

CRS Report for Congress

The Patriot Air Defense System and the Search for an Antitactical Ballistic Missile Defense

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

Steven A. Hildreth
Specialist in National Defense

and

Paul C. Zinsmeister
Specialist in National Defense
Foreign Affairs and National Defense Division

19980513 067

THIS COPY IS UNCLASSIFIED

PLEASE RETURN TO:

BMD TECHNICAL INFORMATION CENTER
BALLISTIC MISSILE DEFENSE ORGANIZATION
7100 DEFENSE PENTAGON
WASHINGTON D.C. 20301-7100

June 3, 1991

PLEASE RETURN TO:

SDI TECHNICAL INFORMATION CENTER



Accession Number: 2968

Publication Date: Jun 03, 1991

Title: Patriot Air Defense System and the Search for an Antitactical Ballistic Missile Defense System

Personal Author: Hildreth, S.A.; Zinsmeister, P.C.

Corporate Author Or Publisher: Library of Congress, Congressional Research Service, Washington, DC Report Number: 91-456 F

Descriptors, Keywords: Patriot Missile ATBM ATM PAC-1 PAC-2 TBMD SDI BMD ABM Treaty Army Congress Vote

Pages: 00047

Cataloged Date: Jun 10, 1991

Document Type: HC

Number of Copies In Library: 000001

Record ID: 22133

Source of Document: CRS

THE PATRIOT AIR DEFENSE SYSTEM AND THE SEARCH FOR AN ANTITACTICAL BALLISTIC MISSILE DEFENSE

SUMMARY

The Army developed the Patriot missile system to defend against high performance aircraft. In the mid-to-late 1980s the Army developed a modified version (Patriot ATM) of the system to defend against tactical missiles (short-range ballistic, cruise, and air-to-surface). PAC-1 mods involved software changes and PAC-2, hardware changes (new fuse and larger fragments for the warhead). Patriot ATM was used during the Persian Gulf War in early 1991 to defend cities and sites in Saudi Arabia and Israel.

Patriot's success against Iraqi Scuds spawned conflicting claims about who supported Patriot and who didn't. The legislative history of Patriot ATM is not that simple. It is linked to nearly-decade long congressional efforts to get DOD to respond to the tactical missile threat: first, the Soviet threat to NATO forces; now, the proliferating global threat. The public record reveals a congressional consensus for early deployment of an effective tactical ballistic missile defense (TBMD).

Congress has been concerned with three issues: the kind of system deployed; the responsible DOD agency; and, not violating the ABM Treaty. In the early and mid 1980s, the House and Senate armed services committees differed on Patriot ATM as a near-term solution: the SASC supported it; the HASC did not, preferring to capitalize on SDI technologies. Both looked to SDI for the longer term. (The HASC has since supported Patriot ATM.) The defense authorizing and appropriating committees have consistently criticized DOD for poor management but differed on which agency should manage TBMD: the Army, the long-time manager of Patriot ATM, or the SDI Organization. The House-passed version of the FY 1992/1993 defense authorization bill includes statutory language establishing the Army as the responsible agency.

Patriot ATM has always been an Army program; it had no connection with SDI. Yet Patriot's Gulf War performance has brought home three lessons for ballistic missile defense (BMD) in general: it offers considerable support for the argument that BMD can work; threats of military retaliation may not deter Third World nations from missile attacks; and a missile defense can't rely solely on destroying enemy missiles and launchers on the ground. Patriot has given ammunition to those who believe that the United States should deploy some BMD capability. Others caution that the technology required would be much more challenging than that represented in Patriot ATM. A BMD option likely will entail choices between systems that comply or don't comply with the ABM Treaty.

Patriot has also sharpened congressional interest in deploying a TBMD system as soon as possible. At this point, the only system that exists is Patriot ATM. But the Army has not committed itself to further upgrades, stating that the concept selected for a future TBMD capability must first undergo further assessment.

TABLE OF CONTENTS

INTRODUCTION	1
SYSTEM DESCRIPTION	3
Figure 1: Patriot Missile Interception	4
PATRIOT'S PERFORMANCE IN THE PERSIAN GULF WAR	5
PROGRAM HISTORY	9
PATRIOT AIR DEFENSE SYSTEM	9
PATRIOT ATM	10
PATRIOT ATM: LEGISLATIVE HISTORY HIGHLIGHTS	13
ISSUES OF CONGRESSIONAL INTEREST	17
IS SDI RESPONSIBLE FOR PATRIOT'S TECHNICAL SUCCESS?	17
PATRIOT'S GULF PERFORMANCE: LESSONS LEARNED FOR BMD & SDI	18
PATRIOT'S EFFECT ON THE SDI AND TACTICAL BALLISTIC MISSILE DEFENSE DEBATE	20
APPENDIX A: LEGISLATIVE HISTORY	21
PATRIOT ATM RDT&E	21
Overview	21
Floor Votes on Patriot ATM.	21
Program Element (PE) 603302A	21
Table 1: Funding History of Army ATM (RDT&E)	23
The Context of Congressional Concern	23
A growing threat	23
Lack of progress in countering the threat	24
Ensuring that ATM/ATBM programs do not violate the ABM Treaty	25
Congressional Oversight: Fiscal Years 1983-1991	25
What kind of system should be deployed?	25
Summary	25
Fiscal Year 1984	26
Fiscal Year 1985	27
Fiscal Years 1987 and 1988	28
Fiscal Years 1989 and 1990	31
Which DOD agency should be responsible for developing a tactical missile defense?	32
Summary	32
Fiscal Year 1989	33
Fiscal Year 1990	35
Fiscal Year 1991	35

TABLE OF CONTENTS -- Continued

PATRIOT PROCUREMENT	36
Procurement of Missiles, etc.	36
Table 2: Procurement of Patriot Missiles and Associated Equipment	37
Procurement of Modifications	39
Table 3: Procurement of Patriot Missile Modifications	40
APPENDIX B: SOVIET SA-X-12 SURFACE-TO-AIR MISSILE	41
APPENDIX C: ARMS SALES, TRANSFERS, & CO-PRODUCTION	45
THE PERSIAN GULF WAR	45
Saudi Arabia	45
Israel	45
Turkey	46
OTHER ARRANGEMENTS	46
Germany	46
The Netherlands	47
Japan	47
Italy	47

THE PATRIOT AIR DEFENSE SYSTEM AND THE SEARCH FOR AN ANTI-TACTICAL BALLISTIC MISSILE DEFENSE

INTRODUCTION

Media publicity of the air battles between U.S. Patriot missiles and Iraqi Scuds during the 1991 Persian Gulf War gave fresh impetus to the long-sought-after deployment by the United States and its allies of an effective defense against tactical ballistic missiles. It also gave rise to public accolades and accusations among and between "those who supported Patriot" and "those who didn't."¹

The Patriot also has become a standard for those who believe that a proliferating missile threat impels the United States to deploy some sort of missile defense within its own borders.² In his January 29th State of the Union address, after commenting on "the remarkable technological advances like the Patriot missile," President Bush announced that he had "directed the SDI [Strategic Defense Initiative] program be refocused on providing protection from limited ballistic missile strikes -- whatever their source."³ And later, in a speech before workers at Raytheon, the producer of the missile, President Bush declared that Patriot was "proof positive that missile defense works."⁴

This report examines the Patriot air defense missile system, particularly the programmatic development and legislative history of its anti-tactical missile

¹ See for example: Archibald, George. Patriot Zaps Foes of 'Star Wars' on the Hill. *The Washington Times*, Jan. 31, 1991. p. B8; Adleman, Ken. Missile Defense Foresight. *The Washington Times*, Feb. 15, 1991. p. F3.; Bad for Civilians. Review and Outlook. *Wall Street Journal*, Jan. 21, 1991. p. A8.

² International Security Council. SDI: Now More Than Ever (Lessons of the Gulf War). *The Washington Times*, Feb. 12, 1991. p. A7.; Brown, Harold. Yes on Patriot, No on SDI. *Washington Post*, Mar. 27, 1991. p. A23.; Starr, Barbara. 'Scud' wars puts SDI back into limelight. *Jane's Defense Weekly*, Feb. 16, 1991. p. 220.

³ Address Before a Joint Session of the Congress on the State of the Union, Jan. 29, 1991. *Weekly Compilation of Presidential Documents*, Vol. 27, No. 5, Monday, Feb. 4, 1991. p. 94.

⁴ Remarks to Raytheon Missile Systems Plant Employees in Andover, Massachusetts, Feb. 15, 1991. *Weekly Compilation of Presidential Documents*, Vol. 27, No. 7, Monday, February 18, 1991. p. 178.

(ATM) capability.⁵ Patriot's performance in the Persian Gulf War has renewed national interest in the SDI and in theater missile defenses; this issue too is explored in the report. Because of considerable interest in Congress' role in developing the Patriot ATM system, a detailed legislative history and analysis is included as an appendix.

⁵ Within the policy community, the terms antitactical missile (ATM) and antitactical ballistic missile (ATBM), as well as short-range, tactical, and theater missile defense (TMD) tend to be used interchangeably. For the purposes of this report, ATBM is identified with the application of SDI technologies to theater missile defense (i.e., against relatively longer range ballistic missiles that could be used within a region, such as Europe or the Middle East), while ATM is identified with the Army's program to develop a tactical missile defense (i.e., against relatively shorter range ballistic missiles, cruise missiles and air-to-surface missiles). There is no apparent policy consensus as to the definition of tactical, theater, or short-range ballistic missiles.

SYSTEM DESCRIPTION

The Patriot is an Army surface-to-air, mobile, air defense missile system. The system as its development has evolved since the mid-1960s defends against the medium- to high-altitude threat from aircraft and cruise missiles, as well as more recently against short-range ballistic missiles. The latter antimissile capable system is called the Patriot PAC-1 and PAC-2 (Patriot Antitactical Missile Capability).

Raytheon Company, Lexington, MA, designed and produces the Patriot system. Martin Marietta, Orlando, FL, is the principal subcontractor, assembling the missile for Raytheon from components produced by other subcontractors.⁶

The basic U.S. Army Patriot configuration is a fire unit, consisting of several components that are physically separated from each other:

- 8 missile launchers (typically), each of which has 4 missiles (factory sealed in canisters) and 4 reload missiles (for each launcher), for a total of 64 missiles;
- a ground-based phased array radar for surveillance, target detection, tracking, and target engagement;
- an Engagement Control Station, manned by Army personnel, to provide either manual or automated command and control of the system; and
- communications equipment and an electrical power generator.

The Patriot system typically operates as a battalion. Each battalion normally consists of six fire units (or batteries), which operate together and share target information. Each fire unit can by itself provide a limited area defense of more than 50 square miles. A battalion operates under the control of a fire distribution center, which controls all fire units and coordinates their operation with those of adjacent battalions and higher level headquarters.

