Audit Report

OFFICE OF THE INSPECTOR GENERAL

ACQUISITION OF THE NAVSTAR GLOBAL POSITIONING SYSTEM USER EQUIPMENT

Report Number 92-024 December 17, 1991

Department of Defense

The following acronyms are used in this report.

GAO.....The General Accounting Office
GPS.....Global Positioning System
NAVSTAR.....Navigation System Time and Ranging

Office of the Inspector General

AUDIT REPORT NO. 92-024 December 17, 1991
(Project No. 1AS-0066)

ACQUISITION OF THE NAVSTAR GLOBAL POSITIONING SYSTEM USER EQUIPMENT

EXECUTIVE SUMMARY

Introduction. The Navigation System Time And Ranging (NAVSTAR) Global Positioning System (GPS) user equipment program consists of receiver sets for processing radio frequency signals from a satellite constellation to determine position and time. A Defense Acquisition Board decision to proceed with GPS user equipment full-rate production is scheduled for January 1992. Through FY 2006, the total life-cycle cost of the GPS user equipment could exceed $6 billion for over 55,000 GPS user equipment sets.

Objectives. Our survey objective was to determine whether the Air Force NAVSTAR GPS Joint Program Office cost-effectively procured user equipment. The survey was made in accordance with the Inspector General's critical program management elements approach. In addition, we reviewed applicable internal controls.

Survey Results. The NAVSTAR GPS Joint Program Office was effectively managing and cost-effectively procuring GPS user equipment.

Internal Controls. Internal controls were effective, and no material deficiencies were disclosed. The NAVSTAR GPS Joint Program Office had established effective procedures for safeguarding Government assets.

Summary of Recommendations. As a result of the survey, we did not make any recommendations or claim any monetary benefits. Therefore, management comments to this final report are not required. If you choose to comment, please do so by January 17, 1992.

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

REPORT
NO. 92-024

December 17, 1991

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION
ASSISTANT SECRETARY OF THE ARMY (FINANCIAL MANAGEMENT)
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT)
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT AND COMPTROLLER)

SUBJECT: Report on the Survey of the Acquisition of the NAVSTAR Global Positioning System User Equipment (Project No. 1AS-0066)

Introduction

This final report is being provided for your information and use. The survey objective was to evaluate the acquisition management of the Navigation System Time and Ranging (NAVSTAR) Global Positioning System (GPS) user equipment to determine whether the user equipment was being cost-effectively procured. We also reviewed associated internal controls.

The Air Force is the lead Military Department for this joint Military Department program. The NAVSTAR GPS Joint Program Office (Joint Program Office), Air Force Space Systems Division, manages the program. Through FY 2006, the total life-cycle cost of the GPS user equipment could exceed $6 billion for over 55,000 GPS user equipment sets.

Scope of Survey

This economy and efficiency survey was conducted in accordance with auditing standards issued by the Comptroller General of the United States as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as were deemed necessary. We performed the survey from August through October 1991. The survey was made in accordance with the Inspector General's critical program management elements approach. As part of this approach, we reviewed nine program management elements: threat versus system requirements, acquisition planning, contracting, production readiness reviews, program stability, testing, cost estimating, logistics support, and component breakout. We reviewed accounting and program data for the period June 1986 through October 1991 to support the audit. We interviewed personnel involved in the acquisition of

the NAVSTAR GPS user equipment. A list of the activities visited or contacted is in Enclosure 1.

Internal Controls

Internal controls were reviewed as deemed necessary for the nine critical program management elements reviewed. Internal controls were determined from applicable DoD and Military Department directives, instructions, and manuals. Our review included acquisition, pricing, and contracting controls established to promote segregation of duties and responsibilities and safeguarding of Government assets. The internal controls reviewed were deemed to be effective in that no material deficiencies were disclosed by the survey.

Background

The NAVSTAR GPS is a space-based radio navigation system that was designed to provide precise, continuous, all-weather global positioning and navigational data, together with time and velocity information for military and civilian users. NAVSTAR GPS is more accurate than other navigation systems; therefore, it will replace land-based navigation systems and will be used to reduce the inaccuracy of airborne navigation systems.

NAVSTAR GPS includes two major acquisition programs: the satellite program and the user equipment program. The satellite program consists of a satellite constellation for transmitting radio signals and ground command and control stations for operating and controlling the satellites. The user equipment program consists of receiver sets for processing radio frequency signals from the satellite constellation to determine position and time. The Defense Acquisition Board initially approved low-rate initial production for the GPS user equipment in June 1986.

