, in its role as the agent for the foreign military sale of the mission systems, requested Boeing to complete a Y2K compliance study to evaluate the AWACS mission systems and subsystems on the Japanese 767 AWACS. The evaluation will use the information obtained in the U.S. AWACS study, taking into account the differences between the U.S. and foreign military sales versions of the mission systems, to determine whether the Japanese 767 version of the AWACS is Y2K compliant.

The Boeing 767 Commercial Airplane Group and the AWACS program office have taken, and continue to take, appropriate action to ensure that the Japanese Government is notified of potential Y2K issues with the AWACS and the Boeing 767 air vehicle.

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## **Appendix C. Technical Assessment of the AWACS Air Vehicle**

Technical engineers in the Office of the Inspector General, DoD, selected five systems to assess the 707 AWACS air vehicle for potential Y2K impact. Engineers from The Boeing Company, the Defense Contract Management Command, and the MITRE Corporation assisted with the review. We selected the following systems for review:

- electronic support measures,
- digital auto pilot unit,
- standard central air data computer,
- altitude identification military system transponder, and
- airborne engine system.

### **Electronic Support Measures**

We obtained engineering schematics from the top level down to the circuit card assembly to determine whether the system contained any microprocessors, and whether the microprocessors had a potential Y2K impact. The electronic support measures interface unit and the computer processor contained digital counters. Because the electronic support measures hardware counters are used to tally the results of pulse parameters, synchronize internal events, and keep track of relative time, they are not susceptible to the Y2K rollover.

We traced the electronics schematics from the top system level down to the circuit card assembly and identified two microchips that did not contain time or date functions. We also reviewed the electronic support measures software, based on a two-step process, a top-down approach, and a bottom-up approach. The top-down approach analyzed the high-level system requirement. The bottom-up approach analyzed the software coding. Neither approach revealed time or date functions. Therefore, the electronic support measures hardware and software have no Y2K impact.

### **Digital Auto Pilot Unit**

We reviewed airplane wiring diagrams, system schematics, and interface control documents for the digital auto pilot unit. The digital auto pilot unit does not receive and transmit time and date information; therefore, there is no Y2K issue.

## **Appendix C. Technical Assessment of the AWACS Air Vehicle**

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The digital auto pilot unit's random access memory processes data during AWACS system operation. The maintenance manual shows that the memory unit does not use a battery, which indicates that data will not be retained after the aircraft is powered down; therefore, there is no Y2K impact.

In addition, the AWACS flight manual does not require time and date input to the flight data acquisition unit except for a thumb wheel entry of month, day, and last digit of the current year. Because the year is a one digit entry, the system reads 1988, 1998, and 2008, as 8; therefore, the last digit of the year has no Y2K impact.

### **Standard Central Air Data Computer**

The standard central air data computer is a component of the flight avionics system. We reviewed the system wiring diagrams, schematics, and interface control documents. The interface control documents do not specify that the air data computer receives or transmits a time or date. As a result, we concluded that the standard central air data computer has no Y2K impact.

### **Altitude Identification Military System Transponder**

We conducted a top-down analysis of the altitude identification military system transponder. The transponder receives, detects, decodes, encodes, and transmits radar signals. We selected the clock and commutator card assembly and analyzed the circuitry to determine whether it contains microchips that process date and time information. We also analyzed the circuit-card assembly and electrical schematic drawings and selected several microcircuits for detailed analysis. Further review of the microcircuit specifications showed that neither contained time or date functions; therefore, the transponder has no Y2K impact.

### **Airborne Engine System**

We reviewed the airborne engine system for Y2K impact and selected the fuel and engine control subsystem for further analysis. The fuel and engine control subsystems are based purely upon pulleys, levers, wire cables, and switch controls of electro-mechanical valves and relays; therefore, we concluded that the airborne engine system has no Y2K impact.

## **Conclusion**

Our review of five AWACS air vehicle systems did not disclose any Y2K impact. Our analyses were based on reviews of system schematics, circuit-card assembly drawings, microchip specifications, airplane wiring diagrams, interface control documents, and flight instrument panel manuals.

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## **Appendix D. Report Distribution**

### **Office of the Secretary of Defense**

Under Secretary of Defense for Acquisition and Technology  
Director, Defense Logistics Studies Information Exchange  
Under Secretary of Defense (Comptroller)  
Deputy Chief Financial Officer  
Deputy Comptroller (Program/Budget)  
Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)  
Year 2000 Oversight and Contingency Planning Office  
Assistant Secretary of Defense (Public Affairs)

### **Department of the Army**

Assistant Secretary of the Army (Financial Management and Comptroller)  
Auditor General, Department of the Army  
Chief Information Officer, Army  
Inspector General, Department of the Army

### **Department of the Navy**

Assistant Secretary of the Navy (Financial Management and Comptroller)  
Auditor General, Department of the Navy  
Chief Information Officer, Navy  
Inspector General, Department of the Navy  
Inspector General, Marine Corps

### **Department of the Air Force**

Assistant Secretary of the Air Force (Financial Management and Comptroller)  
Commander, Air Force Materiel Command  
Auditor General, Department of the Air Force  
Chief Information Officer, Air Force  
Inspector General, Department of the Air Force  
Commander, Electronic Systems Center

## **Other Defense Organizations**

Director, Defense Contract Audit Agency  
Director, Defense Information Systems Agency  
    Inspector General, Defense Information Systems Agency  
    Chief Information Officer, Defense Information Systems Agency  
    United Kingdom Liaison Officer, Defense Information Systems Agency  
Director, Defense Logistics Agency  
Director, National Security Agency  
    Inspector General, National Security Agency  
Inspector General, Defense Intelligence Agency  
Inspector General, National Imagery and Mapping Agency  
Inspector General, National Reconnaissance Office

## **Non-Defense Federal Organizations and Individuals**

Chief Information Officer, General Services Administration  
Office of Management and Budget  
    Office of Information and Regulatory Affairs  
Technical Information Center, National Security and International Affairs Division,  
    General Accounting Office  
Director, Defense Information and Financial Management System, Accounting and  
    Information Management Division, General Accounting Office

Chairman and ranking minority member of each of the following congressional committees and subcommittees

Senate Committee on Appropriations  
Senate Subcommittee on Defense, Committee on Appropriations  
Senate Committee on Armed Services  
Senate Committee on Governmental Affairs  
Senate Special Committee on the Year 2000 Technology Problem  
Senate Select Committee on Intelligence  
House Committee on Appropriations  
House Subcommittee on National Security, Committee on Appropriations  
House Committee on Government Reform and Oversight  
House Subcommittee on Government Management, Information, and Technology,  
    Committee on Government Reform and Oversight  
House Subcommittee on National Security, International Affairs, and Criminal  
    Justice, Committee on Government Reform and Oversight  
House Committee on National Security  
House Permanent Select Committee on Intelligence



# **Audit Team Members**

The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, produced this report.

Thomas F. Gimble  
Robert K. West  
Robert W. Otten  
Jaime A. Bobbio  
Jerel B. Silver  
Kenneth M. Teore  
Wei K. Chang  
Marvin E. Tuxhorn  
Benedicto M. Dichoso  
Laura A. Rainey  
Kathryn M. Ross  
Steven A. Baer