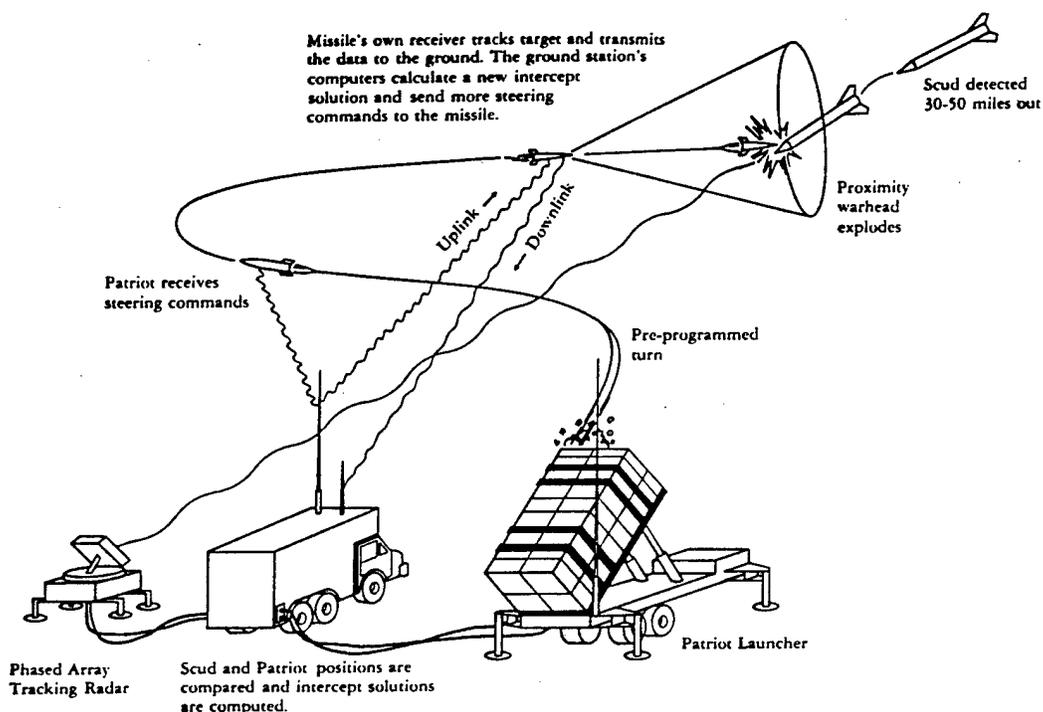
Figure 1 illustrates notionally how the Patriot intercepts an attacking missile. The phased-array radar sees the missile and tracks it. The computer system sets priorities for Patriot intercepts during the latter part of the attacking missile's flight.⁷ Ground computers update the Patriot missile's

⁶ The largest subcontractors include: Morton Thiokol Inc., Oshkosh Truck Corp., Allied Bendix Aerospace, Hewlett Packard Co., and Kaiser Aerospace Electronics. Siemens AG is the principal German contractor, and Mitsubishi Heavy Industries of Japan is a licensed producer of the missile.

⁷ News accounts of the Persian Gulf War indicate that U.S. early-warning satellites and possibly early-warning aircraft alerted Patriot fire units of a possible Iraqi Scud attack. The Patriot system cannot track and target the incoming missile, however, until it comes within the system's radar's line-of-

guidance towards the end of the flight. The Patriot's proximity fuze explodes when an attacking missile comes in close to the Patriot missile, resulting in damage or destruction of the intended target.

Figure 1: Patriot Missile Interception



sight -- about 100 miles out. See: Covault, Craig. USAF Missile Warning Satellites Providing 90-Sec. Scud Attack Alert. Aviation Week and Space Technology, Jan. 21, 1991. p. 60; Satellite-Based Alerting Network Aided in Destruction of Scud. Aerospace Daily, Jan. 21, 1991. p. 106.

PATRIOT'S PERFORMANCE IN THE PERSIAN GULF WAR

The final assessment of Patriot's performance and role in the Persian Gulf War has yet to be written. To date, however, two major conclusions can be reached. First, during the war, while Israel, Saudi Arabia, and U.S. forces were under attack by Iraqi Scud missiles, there was widespread enthusiasm over Patriot's tactical and strategic successes. Second, after the war, there has been greater circumspection over Patriot's tactical successes. These two points are briefly examined below.⁸

The Iraqis reportedly launched some 85 Scuds toward military and civilian targets in Saudi Arabia and Israel. Patriot missiles deployed to defend these targets intercepted 45 of the 47 Scuds they engaged.⁹ One Scud successfully penetrated Patriot defenses, hitting a U.S. military barracks in Dhahran and killing 28 U.S. service personnel.¹⁰ Thirteen were fired at Israel before Patriot fire units were in place and ready for operation.¹¹ The remaining were not attacked by Patriots apparently because they were headed toward open unpopulated or undefended areas.

On the whole, it appeared that Patriot had served to save countless lives. Although the Iraqi missile attacks were considered "militarily ineffective" by the senior U.S. military command, the potential for large civilian casualties was great. In addition, Patriot seemed to contribute significantly to keeping Israel out of the war and keeping the allied coalition together.

Now that the war is over, and more facts are filtering in, the story of Patriot's tactical success has become very complicated (there has been virtually no debate over Patriot's successful strategic contribution in keeping Israel out of the war). It has been reported that while 89% of the Iraqi Scuds directed against Saudi Arabia were intercepted, only 44% of the Scuds' warheads were

⁸ See also U.S. Library of Congress. Desert Shield and Desert Storm: Implications for Future U.S. Force Requirements. CRS Report No. 91-361 RCO, by John M. Collins, April 19, 1991. Washington, 1991.

⁹ Modernization Programs Systems Prove Themselves in the Desert. Army Times, v. 41, May 1991. p. 16.

¹⁰ The Scud was intact when it hit the barracks. No Patriot missiles were fired at it. Army investigations have determined that a computer failure in a Patriot fire unit at Dhahran was the principal cause of this failure. Knowledgeable observers indicated that a combination of other factors also were involved. cite Army Times article. Schmitt, Eric. Army Is Blaming Patriot's Computer for Failure to Stop the Dhahran Scud. New York Times, May 20, 1991. p. A6.

¹¹ Davis, Bob. Patriot Missile, High-Tech Hero in Gulf, Comes Under Attack as Less than Scud's Worst Enemy. Wall Street Journal, April 15, 1991. p. 16.

intercepted in Israel.¹² In addition, Congress has heard testimony that the use of Patriots to intercept Scuds coming into Israel resulted in more damage than would have occurred from the Scuds alone.¹³ In addition, a few Patriot missiles may have actually chased some Scuds into the ground.¹⁴

There apparently are several reasons to account for Patriot's poorer performance in Israel. Although by the end of September 1990 President Bush had taken the required steps to transfer two Patriot fire units to Israel, these units were not in place until after Iraq had fired 11 Scuds into Israel.¹⁵ Apparently, the delay was due to Israeli insistence that these units be manned by Israeli military personnel, despite U.S. offers to provide American military support in the interim while Israeli crews were trained.¹⁶ Second, Israel apparently decided it wanted fewer Patriot fire units than was deemed necessary by some U.S. analysts prior to the war.¹⁷ Hence, the amount of Israeli territory that could be covered effectively was limited. Third, although they had only partially completed their training, Israeli military personnel apparently were placed in charge of operating the Patriot fire units.¹⁸ Fourth, a limited number of PAC-2 missiles were available. This, in combination with the limited area coverage provided by only two fire units, led Israeli personnel to operate

¹² Rep. Aspin, Les. Understanding Technology on the Battlefield: Lessons of Desert Storm for a Defense That Works. Speech before the American Institute of Aeronautics and Astronautics, May 1, 1991. p. 2.

¹³ Postol, Ted. Lessons for SDI From the Gulf War Patriot Experience: A Technical Perspective. Testimony before the House Armed Services Committee, Apr. 16, 1991; New Criticism of Patriot Adds Fuel to U.S., Israeli Debate on Arrow Program. Inside the Army, Vol. 3, No. 17, Apr. 29, 1991. p. 4.

¹⁴ Aspin. Understanding Technology. p. 1.

¹⁵ U.S. President. Memorandum of Justification. Letter to Speaker of the House, Thomas Foley, Sept. 29, 1990.

¹⁶ Shannon, Philip. Incoming Iraqi Missile Destroyed Over Saudi Base. New York Times, Jan. 19 1991. p. 8. See also Diehl, Jacobs on, and Claiborne. Israel Sees Scuds Failing in Purpose. Washington Post, Jan. 25, 1991. p. A29.

¹⁷ Patriot's Success Will Intensify Israeli Debate over Arrow Program. Inside the Pentagon, Vol. 7, No. 4, Jan. 24, 1991. p. 11.

¹⁸ Jt. U.S.-Israeli Forces Use Patriots to Defend Against Iraqi Scud Missiles. Aviation Week and Space Technology, Jan. 28, 1991. p. 34; Skelly, Robert A. News Release. Raytheon Company, Apr. 25. p. 4; New Criticisms of Patriot. Inside the Army, Apr. 29, 1991. p. 5; and Silverberg, David. Israeli Aversion to Patriot Grows. Defense News, Apr. 8, 1991. p. 3.

the Patriot fire units manually, rather than using the faster, automatic mode.¹⁹ In some cases, delays from firing manually may have caused a few Patriot missiles to intercept Scuds close to the ground or to follow incoming Scuds into the ground, perhaps increasing the level of damage.²⁰ In other cases, Israeli operators used the manual override to attack Scuds headed towards areas beyond the Patriot's zone of "high kill probability."²¹ Fifth, the Israeli Defense Force (IDF) measured a "successful" intercept differently than the U.S. and Saudi Arabia. Hence, IDF's criteria for counting a successful intercept contributed to a lower percentage relative to the success rate in Saudi Arabia.²² Finally, the Scuds were fired toward dense population areas, which may have contributed to the damage caused by debris from Patriot intercepts. Nonetheless, the damage probably was less severe than it would have been without Patriot.²³

These points are important to assessing the merits of missile defenses. In one sense, they point out that missile defenses can work. On the other hand, they also demonstrate that missile defenses may well leak. Before exploring these particular issues further, however, it is useful to review the programmatic and legislative history of how Patriot developed as an antitactical missile.

¹⁹ U.S. Army spokesman, May 21, 1991. See also Aspin, *Understanding Technology*, p. 2.

²⁰ Evans, David. *The Patriot Was a Hit, but the Misses Bear Scrutiny, Too*. Chicago Tribune, Mar. 15, 1991. p. 23.

²¹ *Patriot Performance Intensifies Competition*. Inside the Pentagon, May 9, 1991. p. 4.

²² "The IDF considered an engagement as a 'no kill' if a warhead, or portion thereof, or a fuel tank, or various impact debris created an impact crater and/or damage on the ground. Had the 'no kill' assessments not included damage created by falling tanks or debris, the success rate in Israel would have been increased by an additional 35%." See Skelly, News Release, p. 4.

²³ Aspin, *Understanding Technology*, p. 2. *New Criticism of Patriot*. Inside the Army, Apr. 29, 1991. p. 4-5; and Silverberg. *Israeli Aversion to Patriot Grows*. Defense News, Apr. 8, 1991. p. 3.