In 1979, the Joint Program Office awarded Rockwell International Corporation, Collins Government Avionics Division (Rockwell-Collins), the full-scale development contract for GPS user equipment. In April 1985, the Joint Program Office competitively awarded Rockwell-Collins a fixed-price contract for low-rate initial production quantities. Since FY 1990, the Joint Program Office has procured hand-held GPS sets and components for 2- and 5-channel GPS user equipment sets from five contractors. In total, the Joint Program Office has awarded contracts amounting to about $717 million to procure over 6,600 GPS user equipment sets.

Prior Audit Coverage

There has been one audit report issued addressing GPS user equipment. On March 20, 1991, the General Accounting Office (GAO) issued Report No. NSIAD-91-74 (OSD Case No. 8554), "Global Positioning System: Production Should Be Limited Until Receiver Reliability Problems Are Resolved." GAO concluded that continued low-rate initial production of GPS user equipment should be further limited until operational tests of the receiver sets were completed. The October 24, 1990, House and Senate Conference Report, which was based on the draft GAO report, authorized FY 1991 user equipment procurement funds of $17 million for the Army and Navy and directed the Air Force to use unobligated prior year funds to procure 5-channel GPS user equipment sets at no more than the 35-percent option of the low-rate initial production contract.

Discussion

The Joint Program Office was effectively managing and cost-effectively procuring GPS user equipment. Also, there were no evident barriers to proceeding with full-rate production in January 1992 as planned. A discussion of the nine program management elements follows.

Threat Versus System Requirements. Unlike commercial GPS user equipment sets, GPS military user equipment sets were designed to avoid system threats. Military sets have multiple receiving channels and an added frequency to avoid satellite transmission losses and to ensure accuracy for location determinations. In addition, military sets have embedded chips for signal decoding whenever GPS satellite transmissions are scrambled for security reasons.

Acquisition Planning. The GPS user equipment acquisition plan was well defined. The Joint Program Office adequately considered available acquisition alternatives before initiating follow-on procurements in FY 1990. In accordance with the acquisition plan, the Joint Program Office protected the Government's interest in the follow-on contracts by including provisions enabling the variation of quantities ordered and the assessment of liquidated damages to protect the Government from cost impacts resulting from late component deliveries. In addition, the Joint Program Office planned to procure hand-held GPS sets as nondevelopmental items to take advantage of technical advances made by commercial manufacturers.

Contracting. The Joint Program Office negotiated fair and reasonable follow-on production contracts for GPS user equipment in FY 1990. The Joint Program Office released 7 requests for

proposals, received 150 bids, and awarded 5 firm-fixed-price contracts that included production options for FYs 1990 through 1994. Of the five contracts, four were negotiated competitive actions. Rockwell-Collins was awarded the one sole source contract because it had not completed the design drawing packages in time to compete the land and vehicle GPS user equipment and intermediate test set procurement before the close of FY 1990. The Joint Program Office did not plan to exercise future Rockwell-Collins sole source contract options for the sets.

Production Readiness Reviews. The Joint Program Office had performed required production readiness reviews to ensure that contractors were ready to begin full-rate production of 2- and 5-channel GPS user equipment components. Subsequent Joint Program Office documentation indicated that the contractors had taken appropriate corrective actions for problems noted in the production readiness reviews. Also, production risks were minimal since three of the four contractors had previously demonstrated their ability to produce GPS user equipment components in accordance with system technical specifications.

Program Stability. In May 1991, the Joint Program Office processed a program baseline change that resulted from the Military Departments' successful use of hand-held GPS sets during Operation Desert Storm. After Operation Desert Storm, the Military Departments more than doubled their stated requirements for GPS user equipment sets from 25,377 to 55,667 units. The requirements change caused total program costs to increase by $268 million and average unit costs to decrease by $25,000. A program baseline change was required because these cost changes caused program baseline cost breaches. The Defense Acquisition Executive has not officially approved the user equipment program baseline change. According to the Air Force Program Executive Office Organization, the increase in the program baseline has not been denied but is being withheld until agreement can be reached on the GPS satellite program full operational capability date. Except for this latest program baseline change, the Joint Program Office has been able to sustain the GPS user equipment in accordance with the approved program baseline.

Testing. In September 1990, the Defense Acquisition Board directed the performance of extended operational tests to resolve operational deficiencies identified in 5-channel GPS user equipment sets used on sea and air platforms. Preliminary Navy operational test results indicated that interference, interoperability, satellite tracking, and reliability deficiencies had been fixed. Interim Air Force operational test results indicated that integration problems with the F-16 aircraft fire control computer appeared to be corrected.

However, sufficient F-16 flight hours had not been accumulated to demonstrate that the 5-channel GPS user equipment sets will satisfy the 500 hours mean-time-between-failure reliability criteria.

Based on integration difficulties experienced with the F-16 aircraft, the Joint Program Office and the Director, Operational Test and Evaluation, were aware that follow-on tests and evaluations of GPS user equipment on the various aircraft platforms will be required to resolve any integration problems before the GPS user equipment sets are installed on the various aircraft platforms.

