



INSPECTOR GENERAL  
DEPARTMENT OF DEFENSE  
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ARLINGTON, VIRGINIA 22202-2884



REPORT  
NO. 92-098

June 17, 1992

MEMORANDUM FOR THE INSPECTOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Final Report on the Technical Assessment of Optical  
Disk for Patriot Missile System (Project No. 2PT-5009)

### Introduction

We reviewed the Optical Disk for the Patriot Missile System in response to a request from Congresswoman Helen Delich Bentley. She raised concerns that the Army will choose a type of optical disk unit made only in Japan or developed from technology based on a standard from Japan. Our overall objective was to determine the appropriateness of the optical disk source and technology selection.

### Scope of Inquiry

We conducted a comprehensive review of the optical disk, including procurement, engineering specifications, contract documentation, and technical information. We also interviewed personnel in the Patriot Missile System Program Office, the Raytheon Company, and experts in optical disk technology.

The inquiry was conducted from December 1991 through April 1992 by the Technical Assessment Division.

### Background

The Patriot Missile system is an advanced surface-to-air guided missile system that provides mobile, all-weather, day-and-night air defense against hostile high performance aircraft. The system is managed by the Patriot Program Office and comes under the direction of the Program Executive Office for Air Defense.

The mass storage tape units inside the Patriot Missile system were known to have problems in reliability, capacity, and speed. Raytheon is presently working under a multiyear engineering services contract for the Army to replace the mass storage tape units with optical disk storage units.

### Discussion

We reviewed the history of the optical disk procurement for the Patriot Missile system and found that the Patriot Program Office became aware of the deficiencies of tape units prior to 1987, and tasked Raytheon to search for a replacement. Raytheon

conducted research into five different memory storage technologies. In 1988, the optical disk technology was selected.

Raytheon then conducted vendor selection, and at least eleven vendors were considered. The advantages and disadvantages of each vendor's product were presented to the program office and Sundstrand Corporation's Sample Servo (SS) optical disk was selected. Their optical disk was based on Sony's design.

The original requirements from the Patriot Missile Program Office did not specify the technology, but the systems specification, prepared by Raytheon, specified the SS data format. Personnel at Raytheon indicated that they are preparing an update to the specification which will not specify the format. The system specification requires vendors to supply an optical disk with a unique interface. The requirement is transparent to the technology. The system design can adopt either the CCS or SS disk and does not contribute to monopoly by any one technology or vendor.

In February 1989, Sundstrand, in accordance with Japan's Ministry of International Trade and Industry (MITI), informed Raytheon that Sony would not commence shipment of parts without identifying commercial sales. Also, because there was a clear danger of depending on foreign parts in the Patriot Missile system, Raytheon and the Patriot Program Office decided to develop a second source. Cherokee Data System, Inc. was contracted in July 1991 to develop optical disk units using SS format. In late 1991, Sundstrand made a decision to "get out of the business" but promised to deliver the remaining optical disks under contract. Cherokee then became the prime source. After Sundstrand retreated from the business, Raytheon reconsidered the data format and selected Cherokee's U.S. designed Continuous Composite Servo (CCS) optical disk. The Sundstrand SS optical disks were used to verify the design concept.

We surveyed the optical disk industry and found the CCS format is by far the more common for commercial applications. The International Standards Organizations (ISO) allows for either of two formatting schemes, CCS or SS. The American National Standard Institute (ANSI) specifies only the CCS scheme. There is a possibility that the world community will adopt one standard in the future.

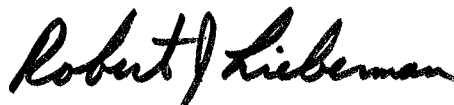
We studied both SS and CCS technologies and found that supporters of the SS technology claimed advantages such as faster access time, less degradation due to wear, relatively compact size, and suitability for application in harsh, military environments. While the claims might have had some truth in the past, they are no longer valid. The SS design and the new CCS design are very similar, and each format can meet Patriot Missile system requirements.

The Buy American Act clause was included in the Patriot Missile contracts awarded to Raytheon. It applies to the prime contracts only, and not to individual subcontracts. Certificates were submitted by Raytheon certifying that the Patriot Missile system is a domestic end product.

### Conclusion

The Army's final selection was not a type of optical disk made only in Japan or developed from technology based on a standard from Japan. The use of an optical disk from a foreign source has been overtaken by events. The CCS standard is technically equal to the SS standard for purpose of the Patriot Missile system application. The optical disk source and technology selection were appropriate.

The courtesies extended to the staff during the inquiry are appreciated. If you have any questions concerning the report, please contact Mr. Kenneth Stavenjord on (703) 614-8174 or Mr. Wei Chang on (703) 614-0314.



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Enclosures

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