PROGRAM HISTORY

PATRIOT AIR DEFENSE SYSTEM

Under Defense Secretary Robert McNamara, the Army, in 1963, began design concepts for the SAM-D (named Patriot in 1976),²⁴ to replace the Nike Hercules and Improved Hawk air defense missiles as the principal ground-based air-defense missile. The Army identified three principal criteria for the new system: 1) minimal operation and maintenance support -- to reduce life-cycle costs; 2) successful performance against the aircraft and short-range ballistic missile threats of the 1970s; and 3) mobility. Raytheon was selected in 1967 as the prime contractor for advanced development of the system. Engineering development was approved in 1972 during the Nixon Administration. In 1974, Defense Secretary James Schlesinger canceled SAM-D's requirement for antitactical missile defense as a cost savings measure.²⁵

Early in the Carter Administration, Defense Secretary Harold Brown accelerated the full-scale production decision milestone for the Patriot air defense missile from 1983 to 1980. Secretary Brown then approved limited production in 1980, although testing results showed that the system had "low reliability and [was] experiencing performance problems in certain combat environments."²⁶

The Patriot air defense system was kept in low-rate production as follow-on testing and evaluation continued. Eventually, satisfactory progress was made in the system's performance and Patriot went into full-scale production in the mid-1980s. Throughout the 1980s, continued testing of Patriot demonstrated

²⁴ The Army's first ATM program was called Plato, which was started in 1951 but for a number of reasons was canceled in 1958. The next major ATM effort began in 1961 with FABMDS (Field Army BMD System), to which the requirement for air defense was added and FABMDS was phased out in 1963. The AADS-70 (Advanced Air Defense System) program followed and was later replaced with the SAM-D (surface-to-air missile defense), both of which had a joint requirement for aircraft and antitactical missile defense. A few years after the ATM requirement for the SAM-D was dropped, the program was renamed Patriot. See Davis, William A., Jr. *Regional Security and Anti-tactical Ballistic Missiles*. Washington, DC, Pergamon-Bracey, 1986.

²⁵ *Ibid.*, p. 4.

²⁶ U.S. General Accounting Office. *Results of Production Testing Should be Considered Before Increasing Patriot's Production*. Report to the Congress by the Comptroller General of the United States. January 26, 1983. Washington, 1983. See also Jahnke, Art. *The Missile that Couldn't Shoot Straight*. Boston Magazine, Vol. 76, No. 130, May 1984. p. 132-133, 158-161.

that system reliability and performance were excellent.²⁷ In 1987, Patriot became a multiyear procurement program.

The first Patriot batteries were fielded in 1983 at Fort Bliss, TX. The initial Patriot deployments overseas took place in 1985 when the first European Patriot battalion was accepted formally into the NATO force structure. More than 100 Patriot fire units have been produced, and they are now deployed in the United States, Germany, the Netherlands, Japan, Saudi Arabia, Israel, and Turkey. (See Appendix C.)

As far as the total program is concerned, the Army goal is to acquire 103 Patriot batteries and about 6,100 missiles in inventory. According to the Army, about half of these missiles would be for air defense purposes and half for defense against missiles.²⁸ To date, about 5,000 Patriot missiles have been produced.²⁹ According to Raytheon, each Patriot fire unit costs between \$100 and \$150 million, depending on all the add-ons. The cost of a single Patriot missile now averages about \$600,000 (earlier in the program, this cost was much higher). The total program cost is estimated at about \$12.7 billion (\$ current).

PATRIOT ATM

The Patriot ATM had a somewhat different, yet parallel development history. In the late 1970s, the Defense Science Board (DSB) examined the vulnerability of the Patriot air defense system and found that Patriot was vulnerable to antiradiation missiles, saturation attacks, and the evolving missile threat. In late 1978, the Army was directed to outline a development program to address these concerns and in late 1980, the planned improvement program was incorporated for implementation.³⁰

By the mid-1980s, test results had shown that Patriot was "the world's finest air defense system and [could] defeat any aircraft in existence today

²⁷ Testimony of General Donald R. Infante, Commanding General, U.S. Army Air Defense Artillery Center and Commandant, U.S. Army Air Defense Artillery School, Fort Bliss Texas, in U.S. Congress. House. Committee on Armed Services. Department of Defense Authorization of Appropriations for Fiscal Year 1987; Title I, Procurement. Hearings on H.R. 4428, 99th Congress, 2nd Session. [H.A.S.C. No. 99-36] Washington, G.P.O., 1987. p. 553-554.

²⁸ Patriot Objective. Aerospace Daily, March 11, 1991. p. 408.

²⁹ The Desert Storm Supplemental Appropriations Act (P.L. 101-28) funded 238 Patriot Missiles: 158 that were expended and 125 to fill a production gap caused by speeding up production for Desert Storm.

³⁰ U.S. Army. Office of Legislative Liaison. Information Paper. Patriot Background. Washinton, 1991. p. 1.

[1984] or anticipated for development."³¹ At the same time, the Army had grown increasingly concerned over Patriot's vulnerability to attack by accurate Soviet tactical ballistic missiles in Eastern Europe. These two factors lead to modifications that focused more directly on upgrading the Patriot system to defend itself against attacking missiles. As a collateral benefit, limited protection could also be extended to other assets in the area in proximity of the Patriot system. Thus it was that the Patriot air defense system acquired an ATM function. From 1986 to January 1991, the testing program produced 17 successful missile intercepts in 17 tries, according to Raytheon and the Army.

The Patriot system was modified in the mid- to late-1980s to give it a capability to intercept short-range ballistic missiles as well as aircraft. The first modification, called the PAC-1, was to the guidance radar's software, which enables the system to track and intercept a number of short-range ballistic missiles simultaneously. The first flight test and missile interception occurred in September 1986. Deployment of Patriot PAC-1 upgrades was completed throughout the Army in 1989.

The second modification, called the PAC-2, involved hardware modifications giving the missile a new fuze and heavier warhead fragments to improve its kill capability. The Full-Scale Development Decision contract was awarded in 1985. The first flight test of this upgrade took place in November 1987. Procurement of the PAC-2 then began in FY 1989. At the time Iraq invaded Kuwait in August 1990 only a handful of PAC-2 missiles had been produced. Because of urgent wartime needs, the PAC-2 was then rushed into surge production to meet anticipated requirements.³²

As a result of its performance in the Persian Gulf War, there is considerable congressional interest in continuing to modernize the Patriot ATM. The first prospective modifications, called the Quick Response Program (QRP), will seek to increase significantly its ATM capability by increasing Patriot's range and easing its deployment. The second proposed modifications, called the Patriot Growth Program, would involve software and hardware changes to significantly improve Patriot's ability to intercept at higher altitudes and longer ranges, giving it a greatly enhanced footprint coverage over the QRP.

Beyond these efforts, however, the potential for further upgrades is uncertain. The Army is examining several alternatives to meet future

³¹ Joint Prepared Statement of James H. Merryman, Lt. General, GS, Deputy Chief of Staff for Research, Development, and Acquisition, and Hon. Jay R. Sculley, Assistant Secretary of the Army, Research, Development, and Acquisition, in U.S. Congress. House. Committee on Armed Services. Defense Department Authorization of Appropriations for Fiscal Year 1985; Title II, Research, Development, Test, and Evaluation. Hearings on H.R. 5167, 98th Congress, 2nd Session. [H.A.S.C. No. 98-34] Washington, G.P.O. p. 562.

³² Patriot Production Tripled for Gulf. Defense Daily, Vol. 169, No. 42, Dec. 3, 1990. p. 347.

antitactical missile requirements.³³ Some of the Army's concerns center around changing the primary air defense mission of the Patriot (defense against high performance aircraft) and further upgrading the Patriot ATM. These concerns have not been fully assessed.³⁴

³³ During House Armed Services Committee hearings on the FY 1991 defense budget, the Army stated in a written response to a question asking if the "Patriot system was the preferred concept for tactical missile defense:" "No, although the Patriot Anti-tactical Missile (ATM) Capability program has been the Army's initial response to the tactical missile threat. . . . The preferred concept for a future capability, beyond PAC-1 and PAC-2, will be selected after trade-off analysis has been conducted between Army and SDIO concepts." U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1991 - H.R. 4739 and Oversight of Previously Authorized Programs. Hearings. [H.A.S.C. No. 101-48] 101st Congress, 2nd Session. Washington, G.P.O., 1991. p. 213. (Hereafter cited as H.A.S.C. 101-48.)

³⁴ Christy, Sarah. Army Doesn't Want a Light Patriot Program. Defense Week, Mar. 11, 1991. p. 13; Army to Control Antitactical Missile Fielding. Defense News, Apr. 29, 1991. p. 20; and Conner Blasts Raytheon's Attempts to Get 'Patriot Light' Funded. Inside the Army, Mar. 11, 1991. p. 2.

PATRIOT ATM: LEGISLATIVE HISTORY HIGHLIGHTS

The legislative history associated with developing an ATM capability for the Patriot air defense system is essentially the history of the Congress' efforts toward fielding an effective system to defend U.S. and allied military forces against tactical cruise and ballistic missiles. The history is marked by a congressional consensus for fielding an effective tactical missile defense as quickly as possible. Nonetheless, there were (and still are) differences over what that system should be and which DOD agency should be responsible for developing it. This history, beginning in 1982 when the Army first requested funding for an Army-led, joint-service ATM (antitactical missile) research and development program, is extensively covered in Appendix A and summarized here.³⁵

The public record emphatically reflects Congress's (i.e., the armed services and appropriations committees) frustration with what it considered to be the unresponsiveness of DOD to the tactical missile threat. As late as 1990 this frustration was vented in the House Appropriations Committee's report on the Department of Defense Appropriations Bill, FY 1991.³⁶ The committee reiterated the Congress' alarm at the "serious problem as evidenced by recent events in the Middle East" from the proliferation of tactical ballistic missiles among Third World countries. The committee then scolded:

Currently the Army and the Strategic Defense Initiative Office (sic) are pursuing separate and uncoordinated programs. SDI is funding new ground launched programs such as ERINT, ERIS, THAAD, and Arrow. The Army is examining a new HAWK replacement missile and Patriot missile upgrades. It is not clear if the Navy and the Air Force are doing anything. The issue of command, control, and communications of an integrated theater system has not yet been adequately addressed.

Later, the committee's report urged that "[i]n a declining defense budget environment . . . the very serious issue of the tactical ballistic missile threat must be afforded a higher priority."

The legislative history also shows that although the House and the Senate agreed on the urgency of a growing tactical missile threat, their views differed on the response. For several years, the House, chiefly on the recommendations of the Armed Services Committee, favored the development of an antitactical ballistic missile (ATBM) system that capitalized on SDI technologies. The House

³⁵ Also included in this appendix are the funding histories for the procurement of Patriot missiles and associated equipment and procurement of modifications to the system.

³⁶ U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriations Bill, 1991. Report No. 101-822 to accompany H.R. 5803. Washington, G.P.O., 1990. p. 178-179.

generally opposed developing an ATBM capability for the Patriot system. During floor debate on H.R. 4428, the FY 1987 defense authorization bill, the House adopted by voice vote an amendment requiring the United States to deploy a system at least as capable as the Soviet Union's SA-12 air defense missile. At the time, the SA-12 was considered by some to be capable of shooting down U.S. Pershing (INF) missiles and submarine launched ballistic missiles.³⁷ (See Appendix B.)

The Senate looked more favorably on the potential near-term ATBM capability of the Patriot system and consistently supported the Army's annual funding requests for Patriot ATM. The Senate Armed Services Committee, however, looked to SDI for a long term solution to the tactical missile threat. The House Armed Services Committee eventually supported Patriot ATM as a likely candidate for NATO's extended air defense program.