Cost Estimating. The Joint Program Office prepared reasonable program cost estimates in support of the September 1990 Defense Acquisition Board program review. After reviewing the program cost estimates, the DoD Cost Analysis Improvement Group concluded that the Joint Program Office's cost estimates were reasonable and provided flexibility for procuring additional GPS user equipment sets. As of October 31, 1991, the Joint Program Office was preparing cost estimates supporting the Defense Acquisition Board's January 1992 full-rate production decision review.

Logistics Support. The Joint Program Office has developed GPS user equipment logistics and maintenance plans that appeared adequate. Manuals were developed, validated, and delivered, and spare parts were being procured on GPS user equipment production contracts. Further, 2- and 5-channel GPS user equipment sets were designed to be maintained by operational units. The Army and Air Force have established maintenance depots for GPS user equipment with Full Operational Capability scheduled for June 1994. The Navy plans to use Army and Air Force depots for maintenance support.

Component Breakout. The Joint Program Office was effectively breaking out GPS user equipment components in accordance with guidance in the Federal Acquisition Regulation. The Joint Program Office broke out major components of the 2- and 5-channel GPS user equipment sets for separate procurements after exercising the last Rockwell-Collins contract option in FY 1989. The Joint Program Office estimated that component breakout would result in program savings of as much as 15 percent without jeopardizing the quality, reliability, performance, and delivery of the GPS user equipment sets based on design maturity. We commend the Joint Program Office for cost-effectively breaking out the major components of the 2- and 5-channel GPS user equipment sets through competition beginning in FY 1990.

Since this report contains no findings or recommendations, written comments are not required. However, if you choose to comment, please do so by January 17, 1992. Because there are no findings or recommendations in this report, we are issuing it in final form. This report does not claim any monetary benefits.

The courtesies extended to the audit staff are appreciated. If you have any questions on this survey, please contact Mr. John E. Meling at (703) 614-3994 (DSN 224-3994) or Mr. David M. Wyte at (703) 693-0497 (DSN 223-0497). Copies of this report are being provided to the activities listed in Enclosure 2.

Robert J. Lieberman
Assistant Inspector General
for Auditing

Enclosures

cc:
Secretary of the Army
Secretary of the Navy
Secretary of the Air Force

ACTIVITIES VISITED OR CONTACTED

Office of Secretary of Defense

Office of the Under Secretary of Defense for Acquisition, Washington, DC
Office of the Director, Operational Test and Evaluation, Washington, DC

Department of the Air Force

U.S. Air Force Program Executive Office Organization, Washington, DC
Global Positioning System Joint Service System Management Office, Washington, DC
NAVSTAR Global Positioning System Joint Program Office, Air Force Space Systems Division, Los Angeles, CA
Air Force Operational Test and Evaluation Center, Kirtland Air Force Base, NM

REPORT DISTRIBUTION

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition
Assistant Secretary of Defense (Public Affairs)
Comptroller of the Department of Defense
Director, Operational Test and Evaluation

Department of the Army

Secretary of the Army
Assistant Secretary of the Army (Financial Management)
Assistant Secretary of the Army (Research, Development and Acquisition)
Auditor General, U.S. Army Audit Agency

Department of the Navy

Secretary of the Navy
Assistant Secretary of the Navy (Financial Management)
Assistant Secretary of the Navy (Research, Development and Acquisition)
Auditor General, Naval Audit Service

Department of the Air Force

Secretary of the Air Force
Assistant Secretary of the Air Force (Acquisition)
Assistant Secretary of the Air Force (Financial Management and Comptroller)
U.S. Air Force Program Executive Office Organization
Global Positioning System Joint Service System Management Office
NAVSTAR Global Positioning System Joint Program Office, Air Force Space Systems Division
Air Force Operational Test and Evaluation Center
Auditor General, Air Force Audit Agency

Defense Agencies

Director, Defense Logistics Agency
Director, Defense Logistics Studies Information Exchange

REPORT DISTRIBUTION
(continued)

Non-DoD Activities

Office of Management and Budget

U.S. General Accounting Office, NSIAD Technical Information Center

Congressional Committees:

Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
Senate Ranking Minority Member, Committee on Armed Services
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
House Ranking Minority Member, Committee on Appropriations
House Committee on Armed Services
House Committee on Government Operations
House Subcommittee on Legislation and National Security, Committee on Government Operations

SURVEY TEAM MEMBERS

Donald E. Reed, Director, Acquisition Management Directorate
John E. Meling, Program Director
David M. Wyte, Project Manager
Donald Stockton, Team Leader
David F. Vincent, Team Leader
Rigoberto Luis, Auditor
Mohsin R. Mughal, Auditor
Brian Roberts, Auditor
Kimberly Y. Willis, Editor
Ana A. King, Secretary