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**OPERATION DESERT
STORM**



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**Project Manager's Assessment
of Patriot Missile's Overall
Performance Is Not Supported**

Statement of Richard Davis, Director, Army Issues, National
Security and International Affairs Division



Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to share our observations on the Project Manager's assessment of the Patriot missile system's performance during Operation Desert Storm. My statement will focus on (1) the Army's efforts to deploy an effective missile defense against Iraqi Scud missiles and (2) the Patriot Project Manager's analysis of the Patriot's performance. Our review indicated in general that the Army and supporting contractors overcame significant obstacles to provide tactical missile defense in Saudi Arabia and Israel but that the Project Manager's assessment that Patriot was successful against 70 percent of the Iraqi Scuds was not supported. The quality of the performance data is now being reassessed.

Our observations are based on a February 1992 briefing by the Patriot Project Manager and an examination of two reports cited as the basis for the assessment. In the course of our work we interviewed officials in the Patriot Project Office, the Office of the Army's Deputy Chief of Staff for Operations, the Army Training and Doctrine Command's System Manager for High-Medium Air Defense, and the Army's Ballistic Research Laboratory. Our examination of the two reports included comparing them to the Army's briefing and tracing the statements in the reports to supporting records. Because the Army is continuing to gather data, we have not independently examined Patriot's performance. We discussed our observations with Project Office officials and have included their views as appropriate.

BACKGROUND

Patriot is a surface-to-air guided missile system designed to protect U.S. forces from air strikes. The system consists of a ground radar, an engagement control station, an antenna, an electric power plant, and typically eight launchers. Each launcher contains four missiles in their individual storage-transportation-launch containers.

Production of the basic antiaircraft system began in the early 1980s, with initial deployment in Germany in 1985. The Army subsequently began exploring Patriot's ability to defend against tactical ballistic missiles. The first step to achieve an anti-tactical missile capability (PAC-1) involved software modifications to improve detection and tracking of specific Soviet tactical ballistic missiles. PAC-1, completed in 1988, provided self-defense but not the capability to destroy the incoming warhead. To achieve this advanced capability, the Army began a second improvement (PAC-2), which provided a new fuse and warhead. The PAC-2 fuse is much faster and enables Patriot to engage the front of an incoming missile where the warhead is located. The PAC-2 warhead produces larger fragments to disable tactical missiles.

THE ARMY QUICKLY MODIFIED PATRIOT AND
ACCELERATED PRODUCTION TO DEAL WITH THE SCUD

At the time Iraqi forces invaded Kuwait in early August 1990, Patriot had no capability to engage the extended-range version of the Scud missile--referred to as the Al-Hussein. The extended range enabled the Scud to travel at speeds much higher than the Soviet missiles against which Patriot had been designed to defend. The Al-Hussein flies at speeds of between 6,500 and 7,200 feet per second, compared with between 5,200 and 5,900 feet per second for the Soviet missile.

In less than 1 week, the Army and the prime contractor, working closely with the intelligence community, identified, assessed, and incorporated software modifications to provide Patriot fire units the capability to engage the faster Scud missiles. These modifications were incorporated into the first units deployed to the Gulf in August 1990.

After Patriot began engaging Scud missiles, there were two additional software modifications. These modifications were intended to (1) increase the altitude at which Patriot intercepted the Scud and (2) reduce the number of false targets detected by Patriot fire units.

Accelerated Production

At the time of the Iraqi invasion, there were only three of the more capable PAC-2 missiles in the Army's inventory. As a result of emergency production orders, however, the Army was able to supply PAC-2 missiles to all units by the time of the first Scud engagement in January 1991. By the end of that month, about 600 of the more capable missiles were in the Gulf region, which was substantially more than initially planned.

SOURCE DOCUMENTS HAD SERIOUS LIMITATIONS AND
DID NOT SUPPORT THE PROJECT MANAGER'S ASSESSMENT

The Project Manager's assessment indicated that many of the Scud missiles that were launched against targets in Saudi Arabia and Israel were not a threat to areas protected by Patriot. For the ones that were assessed as coming too close, the assessment showed that Patriot successfully engaged about 70 percent of the Scud missiles--over 80 percent in Saudi Arabia and over 50 percent in Israel. The Project Manager defined an engagement as successful if Patriot destroyed or disabled the incoming warhead or if Patriot caused the incoming warhead to change course and land outside a protected area.

Our review of the two principal supporting documents showed the data had serious limitations and did not support the assessment.

System Manager's Summary
Was Not Properly Used

The first document we examined was prepared by the Army Training and Doctrine Command's System Manager for High-Medium Air Defense. This document is a large spreadsheet displaying information such as the date of each Scud launch, the Patriot unit or units that engaged it, and the results of the engagement.