Ever since the armed services committees agreed in 1984 that near term and long term antitactical missile development should be split (see page 27 of Appendix A), both the Army and the SDIO have had pieces of the management responsibility. Essentially, the Army has been looking at near term capabilities; until recently, that effort has concentrated on developing a self defense capability for Patriot. The SDIO has been looking at more advanced technology solutions such as ERINT, ERIS, THAAD, and the Israeli program, Arrow.³⁸

From the start, the Congress has been critical of the DOD's management of these programs. In 1988, the Senate Appropriations Committee attempted to sort out overlapping effort and recommended that the Army become the single responsible manager for antitactical missile programs. That proposal failed in conference. Last year, concurrent with the Department of Defense Appropriations Act, 1991, the Congress, on the recommendation of the House Appropriations Committee, directed that the Secretary of Defense establish a new "Tactical Ballistic Missile Defense" (TBMD) program and appropriated \$218 million for it. The conferees directed the Secretary of Defense to submit to the House and Senate armed services and appropriations committees by March 1, 1991 a report of.³⁹

³⁷ The Congress adopted this standard in 1987 for ATBM systems developed under the auspices of the Strategic Defense Initiative Organization. See section 217(a) of the National Defense Authorization Act for Fiscal Years 1988 and 1989. P.L. 100-180 (101 STAT 1052).

³⁸ ERINT = Extended Range Interceptor Technology; ERIS = Exoatmospheric Reentry Vehicle Interceptor Subsystem; THAAD = Tactical High Altitude Area Defense.

³⁹ U.S. Congress. House. Committee of Conference. Making Appropriations for the Department of Defense. Report No. 101-938 to accompany H.R. 5803. Washington, G.P.O., 1990. p. 117-118.

his plan for determining the requirements for a baseline U.S. tactical ballistic missile defense system, and for selecting this baseline in the manner discussed by the conferees, and for fielding a system.

The conferees also directed that the Secretary's plan be fully funded in the FYs 1992-1997 Six Year Defense Plan.⁴⁰

In response to the Congress' direction to establish a centrally-managed TBMD program, in November 1990 SDIO was given responsibility for the TBMD program, including any further Patriot upgrades.⁴¹ In March 1991, the Director of SDIO established the TBMD manager at the deputy director level.⁴² Some believe that this arrangement will not resolve longstanding concern that within SDIO strategic defense programs have precedence over tactical defense programs. Thus legislation was introduced in the 102nd Congress that would mandate a TBMD manager independent of and on equal footing with the Director of SDIO.⁴³ The House Armed Services Committee subsequently approved the FY1992/1993 defense authorization bill, which included a provision that would remove all theater missile defense research and development from SDIO and place the Army in charge of the Joint Tactical Ballistic Missile Defense (TMD) Program.⁴⁴

Finally, it must be noted that through report and legislative language the Congress continually has cautioned the Executive Branch to keep tactical missile defense programs within the bounds of the ABM Treaty.

⁴⁰ Ibid., p. 117-118.

⁴¹ Army Will Work Through SDIO to Develop Corps SAM. Defense Daily, Vol 169, No. 33, Nov. 16, 1990. p. 277. See also U.S. Department of Defense, Office of Assistant Secretary of Defense (Public Affairs). Fact Sheet, New Strategic Defense Initiative Program Focus: Global Protection Against Limited Strikes (GPALS). News Release No. 54-91, January 30, 1991. Washington, 1991. p. 14.

⁴² Schoenfeld, Bruce. SDIO Shifts to Emphasize Tactical Defense. Defense Week, Mar. 25, 1991. p. 1/15.

⁴³ H.R. 1446 introduced by Representative Timothy Penny on Mar. 14, 1991, and referred to the House Armed Services Subcommittee on Research and Development. Also, see: Schoenfeld, Bruce. Support Seen Growing for Moving Tactical Missile Defense From SDI. Defense Week, May 6, 1991, p. 6.

⁴⁴ U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Years 1991 and 1993. Report No. 102-60 to accompany H.R. 2100. 102nd Congress, 2nd Session. Washington, G.P.O., 1991. p. 171-172.

ISSUES OF CONGRESSIONAL INTEREST

The success of the Patriot antitactical missile in the Persian Gulf War has renewed and enlivened the debate over SDI and theater missile defenses. This section first seeks to clarify the Patriot and SDI relationship. It then examines some of the lessons learned from Patriot's experience in the Persian Gulf War and its salience to ballistic missile defense in general and SDI in particular. Finally, this section assesses the implications of Patriot's success for the future of theater missile defenses.

IS SDI RESPONSIBLE FOR PATRIOT'S TECHNICAL SUCCESS?

There have been a number of misconceptions about Patriot. In fact, one of the first misunderstandings concerned who was responsible for Patriot's apparent technical success. Some SDI advocates and many media commentators attributed Patriot's performance in Saudi Arabia and Israel to the Strategic Defense Initiative. But this has not been the case. As the preceding discussion of its development indicates, the Army developed Patriot's anti-tactical missile capability independent of SDIO. Patriot did not benefit from the programs under the SDI.⁴⁵ As one official familiar with the program reportedly characterized the Patriot-SDI relationship: "We have tried to get SDI to fund [Patriot] and haven't got a dime from them. They've basically shunted us off for three years and told us to go back to the Army."⁴⁶ Similarly, Henry Cooper, Director of SDIO, said "SDI has nothing to do with [the] Patriot."⁴⁷

As discussed earlier, however, Patriot's relationship with SDIO has changed. First, in November 1990, SDIO was given responsibility for the new TBMD program (including continued Patriot ATM development). Second, SDIO

⁴⁵ SDIO funded two small Patriot experiments. One studied whether an active radar sensor could be placed on the Patriot missile to improve its ability to engage targets. The other experiment studied how much further the Patriot launcher could be removed from the Engagement Control Station and still be able to conduct defensive engagements. These experiments have not lead to modifications of the Patriot systems now deployed. See SDIO Considering Plan to Upgrade Patriot with Active Multi-Mode Radar. Inside the Pentagon, February 7, 1991. p. 1, 14.

⁴⁶ Christy, Sarah and Capallio, Tony. Patriot Missile: Army Cinderella Story. Defense Week, Jan. 23, 1991. p. 1.

⁴⁷ Smith, Jeffrey and Morgan, Dan. SDI Ordered to Aim Lower, Scale Back. Washington Post, Jan. 31, 1991. p. A7. Echoing these comments, an Army spokesman reportedly said in the same article: "The Patriot systems fighting now in Israel and Saudi Arabia were developed, bought, and paid for by and for the U.S. Army. They are not some product of 'Star Wars' technology or 'Star Wars' funding."

has now integrated tactical ballistic missile defense into the Administration's plan to deploy an initial large scale BMD system called GPALS (Global Protection Against Limited Strike). Patriot's relationship with SDIO may yet change again if recent House Armed Services Committee action on the defense bill becomes law. As the committee reported:

The Gulf War demonstrated the importance of effective defenses against the growing threat posed to U.S. troops and allies overseas by short-range ballistic missiles. The committee strongly supports theater and tactical missile defenses. The committee does not believe, however, that SDIO is the appropriate agency to manage this effort. The Army's considerable experience in acquiring and fielding the Patriot missile system and developing TMD doctrine, training, and tactics make it the logical choice for lead agency on tactical missile defenses.⁴⁸

PATRIOT'S GULF PERFORMANCE: LESSONS LEARNED FOR BMD & SDI

There remains a certain amount of ambiguity about what Patriot's role in Operation Desert Storm means for ballistic missile defenses and SDI. From the perspective of President Bush and Defense Secretary Cheney, Patriot's success is proof that missile defenses work, and therefore a large-scale SDI system can and should be developed and deployed. Other policymakers are less sanguine, however. Nonetheless, there appears to be some consensus that Patriot's role in the Persian Gulf War brought home three lessons for BMD in general.

- *Patriot's qualified success as an effective, albeit limited, BMD offers considerable support for the argument that ballistic missile defenses can work.* Patriot hit almost all of the Iraqi Scuds it engaged, and contributed significantly to the Persian Gulf War.
- *Threats of military retaliation may not be to deter a Third World nation from carrying out missile attacks.* Iraqi attacks on Saudi Arabia, Israel, and U.S. forces is a case in point. To rely solely on deterrence may be inadequate, especially in an era of ballistic missile proliferation.
- *A defense against a missile attack can not rely solely on destroying a potential enemy's missiles and launchers on the ground.* Despite extensive intelligence gathering capabilities and numerous optimum conditions for attacking Iraq's missiles and launchers, coalition forces could not destroy them all.

⁴⁸ U.S. Congress. House. Committee on Armed Services. Department of Defense Authorization Act, FY 1992. Report No. 102-60 to accompany H.R. 2100. 102nd Congress, 1st Session. Washington, G.P.O., 1991. p. 171-172.

The lessons learned from Patriot's performance in the Gulf War for the SDI program in particular are less clear. The BMD system envisioned by the SDI for deployment beginning in the late 1990s would be technically much more challenging. For example:

- Patriot uses an exploding warhead to destroy or disable an incoming missile and therefore does not have to be as accurate as hit-to-kill SDI interceptors, which must destroy their intended target through direct impact.
- Patriot missiles encountered limited attacks by large, "slow" missiles⁴⁹ against known targets. An SDI system would have to be able to defend the United States and its allies from incoming missiles with smaller, faster warheads with perhaps no warning of where an attack might occur.
- While the Patriot system did not have to be perfect (the low-yield conventional warhead on an Iraqi Scud did not make it a militarily significant weapon), a nuclear or chemical warhead would require incomparably better performance of an SDI system.

The primary effect of Patriot's performance has been to inspire a growing belief that the United States should deploy some BMD capability in order to counter the perceived growing threat from global missile proliferation. The major policy debate now forming will be over how much BMD capability should be pursued, and whether the United States should continue to adhere to the 1972 ABM Treaty to develop that capability.

Concerning, there appear to be three main policy perspectives.⁵⁰ One alternative would be to abandon the ABM Treaty in favor of a large-scale SDI system, as well as deploy some number of Patriot or Patriot-like missile defenses.⁵¹ Another choice would be to pursue an ABM Treaty compliant BMD system, *and/or* deploy some number of Patriot or Patriot-like missile defenses, which are not constrained by the ABM Treaty.⁵² Still another option might

⁴⁹ Iraqi Scuds were not designed to have the warhead separate from the missile.

⁵⁰ For more detailed discussion of these options, see U.S. Library of Congress. Congressional Research Service. *Persian Gulf War: Defense-Policy Implications for Congress*. CRS Report 91-421, coordinated by Ronald O'Rourke. May 15, 1991. p. 9-10.

⁵¹ For example, see Wallop, Malcolm. *Patriots Point the Way*. New York Times, Jan. 31, 1991. p. A23.

⁵² For example, see Aspin, Les. *Patriots, Scuds and the Future of Ballistic Missile Defense*. Speech before the National Security Industrial Association, Washington Chapter. Apr. 24, 1991.

be to continue to deploy only Patriot or Patriot-like missile defenses, and avoid deploying any strategic defenses, irrespective of what is permitted by treaty.

PATRIOT'S EFFECT ON THE SDI AND TACTICAL BALLISTIC MISSILE DEFENSE DEBATE

Another effect of Patriot's success has been to sharpen congressional interest in promoting a coherent TBMD research and development effort. As the record has shown, the responsible committees of Congress have been frustrated with the unresponsiveness of the Defense Department to the tactical missile threat. Over time, a consensus has emerged, recently spurred by the realities of the Persian Gulf War, for the DOD to deploy a theater missile defense as soon as possible.

But, where do we go from here? Several important policy questions remain for the Congress to consider:

- Because Patriot was developed as an air defense weapon to meet critical Army needs, and only later acquired an antitactical missile mission, should Patriot continue to be upgraded or should other TBMD technologies under development be accelerated?
- What effect would further upgrades to the Patriot ATM have on the Army's overall air defense requirements? How has the demise of the Warsaw Pact and Soviet threat to Europe affected this requirement?
- Should theater missile defenses (including Patriot) be integrated into a BMD system that includes some space-based potential for intercepting short-range ballistic missiles?
- Should the Army, SDIO, or both control the scope and direction of theater ballistic missile defense research and development?

The proliferation of ballistic missiles throughout the world threatens to change the way in which the United States has historically dealt with crises and conflicts. Among the many diplomatic, political, and military options available today for U.S. policymakers is to continue development and deployment of Patriot or Patriot-like theater missile defenses. Because of Patriot's success in the Persian Gulf War and the congressional consensus for such defenses, it is now likely that additional TBMD capabilities will be deployed, thus giving U.S. military planners further options in future conflicts.

APPENDIX A: LEGISLATIVE HISTORY**PATRIOT ATM RDT&E****Overview**

The legislative record of the development of the Patriot ATM is the chronicle of congressional attempts to hasten deployment of an effective missile defense system against short-range ballistic missiles. The public account records perennial congressional frustration with what it has viewed as a slow and unfocused effort by the Department of Defense (DOD). But the story also shows the Congress not only at odds with the DOD, but often with itself.

Floor Votes on Patriot ATM.

The public record of this issue is almost entirely the actions and recommendations of the armed services and (defense) appropriations committees. Our research covering roughly the past decade did not find any floor vote in either the House or the Senate wherein Patriot ATM was the sole subject. We did find two floor votes (exclusive of votes on defense authorization and appropriations bills) that involved Patriot ATM. One vote was in the House, the other in the Senate.

The House vote took place in 1986 on an amendment to the FY 1987 defense authorization bill offered by Representative Duncan Hunter. By voice vote the House adopted Mr. Hunter's amendment that set a minimum standard for the capability of any antitactical missile system deployed by the United States in cooperation with its allies. (See discussion beginning at page 28.)

In 1990, the Senate by recorded vote of 96-2 added a Sense of Congress Resolution on Enhanced Theater Defense Systems to the FY 1991 defense authorization bill. The amendment, offered by Senator John Warner, among other things authorized expenditures from Army RDT&E funds for "additional tests of the Patriot II system." The amendment as rewritten by the Committee of Conference appears as section 225 of the National Defense Authorization Act for Fiscal Year 1991 (P.L. 101-510, 104 STAT 1514-1515).

Program Element (PE) 603302A

The Patriot ATM effort had always been part of PE 603302A in the Army RDT&E (Research, Development, Test, and Evaluation) budget. This program element line number in the defense budget identified a tri-service program led by the Army to develop active and passive technologies to counter Soviet tactical missiles. The near-term priority was to upgrade the Army's Patriot and HAWK air defense systems. The long-term objective was the development of new

technologies. Funding for this PE was first requested and appropriated in FY 1983.⁶³

Before the FY 1990/1991 budget request, the program was identified as Anti-tactical Missile. **Most of the funds requested annually were for Patriot ATM.** The FY 1990/1991 budget signaled a change in direction: the program had a new name -- Joint-Tactical Missile Defense (JTMD) program; only 44 percent of the funds requested were for Patriot ATM; and FY 1991 was forecasted to be the last year funds would be requested for Patriot ATM.⁶⁴ The Army described JTMD as an effort⁶⁵

... to counter the **conventional** short range tactical missile (TM) threat in mature and contingency theaters. JTMD consists of four components: Active Defense to destroy TMs in flight; Attack Operations to destroy launchers and associated equipment on the ground; Passive Measures to reduce vulnerability to enemy attack; and Command, Control, Communications and Intelligence (C3I) to coordinate JTMD activities. (Emphasis added.)

A cursory review of the 9-year funding history of P.E. 603320a (Table 1) shows that Congress denied the Army's requests six times, approved them twice, and provided more funds than requested once. Behind the numbers, however, the public record shows the Congress (i.e., the defense authorizing and appropriating committees) urging the DOD to better focus and accelerate development of antitactical missile program.

The cuts made in FYs 1983 and 1984 reflected concern over the lack of defined objectives and costs of the Army's ATM program. The Senate Appropriations Committee in its report on the FY 1984 defense appropriations bill commented that "[t]he ATM program is still in the conceptual phase. The Army cannot identify inventory objectives or even an order of magnitude cost estimate for the program."⁶⁶ The reduction to the Army's FY 1985 request was essentially for the same reason. In particular, the DOD had failed to submit a

⁶³ U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriations for 1984. Hearings before the Subcommittee on the Department of Defense. 98th Congress, 1st Session. Washington, G.P.O., 1983. p. 272-273.

⁶⁴ U.S. Department of the Army. Descriptive Summaries for Program Elements of the Research, Development, Test and Evaluation, Army Program FY 1990/1991 (U). Washington, 19 .p. 224.

⁶⁵ H.A.S.C. 101-48, p. 274.

⁶⁶ U.S. Congress. Senate. Committee on Appropriations. Department of Defense Appropriation Bill, 1984. Report No. 98-292 to accompany S. 2039. 98th Congress, 1st Session. Washington, G.P.O., 1983. p. 158.

report outlining its ATM program. The reductions in FYs 1987 and 1988, which resulted from differences of views over Patriot ATM, were offset by providing funds to spur other antitactical missile programs. Finally, while totally denying FY 1991 funding for P.E. 603320A, the Congress created and funded a new centrally managed Tactical Ballistic Missile Program.

Table 1: Funding History of Army ATM (RDT&E)
(Program Element 603302A. Current-year dollars, in millions)

FY	Request	Authorization			Appropriation		
		House	Senate	Conf.	House	Senate	Conf.
1991	62.3	62.3	62.3	62.3	0.0	62.3	0.0
1990	36.1	86.1	36.1	61.1	86.1	36.1	46.1
1989	31.5	31.5	31.5	31.5	20.7	31.5	31.5
1988	29.5	5.2	29.5	26.5	5.2	26.5	26.5
1987	38.6	0.0	38.6	30.0	0.0	38.6	30.0
1986	62.8	62.8	62.8	62.8	62.8	62.8	62.8
1985	92.3	15.0	32.3	32.3	15.0	32.3	32.3
1984	33.3	17.3	33.3	25.0	25.0	10.0	17.5
1983	27.2	0.0	19.6	19.6	19.6	0.0	10.0

Source: Annual reports of House and Senate Armed Services and (defense) Appropriations Committees.

The Context of Congressional Concern

The Congress had these principal concerns with the DOD's ATBM efforts:

A growing threat. Early on, the Congress was alarmed about the threat to NATO land and naval forces from Soviet tactical missiles. Events in particular, the INF Treaty,⁵⁷ the withdrawal of Soviet forces from Eastern Europe, and the breakup of the Warsaw Pact military coalition have combined to change the character of the threat. Congress over time has come to define

⁵⁷ Treaty Between the United States and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles. Signed Dec. 8, 1987.

the threat in global terms.⁶⁸ For example, Senator Warner's Sense of Congress Resolution described the threat in these terms:⁶⁹

The proliferation of ballistic missiles and chemical and nuclear weapons technology applicable to missile warhead development is potentially destabilizing, is a threat to United States forces, and poses a significant threat to the national security of friends and allies of the United States around the world.

Lack of progress in countering the threat. The defense committees have continually prodded the DOD to respond more urgently to the threat. Moreover, through report language the Congress has directed the DOD to structure its ATBM program so as to assign priorities, avoid duplication, and concentrate effort. For example the House Armed Services Committee's report on the FY 1984 defense authorization bill complained:⁶⁰

. . . . Virtually no effort was being expended on anti-tactical ballistic missiles despite the existence of large numbers of ballistic missile launchers in the Soviet inventory and despite stated Soviet intentions to use Strategic Rocket Force weapons against NATO land and sea forces.

The House Appropriations Committee's report on the FY 1991 defense appropriations bill indicates that such concern has not been assuaged. The committee again reiterated Congress' alarm at the "serious problem as evidenced by recent events in the Middle East" from the proliferation of tactical ballistic missiles in Third World countries.⁶¹ Referring to current Defense Department efforts to deploy an ATBM system in the relatively near term, the committee pointedly noted:⁶²

⁶⁸ In 1986, at the request of then Senator Dan Quayle, CRS published the first of a series of reports on missile proliferation. U.S. Library of Congress. Congressional Research Service. *Ballistic Missile Proliferation in the Third World*. Report No. 86-29 SPR. Washington, 1979. p. 43.

⁶⁹ Section 225 (a)(1), National Defense Authorization Act for Fiscal Year 1991. Public Law 101-510. 104 STAT. 1514-1515.

⁶⁰ U.S. Congress. House. Committee on Armed Services. Department of Defense Authorization Act, 1984. Report No. 98-107 to accompany H.R. 2969. Washington, G.P.O., 1983. p. 128-29. (Hereafter cited as HASC Report No. 98-107.)

⁶¹ U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriations Bill, 1991. Report No. 101-822 to accompany H.R. 5803. Washington, G.P.O., 1990. p. 178-179.

⁶² *Ibid.*, p. 178-179.

... Currently the Army and the Strategic Defense Initiative Office (sic) are pursuing separate and uncoordinated programs. SDI is funding new ground launched programs such as ERINT, ERIS, THAAD, and Arrow. The Army is examining a new Hawk replacement missile and Patriot missile upgrades. It is not clear that the Navy and the Air Force are doing anything. The issue of command, control, and communications of an integrated theater system has not yet been adequately addressed.

The committee report later urged that "[i]n a declining defense budget environment . . . the very serious issue of the tactical ballistic missile threat must be afforded a higher priority."⁶³

Ensuring that ATM/ATBM programs do not violate the ABM Treaty. The Congress has repeatedly cautioned the DOD to not use ATBM programs as a means for circumventing the ABM Treaty. In its report on the FY 1985 defense authorization bill for example, the Senate Armed Services Committee expressed its concern that the Patriot ATM program "not be extended to provide defense against strategic ballistic missiles in a manner that would violate the ABM treaty"⁶⁴

Congressional Oversight: Fiscal Years 1983-1991

In the context outlined above, the Congress has acted aggressively to give momentum and direction to the development and deployment of defenses against tactical missiles. Congress's oversight of the DOD's antitactical missile program has focused on two issues: (1) the kind of system that should be deployed to counter tactical ballistic missiles, and (2) which agency in the DOD should be responsible for developing it. The remainder of this section summarizes the views of the chief congressional protagonists on these two issues.

What kind of system should be deployed?

Summary. The House Armed Services Committee (HASC) and the Senate Armed Services Committee (SASC) mainly addressed this issue. The two committees have agreed that the long term solution requires the kinds of technologies being explored by SDIO. For several years, however, the committees differed over the near term solution for countering existing Soviet tactical ballistic missiles. In sum, the SASC supported Patriot ATM. The HASC did not, appearing to favor a system that would have more advanced technologies. The HASC subsequently supported Patriot ATM as a candidate for NATO's "extended air defense" program. The HASC and SASC positions are

⁶³ Ibid., p. 178-179.