Our review of the spreadsheet and several binders of supporting notes showed that the spreadsheet was actually an inaccurate summary of information obtained through telephone calls to various units in the Gulf, Army staff offices in the Pentagon, or the Patriot Project Office. In addition, many gaps and inconsistencies existed between the data presented on the spreadsheet and the supporting records. For example, there were several instances in which Patriot operators reported destroying more Scud warheads than there were missiles launched. In other instances, the supporting telephone record showed the Scud was diverted from a protected area, but the spreadsheet showed the Scud's warhead was destroyed. In some cases, there were no records supporting the spreadsheet entries.

The System Manager told us that he was not surprised that we found gaps and inconsistencies in the data. He said the spreadsheet was not intended to be used as an analysis of Patriot's performance. He said it was intended as a tool to keep himself and others at the Air Defense School abreast of events in the Gulf; therefore, he made no attempt to analyze and refine the data.

Ballistic Research Laboratory Report Often Did Not
Support the Assessment and Had Other Limitations

A second document cited in the Project Manager's assessment was a draft report prepared by the Ballistic Research Laboratory. The objectives of the draft report were to determine which impact points on the ground were caused by detonations of high explosives and, if possible, to determine the magnitude of the explosions.

Our review of the draft report and discussions with its author identified several limitations.

- The report included information on only about one-third of the Saudi engagements, although the Project Manager's assessment cited it as a source for all engagements.
- The report assumed that Patriot destroyed Scud warheads in the air unless warhead damage was found on the ground. This assumption is improper because some units did not attempt to locate damage.

-- The report's analysis of identified damage was limited because (1) it was based on the efforts of one engineer working in Saudi Arabia for 5 days in February 1991 and 19 days in March 1991, (2) it relied heavily on photographs and interviews with military personnel assigned to the Patriot units, and (3) site visits were always made days or weeks after an impact when craters had often been filled and missile debris removed.

The combination of these limitations likely contributed to errors we found in the draft report. For example, the dates of two events were reversed, and a photograph purportedly depicting a Scud warhead disabled by Patriot actually pictured a Scud fuel tank.

The author of the draft report told us that his efforts to finalize the report had identified these and other needed corrections. The Associate Director at the Laboratory said that, in finalizing the report, the Laboratory would take a close look at the supporting data for its assumptions and conclusions.

PROJECT MANAGER'S ASSESSMENT DID NOT INCLUDE IMPORTANT INFORMATION

As previously mentioned, the Project Manager's assessment of Patriot's performance focused on how many Scud warheads Patriot destroyed, disabled, or diverted from protected areas. The assessment omitted other important information that could contribute to a better understanding of Patriot's performance.

First, the assessment did not provide a full accounting of the total number of Patriot missiles fired. The assessment provides a record of each Scud missile launched and the number that endangered protected areas, but did not mention the number of Patriot missiles launched. Also, the detailed mission-by-mission analysis accounts for only about 86 percent of the 159 Patriot missiles launched.

The Deputy Project Manager told us that fire units typically launch two Patriot missiles at each target in order to increase the success rate. In his opinion, however, the number of Patriot missiles launched is not relevant to Patriot's effectiveness. We believe that whether it took one, two, or a dozen Patriot missiles to stop an incoming Scud is important to understanding its effectiveness.

The assessment also considered only the damage caused by Scud warheads. Although the Army has described the Scud's fuel tank as an effective kinetic energy weapon capable of causing significant damage, the assessment did not include damage that may have been caused by the fuel tank and components other than the warhead. Project officials told us that an Israeli

assessment of Patriot's effectiveness considered any ground explosion as an unsuccessful engagement.

A third area not included in the assessment was the number of false targets detected. As mentioned earlier, there were software modifications to reduce the number of false targets detected by the fire units. Although Patriot missiles were launched at false targets, the Project Manager's assessment is silent on the extent of the problem and any adverse effects.

THE PROJECT OFFICE IS REASSESSING
PATRIOT'S PERFORMANCE

When we discussed our observations with Project Office officials, they pointed out that they too had recognized limitations of the assessment and supporting records. As a result, they did not submit the briefing to Army headquarters for approval as planned. Rather, they have (1) revised their methodology, (2) eliminated the Training and Doctrine Command's System Manager for High-Medium Air Defense summary from consideration, (3) obtained additional information and records from individual units, and (4) sent an assessment team to Israel to resolve wide differences between the Project Manager's assessment and the assessments made by Israeli officials.

Army officials shared their reassessment with us, but it was not available in sufficient time for us to evaluate it. Also, the officials told us that detailed supporting data was not yet available.

CONCLUSION

In conclusion, Mr. Chairman, the Project Manager's February 1992 assessment was based on documents that had significant limitations and did not support his assessment. Also, additional information such as the number of Patriot missiles required to destroy or divert the Scud and the significance of false targets could provide a more complete understanding of Patriot's performance. Project Office officials have also recognized limitations in their supporting data and are reworking their assessment.

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Mr. Chairman, this concludes our testimony. We will be happy to answer any questions you or the Subcommittee members may have at this time.

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