⁶⁴ U.S. Congress. Senate. Omnibus Defense Authorization Act, 1985. Report No. 98-500 to accompany S. 2723. 98th Congress, 2nd Session. Washington, G.P.O., 1984. p. 130.

summarized from their respective committee reports and conference reports on annual fiscal year national defense authorization acts.

*Fiscal Year 1984.*⁶⁵ The HASC cut the Army's ATM (i.e., PE 603302A) request (\$33.3 million) nearly in half and recommended the ATM program be transferred, "without additional funding," to the (Army-managed) Ballistic Missile Defense Advanced Technology program (the forerunner to SDI) to capitalize on the technology being developed by that program. Funds were authorized for the Army to upgrade the HAWK low- to medium-altitude air defense missile to counter cruise missiles.⁶⁶

While the HASC did not mention the Patriot by name, Army officials had testified that the ATM program included upgrading Patriot to attack tactical missiles.⁶⁷ The HASC's recommendation thus would appear to have precluded the Army from developing Patriot ATM.

The SASC did not specifically mention Patriot ATM in approving the Army's request. Its position carried in conference. Although the Conference Report is not explicit, the conferees authorized \$25 million for ATM, which allowed the Army to continue upgrading Patriot. **More importantly, the conferees recognized the need for separate near term and long term responses to the tactical missile threat.** The conferees agreed that the long term effort should take advantage of technologies "being developed in other agencies." The conferees also directed the Secretary of Defense to submit a report to both committees that "identified anti-tactical missile defensive requirements among all the services."⁶⁸

⁶⁵ PE 603302A was first funded in FY 1983. Neither Armed Services Committee commented about the program. The Senate Appropriations Committee recommended that the Army not begin an ATM program until "some time in the future." Before committing to an ATM program, the committee reported, the Army was expected to "develop firmer cost, schedule, and inventory objectives." U.S. Congress. Senate. Committee on Appropriations. Department of Defense Appropriation Bill, 1983. Report No. 97-580 to accompany S. 2951. 97th Congress, 2nd Session. Washington, G.P.O., 1982. p. 115.

⁶⁶ HASC Report No. 98-107. p. 128-129.

⁶⁷ Testimony of Lt. General James H. Merryman in U.S. Congress. House. Committee on Appropriations. Subcommittee on the Department of Defense. Hearings on Army RDT&E Programs, Mar. 17, 1983. 98th Congress, 1st Session. Washington, G.P.O., 1983. p. 273.

⁶⁸ U.S. Congress. Senate. Conference Report. Department of Defense Authorization Act, 1984. Report No. 98-213 to accompany S. 675. 98th Congress, 1st Session. Washington, G.P.O., 1983. p. 185-186.

Fiscal Year 1985. Dissatisfied with the DOD's failure to define the ATM program -- the report directed the previous year had not been submitted -- both committees severely reduced the Army's ATM request (\$92.3 million). The HASC cut nearly 85 percent and the SASC nearly two-thirds. The HASC's report best summarized the committees' reasons:⁶⁹

... the ATM program lacks a definitive plan, does not have a clearly stated objective, and would not lead to a near term solution to counter the existing tactical missile threat.

The HASC authorized \$15 million "for the development and coordination of near term solutions to counter in-flight cruise missiles and to negate ground based tactical missile launchers." It also recommended that the Secretary of Defense place those antitactical missile programs "to counter tactical missiles in flight" with the SDI program.⁷⁰ Once again, the HASC appeared to favor bypassing Patriot ATM for more advanced technology.

The SASC agreed with cutting the ATM program, but authorized \$32.3 million for the Army "to carry out the near term effort that has promise for immediate results."⁷¹ The committee noted that these funds would be used primarily to modify the Patriot system to defend "against short-range missiles such as the SS-21 and the SS-23."⁷²

Significantly, the committees in conference divided responsibility for the near term and long term ATM programs: the Army retained responsibility for the near term response, which included Patriot. The fledgling SDI program was given management of long term development projects.⁷³

⁶⁹ U.S. Congress. House. Committee on Armed Services. Department of Defense Authorization Act, 1985. Report No. 98-691 to accompany H.R. 5167. 98th Congress, 2nd Session. Washington, G.P.O., 1984. p. 152.

⁷⁰ Ibid., p. 152.

⁷¹ U.S. Congress. Senate. Committee on Armed Services. Omnibus Defense Authorization Act, 1985. Report No. 98-500, to accompany S. 2723. 98th Congress, 2nd Session. Washington, G.P.O., 1984. p. 130.

⁷² Ibid. p. 130.

⁷³ "The conferees agreed to an authorization of \$32.335 million to be used only to carry out the near term ATM program consistent with the guidance provided in the Senate report The long-term ATM requirement is to be carried out in accordance with guidance provided by the House report U.S. Congress. House. Committee of Conference. Department of Defense Authorization Act, 1985. Report No. 98-1080, to accompany H.R. 5167. 98th Congress, 2nd Session. Washington, G.P.O., 1984. p. 255.

Fiscal Years 1987 and 1988. Despite the apparent compromise worked out two years earlier, the committees once again divided on Patriot ATM: for both fiscal years the SASC authorized funding; the HASC did not. While denying funding for Patriot, however, the HASC recommended funding for alternative programs (discussed below). Neither committee's report for either fiscal year elaborates on its recommendations or its differences with the other committee. The Senate position, however, largely prevailed in conference. Even so, the FY 1987 conference report denied \$8.6 million of the request (\$38.6 million) and the conference report for the FY 1988/1989 defense budget authorized \$3 million less than the request (\$29.6 million). The conference reports did not explain these reductions.

The HASC's report on the FY1987 defense authorization bill (H.R. 4428) offered no explanation for denying the Army's ATM request (\$38.6 million). During our research for this report, however, CRS was told of a classified report that was characterized as critical of Patriot's antitactical missile capability. The report, entitled "ATM: Independent Assessment," was prepared by Bell Laboratories under contract with the Army. It may have been available at the time the Congress was considering the FY 1987 defense budget, but CRS could not confirm if or to what extent the report influenced the HASC's action.

During floor consideration of H.R. 4428, the House adopted by voice vote the following amendment that would have established a qualitative standard for a U.S.-deployed ATBM system. The amendment seemed to have been consistent with the HASC's position favoring the deployment of an ATBM system incorporating advanced technology.⁷⁴

The Congress declares that it is the policy of the United States to expeditiously develop and deploy in cooperation with our allies a defensive system as capable as the Soviet SA-12 system to defend against attacks by tactical ballistic missiles.

There was no debate on the amendment, which was offered by Representative Duncan Hunter.⁷⁵ The House conferees subsequently receded from Mr. Hunter's amendment. The Conference Report explained that "other sections of

⁷⁴ U.S. Congress. Amendment Offered by Mr. Hunter. Congressional Record. Aug. 14, 1986. p. H 6281.

⁷⁵ Arguing for his amendment, Mr. Hunter noted that the Soviets had completed research and development and testing on the SA-X-12. He went on to say that "[t]hose of us who are debating SDI in this body and the other body and in the Nation are looking at that missile and its capability to destroy some of our Pershing [INF] missiles, our submarine launched missiles, and even some of our ICBM missiles." He concluded by saying that "[r]ight now our allies in Europe are faced with SS-20s which they cannot confront and this amendment simply says that the United States intends to have a system that is at least as capable of taking down tactical ballistic missiles as the SAM-12." Ibid.

the House and Senate bills . . . provided funding and direction for the development of an ATBM system."⁷⁶

The following year, the HASC's report on the FY 1988/1989 defense authorization bill explained that funding for Patriot ATM RDT&E (and other named Defense Department RDT&E programs) was denied because of "far too much duplication of effort" and "needless redundancy" in defense research.⁷⁷

Near-term deployment. The SASC report on the FY 1988/1989 defense authorization bill noted that the Soviet Union's willingness to negotiate elimination of intermediate range and shorter range ballistic missiles and cruise missiles "would, if accepted by NATO, lessen the requirement for ATBM" in Europe. The report also noted, however, that short and medium range tactical missiles would continue to threaten NATO and non-NATO allies of the United States.⁷⁸

This theme set the tone for both committees to urge the DOD to pursue early development and deployment of an ATBM system that could defeat these missiles. This effort, the committees directed, should be done in cost-sharing collaboration with NATO and non-NATO allies. Both committees authorized unrequested funds for this purpose. The HASC recommended \$100 million (later reduced to \$50 million by a substitute House authorization bill) for the Army to begin **"cooperative development and deployment, with U.S. allies, of an ATBM system, designed to be no less capable than the Soviet SA-X-12 system."**⁷⁹ The SASC recommended \$100 million for the DOD to collaboratively explore with "NATO and non-NATO allies" an effective extended air defense system.⁸⁰ Both committees believed that the antitactical

⁷⁶ U.S. Congress. House. Committee of Conference. National Defense Authorization Act for Fiscal Year 1987. Report no. 99-1001, to accompany S. 2638. 99th Congress, 2nd Session. Washington, G.P.O., 1986. p. 456.

⁷⁷ U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1988/1989. Report No. 100-58, to accompany H.R. 1748. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 109.

⁷⁸ U.S. Congress. Senate. Committee on Armed Services. National Defense Authorization Act for Fiscal Years 1988 and 1989. Report No. 100-57 to accompany S. 1174. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 116.

⁷⁹ U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1988/1989. Report No. 100-58, to accompany H.R. 1748. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 134. (Hereafter cited as HASC Report No. 100-59.)

⁸⁰ U.S. Congress. Senate. Committee on Armed Services. National Defense Authorization Act for Fiscal Years 1988 and 1989 to accompany S. 1174. Report No. 100-57. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 116.

missile systems developed for the near term would incorporate existing technology. Nonetheless, the HASC by directing that any system deployed had to be as capable as the Soviet SA-12 seemed to rule out Patriot ATM as a candidate.⁸¹

Long-term deployment. Both committees were disturbed over the lack of progress toward developing an ATBM system that capitalized on the kinds of technologies being explored by the SDI. The SASC report on the FY 1987 defense authorization bill captures the sentiments of the two committees. Noting that the committee had held hearings on the Soviet tactical missile threat and the DOD efforts to address the threat, the committee reported:⁸²

These hearings confirmed the seriousness of the Soviet tactical missile ballistic threat, as well as the committee's view that the job of addressing this threat is receiving insufficient attention within the Department of Defense.

To speed progress, the committees acted on two fronts: **they allocated funds for ATBM development by the SDIO from funds authorized for the SDI and they set out time targets for results.**

For FY 1987, both committees allocated up to \$50 million for ATBM development. The HASC also directed that a separate office for ATBM RDT&E be established within the SDIO.⁸³ The SASC did not provide similar direction. Rather, the committee's report laid down time parameters for deploying an ATBM system.⁸⁴

⁸¹ The Conference Committee authorized (section 217 (b) of the National Defense Authorization Act for Fiscal Year 1988/1989) the Army to obligate \$25.0 million on approval of the Director of Defense Research and Engineering for the purpose of "research and development in connection with anti-tactical missile systems or extended air defense." U.S. Congress. House. Committee of Conference. National Defense Authorization Act for Fiscal Years 1988 and 1989. Report No. 100-446 to accompany H.R. 1748. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 592.

⁸² U.S. Congress. Senate. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1987. Report No. 99-133, to accompany S. 2638. 99th Congress, 2nd Session. Washington. G.P.O., 1986. p. 184.

⁸³ U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1987. Report No. 99-718 to accompany H.R. 4428. 99th Congress, 2nd Session. Washington, G.P.O., 1986. p. 146.

⁸⁴ U.S. Congress. Senate. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1987. Report No. 99-331 to accompany S. 2638. 99th Congress, 2nd Session. Washington, G.P.O., 1986. p. 185.

... The funding [identified within SDI] by the committee should be used to accelerate the development and deployment of relevant technologies to support full scale development of [an ATBM] system in fiscal year 1988, with a view toward deployment in the early 1990s.

The conference committee did not agree to establishing a separate ATBM office. The report of the conference did not explain why.⁸⁵

For FY 1988, the HASC allocated \$73 million of SDI funds for "ATBM experiments and demonstration projects"; the SASC did not provide funding. The HASC stipulated that the experiments and demonstration projects had to be conducted within two to three years after enactment of the FY 1988/1989 National Defense Authorization Act.⁸⁶ The Conference Committee authorized \$50 million, and stipulated in the Authorization Act that these projects were to be carried out on a cooperative basis with U.S. allies that signed Memorandums of Understanding to participate in the SDI program.⁸⁷ **The Conference Committee rejected the time targets set out by the HASC, but adopted the SA-X-12 standard for any ATBM system developed by SDIO through these projects.**⁸⁸

Fiscal Years 1989 and 1990. Both committee approved full funding of the Army's ATM request (\$31.5 million) for FY 1989.⁸⁹ **Reversing its previous position, the HASC supported Patriot ATM.** Its report on the FY 1989 defense authorization bill explained that the committee "... understands that

⁸⁵ U.S. Congress. House. Committee of Conference. National Defense Authorization Act for Fiscal Year 1987. Report No. 99-1001 to accompany S. 2638. 99th Congress, 2nd Session. Washington, G.P.O., 1986. p. 446.

⁸⁶ U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Years 1988 and 1989. Report No. 100-58 to accompany H.R. 1748. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 133-134.

⁸⁷ U.S. Congress. House. Conference Report. National Defense Authorization Act for Fiscal Years 1988 and 1989. Report No. 100-446 to accompany H.R. 1748. 100th Congress, 1st Session. Washington, G.P.O., 1987. p. 592.

⁸⁸ Section 217(a) (101 STAT 1052) of the National Defense Authorization Act for Fiscal Years 1988 and 1989. P.L. 100-180. Paragraph (3) reads as follows: "Any system developed under this subsection shall be designed to be no less capable than the SA-X-12 system of the Soviet Union."

⁸⁹ The House Appropriations Committee denied \$10.8 million of the FY 1989 request but funds were for items other than Patriot ATM. U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriations Bill, 1989. Report No. 100-681 to accompany H.R. 4781. 100th Congress, 2nd Session. Washington, G.P.O., 1988. p. 152.

the Patriot Air Defense system has further growth potential that may permit a less costly solution to countering future tactical or theater missile threats." The committee also commented that it ". . . also understands that the Federal Republic of Germany supports upgrading the Patriot Air Defense system beyond the current ATM program to counter future aircraft, cruise missile, and tactical ballistic missiles (extended air defense) threats." The committee concluded by "[encouraging] the DOD to conduct a demonstration-validation of an upgraded Patriot ATM as part of the NATO Cooperative program."⁹⁰

Concurrent with the defense budget request for FY 1990, the Army, as noted above, had redefined and retitled (Joint-Tactical Ballistic Missile Defense) its antitactical missile RDT&E program. The HASC reacted favorably and added \$50 million to the Army's request (\$36.1 million). The SASC approved the amount requested. The Conference Committee agreed to an increase of \$25 million and directed that the Secretary of the Army report on how the additional funds would be used.⁹¹

Which DOD agency should be responsible for developing a tactical missile defense?

Summary. The legislative history recounted thus far shows that the HASC and SASC recognized the need for the DOD to develop near term and long term solutions to the tactical ballistic missile threat. But the history also shows they had different views about which agency (or agencies) within the DOD should have responsibility. The SASC seemed content with the Army developing responses to the near term threat and the SDIO working on ATBM systems that incorporated advanced technologies.

The HASC for a while wanted the Army to develop defenses against cruise missiles and the SDIO to develop ATBM systems capitalizing on SDI-related technologies. As mentioned above, the HASC unsuccessfully attempted to create through language in the FY 1987 Defense Authorization Act a separate ATBM office within the SDIO. Some three years later, as noted above, the committee found reason to support the Army's JTMD program.

Until the FY 1989 defense budget request, the (defense) appropriations committees did not directly address the ATM/ATBM issue. Concurrent with the FY 1989 Defense Appropriation Act, however, both the House Appropriations

⁹⁰ U.S. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Year 1989. Report No. 100-563, to accompany H.R. 4264. 100th Congress, 2nd Session. Washington, G.P.O., 1988. p. 173.

⁹¹ U.S. Congress. House. Committee of Conference. Authorizing Appropriations for Fiscal Year 1990 for Military Activities of the Department of Defense, for Military Construction, and for Defense Activities of the Department of Energy, to Prescribe Personnel Strengths for Such Fiscal Year for the Armed Forces, and Other Purposes. Report No. 101-331, to accompany H.R. 2461. 101st Congress, 2nd Session. Washington, G.P.O., 1989. p. 478-479.

Committee (HAC) and the Senate Appropriations Committee (SAC) voiced their concerns about the management and direction of these programs. Ultimately, the HAC was responsible for establishing a single program -- Tactical Ballistic Missile Defense (TBMD) -- under a single manager within the office of the Secretary of Defense.

The DOD since has established a manager for TBMD within SDIO at the deputy director level.⁹² Some fear that the DOD's decision will continue to subordinate ATM development to SDI programs. To avert this possibility, legislation has been introduced in the 102nd Congress that would establish a manager for TBMD separate from and on an equal footing with the SDIO.^{93,94}

The following discussion summarizes the actions of the HAC and the SAC on this question.

Fiscal Year 1989. In their reports on their respective FY 1989 defense appropriations bills, both the HAC and the SAC expressed concerns about the status of the ATM/ATBM programs. The HAC report complained:⁹⁵

The Committee understands that the entire anti-tactical missile program . . . is underfunded. A rational program which includes the necessary command and control, passive countermeasures, offensive measures, and active defense measures has not been structured.

⁹² Schoenfeld, Bruce. SDIO Shifts to Emphasize Tactical Defense. *Defense Weekly*. Mar. 25, 1991. p. 1/15.

⁹³ U.S. Congress. House. House Armed Services Committee. Research and Development. Tactical Missile Defense Act of 1991. Bill introduced Mar. 14, 1991, by Timothy Penny (with 6 cosponsors), No., 102 Congress, 2nd Session. Washington, G.P.O., 1991.

⁹⁴ The HASC in its report on the FY1992 defense authorization bill recommended bill language that would "require the Secretary of Defense to create a Joint Tactical Missile Defense (TMD) Program and to designate the Army as executive agent to include acting as Acquisition Executive for the program." U.S. Congress. House. Committee on Armed Services. National Defense Authorization Act for Fiscal Years 1992 and 1993. Report No. 102-60, to accompany H.R. 2100. Washington, G.P.O., 1991. p. 171-172.

⁹⁵ U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriations Bill, 1989. Report No. 100-681, to accompany H.R. 4781. 100th Congress, 2nd Session. Washington, G.P.O., 1988. p. 152.

The committee recommended that before the Army could obligate any funds -- "to include Patriot modifications" -- the "Under Secretary of Defense" had to complete an "anti-tactical masterplan."⁹⁶

Similarly, the SAC attempted to sort out the "overlap" between Army and SDI ATBM programs. The committee's report noted:⁹⁷

Considering the magnitude of the tactical ballistic missile threat, and the likely great expense to develop a defense against it, the Committee believes it is especially important to ensure that the most cost- and militarily effective solution to the ATBM problem is selected, that redundant efforts be eliminated, and that there be maximum cost-sharing with our allies.

The SAC recommended that "ATBM development and theater missile defense-related activities in SDI be transferred to the Army." The committee also recommended that \$114.9 million allocated by SDIO for SDI-related ATBM research be transferred to the Army. But before any funds could be obligated the committee required the Army to submit to the Congress.⁹⁸

. . . the results of a comprehensive analysis comparing the cost- and militarily-effectiveness of all the SDI candidate ATBM missiles and the advanced tactical Patriot, along with a detailed justification for the Army's decisions to allocate the funds provided and to eliminate the duplication among these programs.

The report of the Committee of Conference noted that the conferees agreed with the "coordination and duplication issues between the Army and SDI as discussed in the Senate report. However, the conferees do not agree to obligation restrictions on these programs."⁹⁹ **The compromise bill did not, however, transfer the \$114.9 million from SDIO to the Army as recommended by the SAC.** The conferees also reported that they "would be willing to consider a reprogramming to fund research and development on [an Advanced Tactical Patriot] in fiscal year 1989 once the Army submits its ATBM

⁹⁶ Ibid., p. 152.

⁹⁷ U.S. Congress. Senate. Committee on Appropriations. Department of Defense Appropriation Bill, 1989. Report No. 100-402, to accompany H.R. 4781. 100th Congress, 2nd Session. Washington, G.P.O., 1988. p. 225-226.

⁹⁸ Ibid., p. 225-226.

⁹⁹ U.S. Congress. House. Conference Report. Making Appropriations for the Department of Defense. Report No. 100-1002 to accompany H.R. 4781. 100th Congress, 2nd Session. Washington, G.P.O., 1988. p. 71.

Master Plan and demonstrates that there is no duplication with SDI ATBM activities."¹⁰⁰

Fiscal Year 1990. The SAC recommended funding the amount requested for JTMD (\$36.1 million), \$50 million less than authorized and \$50 million less than recommended by the HAC. Continuing the theme of its previous year's report, the committee commented:¹⁰¹

... the Committee understands that the Office of the Secretary of Defense (OSD) is reviewing the entire [JTMD] program to reconcile and rationalize the multiplicity of technologies being developed by the Army in its JTMD and air defense programs and by the Antitactical Ballistic Missile Defense Program within the Strategic Defense Initiative.

Fiscal Year 1991. Fiscal Year 1991 may prove to have been a watershed in the Congress' pursuit of a rational ATBM development program. The HAC did not fund the Army's ATM request (\$62.3 million) although the request had been authorized by the armed services committees. **Instead, the HAC recommended that the Secretary of Defense establish a "new single, integrated program, separate from SDI."** The HAC recommended \$250 million for this new program, which it called "Tactical Ballistic Missile Defense" (TBMD). The HAC's report stated that future funding requests for ATBM programs, including "Patriot upgrades if necessary" would be through the TBMD. Notably, the HAC charged the TBMD program to field an "integrated, ground-launched" system by 1995. The HAC also endorsed ERINT (SDIO's Extended Range Interceptor) as the "best" candidate system because of "the extensive work already done by SDI to develop it." Finally, the HAC report directed that not less than \$103 million and \$50 million, respectively, should be allocated to ERINT and Arrow.¹⁰²

¹⁰⁰ Ibid. p. 89. The SAC's report as well as the Conference report on the Defense Appropriations Act for Fiscal Year 1989 mentioned the Advanced Tactical Patriot. In testimony the following year, the Army advised that it did not have such a program; that the name was coined by industry. U.S. Congress. House. Committee on Appropriations. Subcommittee on the Department of Defense. Department of Defense Appropriations for 1990. Hearings. Research, Development, Test and Evaluation, Army. Mar. 22, 1989. 100th Congress, 1st Session. Washington, G.P.O., 1989. p. 185-186.

¹⁰¹ U.S. Congress. Senate. Committee on Appropriations. Department of Defense Appropriation Bill, 1990. Report No. 101-132 to accompany H.R. 3072. 101st Congress, 1st Session. Washington, G.P.O., 1989. p. 250.

¹⁰² U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriation Bill, 1991. Report No. 101-822 to accompany H.R. 5803. 101st Congress, 2nd Session. Washington, G.P.O., 1990. p. 178-179.

The conferees agreed to appropriate \$218.2 million for the TBMD program. But they disagreed with the HAC in two important respects: First, they "reserved judgment" on a preferred system. Second, they "believed that a U.S. [anti]tactical ballistic missile system should be fielded as soon as technologically and fiscally feasible." The conferees also added bill language that allocated, at a minimum, \$103 million for ERINT, \$45.4 million for Patriot, and \$42 million for Arrow. The conferees instructed the Secretary of Defense to submit to the armed services and appropriations committees a report of:

his plan for determining the requirements of a baseline U.S. tactical ballistic missile defense system, and for selecting this baseline in the manner discussed by the conferees, and for fielding a system.

And they directed that the plan submitted by the Secretary reflect full funding for the fiscal years 1992-1997 Six Year Defense Program.¹⁰³

PATRIOT PROCUREMENT

Procurement of Missiles, etc.

The funding history of Patriot missile procurement begins in FY 1979 (Table 2). The first missiles were procured in FY 1980. Table 2 shows that except for fiscal years 1982 through 1985 the Congress has supported the Army's procurement program. Our research found two floor votes, one in the House and one in the Senate, in which procurement of Patriot missiles was involved along with other procurement programs. These votes are discussed in footnotes 106 and 109 below.

¹⁰³ U.S. Congress. House. Committee of Conference. Making Appropriations for the Department of Defense. Report No. 101-938 to accompany H.R. 5803. 101st Congress, 2nd Session. Washington, G.P.O., 1990. p. 117-118.

Table 2: Procurement of Patriot Missiles and Associated Equipment

FY	Request	Current-year dollars, in millions/number of missiles					
		Authorization			Appropriation		
		House	Senate	Conference	House	Senate	Conference
1991	883.2/817	790.8/817	790.8/817	790.8/817	828.8/817	704.9/817	736.4/817
1990	924.5/815	924.5/815	924.5/815	924.5/815	911.9/815	676.2/815	911.9/815
1989	818.7/815	818.7/815	818.7/815	818.7/815	818.7/815	818.7/815	818.7/815
1988	891.5/715	891.5/715	891.5/715	876.5/715	872.5/715	872.5/715	872.5/715
1987	996.8/700	996.8/700	965.3/700	960.3/700	947.8/700	965.3/700	962.3/700
1986	983.4/585	983.4/585	983.4/585	983.4/585	967.4/585	974.6/585	963.4/585
1985	1096.4/585	976.4/440	976.4/440	976.4/440	976.4/440	970.6/445	976.4/440
1984	992.0/525	936.0/525	812.4/287	885.0/440	885.0/440	885.0/440	885.0/440
1983	805.1/376	805.1/376	805.1/376	805.1/376	779.1/376	687.3/287	779.1/376
1982	820.8/364	795.8/364	486.1/130	670.0/244	670.0/244	670.0/244	670.0/244
1981	473.7/183	473.7/183	473.7/183	473.7/183	473.7/183	448.7/183	448.7/183
1980	426.0/155	426.0/155	396.0/155	396.0/155	426.0/155	396.0/155	396.0/155
1979	67.3/0	67.3/0	67.3/0	67.3/0	67.3/0	67.3/0	67.3/0

Source: Annual Reports of the House and Senate Armed Services and (defense) Appropriations Committees.

In general, funding adjustments since FY 1986 were made to such items as advanced procurement and spares or because of savings realized through multiyear procurement.¹⁰⁴ The Congress approved multiyear funding with the FY 1987 budget request.^{105,106}

The Army's procurement requests for fiscal years 1982 through 1985 were cut three of the four years. And, although the Army's request for FY 1983 was approved, the Senate Appropriations Committee had recommended a reduction.

- The FY 1982 request was cut on the recommendation of the Senate Armed Services Committee on grounds that "only limited production funding should be approved since further specified testing must be completed to resolve existing problems."¹⁰⁷

¹⁰⁴ For the FY 1990 defense appropriation bill, the Senate Appropriations Committee denied \$248.3 million of the Army's request. These funds were the first increment of an exchange agreement with Italy involving the Patriot air defense system. The committee preferred to wait until an agreement was signed and it was clear that Italy would provide funding to implement its part of the agreement. The funds were restored in conference. U.S. Congress. Senate. Committee on Appropriations. Department of Defense Appropriations Bill, 1990. Report No. 101-132, to accompany H.R. 30 72. 101st Congress, 1st Session. Washington, G.P.O., 1989. p. 93-94.

¹⁰⁵ U.S. Congress. House. Committee on Armed Services. Department of Defense Authorization Act, 1987. Report No. 99-718, to accompany H.R. 4428. 99th Congress, 2nd Session. Washington, G.P.O., 1986. p.23.

¹⁰⁶ During floor consideration of H.R. 4428, the House passed an amendment to reconcile the bill with the FY 1987 budget resolution. Funding for a number of defense programs were adjusted or deleted, including \$30 million to begin multiyear procurement of Patriot missiles and fire units. A later amendment restored budget authority for some programs, including the \$30 million for Patriot, to the extent "of reductions made in other parts of the bill." The amendment was approved by voice vote. U.S. Congress. Congressional Record (bound edition), v. 132, part 14. 99th Congress, 2nd Session. Aug. 8, 1988. p. 19896-19910 and Aug. 11, 1988 (Amendment offered by Mr. Spratt). p. 20698-20699.

¹⁰⁷ U.S. Senate. Senate Armed Services Committee. Department of Defense Authorization for Appropriations for Fiscal Year 1982. Report No. 97-58, to accompany S. 815. 97th Congress, 1st Session. Washington, G.P.O., 1981. p. 60-61. The report also noted that: (a) the year earlier (1980) the committee had asked the Secretary of Defense to certify before committing funds for full production that "the Patriot system was suitable for hardware production"; and (b) the Secretary responded on November 17, 1980 that Patriot would continue in limited production "with additional testing required prior to a decision to increase production."

- The Senate Appropriations Committee recommended cutting the FY 1983 request because production delays had caused slippage in deliveries and pushed back Patriot's IOC (initial operating capability) by 1 month.¹⁰⁸
- The Senate Armed Services Committee recommended cutting 238 missiles from the FY 1983 request "in view of funding constraints."¹⁰⁹
- The FY 1985 request was reduced because of "technical and training difficulties which have led to about a six-month slip in the program."¹¹⁰

Procurement of Modifications

The funding history of Patriot procurement of modifications begins in FY 1986 (Table 3). It shows that on two occasions, fiscal years 1987 and 1988, Congress appropriated less funds than requested by DOD and authorized by the National Defense Authorization Acts for those years. In both instances, the House Appropriations Committee recommended that funds for procuring an upgraded data link to use SINGARS (Single Channel Ground and Airborne Radio System) be deferred on grounds that the SINGARS program was experiencing problems.¹¹¹ These cuts were largely sustained by the Conference Committees.

¹⁰⁸ U.S. Congress. Senate. Committee on Appropriations. Department of Defense Appropriation Bill, 1983. Report No. 97-580, to accompany S. 2951. 97th Congress, 2nd Session. Washington, G.P.O., 1982. p. 73.

¹⁰⁹ U.S. Congress. Senate. Senate Armed Services Committee. Omnibus Defense Authorization Act, 1984. Report No. 98-174, to accompany S. 675. Washington, G.P.O., 1983. p. 31-32. During Senate floor debate on S. 675, Senator Nunn offered an amendment that would have increased funding beyond the committee's recommendations for a number of conventional weapons systems. With respect to Patriot, the amendment would have added back 238 missiles. The amendment was defeated by a recorded vote (56-41) on a motion to table. U.S. Congress. Congressional Record, Jul. 14, 1983. Bound Edition. Omnibus Defense Authorizations, 1984. p. 19197-19216.

¹¹⁰ U.S. Congress. Senate. Committee on Armed Services. Omnibus Defense Authorization Act, 1985. Report No. 98-500, to accompany S. 2723. 98th Congress, 2nd Session. Washington, G.P.O., 1984. p. 25-26.

¹¹¹ U.S. Congress. House. Committee on Appropriations. Department of Defense Appropriations Bill, 1987. Report No. 99-793, to accompany H.R. 5438. 99th Congress, 2nd Session. Washington, G.P.O., 1986. p. 116.

Table 3: Procurement of Patriot Missile Modifications

Current-dollars, in millions							
FY	Request	Authorization			Appropriation		
		House	Senate	Conf.	House	Senate	Conf.
1991	20.9	20.9	20.9	20.9	20.9	20.9	20.9
1990	19.5	19.5	19.5	19.5	19.5	19.5	19.5
1989	40.2	40.2	40.2	40.2	40.2	40.2	40.2
1988	40.0	40.0	40.0	40.0	16.3	40.0	29.0
1987	38.6	38.6	38.6	38.6	21.9	38.6	21.9
1986	17.2	17.2	17.2	17.2	17.2	17.2	17.2

Source: Annual Reports of the House and Senate Armed Services and (defense) Appropriations Committees.

APPENDIX B: SOVIET SA-X-12 SURFACE-TO-AIR MISSILE

During the late 1970s and early 1980s, the Soviet Union developed two versions of the SA-12 to enhance the capability of its extensive air defense network: the SA-12A (Gladiator) and the SA-X-12B (Giant). The SA-12 is a mobile, low- to high-altitude SAM system. It is somewhat larger and considerably heavier than the Patriot missile.

Testing of the SA-12, especially the Giant version in the early- to mid-1980s, caused considerable concern in the Reagan Administration on two counts. First, the Defense Department expressed concern over the SA-X-12's potential capability as a strategic defense weapon. Starting in 1985, the Pentagon began to assert that the SA-X-12 could engage U.S. INF systems (i.e., Pershing I and Pershing II) "and some types of U.S. strategic ballistic missiles as well."¹¹² Similarly, the Arms Control and Disarmament Agency (ACDA) stated that "such a system with ATBM capabilities could have many of the features one would expect to see designed into an ABM system, possibly giving it capabilities to intercept some types of strategic ballistic warheads."¹¹³ The Reagan Administration did not publicly disclose any specific details or capabilities of the SA-12. Nonetheless, the period of greatest Administration concern over the SA-12 coincided with strong House interest in deploying a near-term theater missile defense comparable to the SA-X-12 and implicitly more capable than the Patriot. During this time, the public record alleges that the SA-12 might have actually intercepted missiles of ranges up to about 1,100 miles (with assertions that it was even more capable) and that it would be used to defend Soviet ICBMs.¹¹⁴

¹¹² U.S. Department of Defense. *Soviet Military Power*, 1985. Washington, 198 . p. 48.

¹¹³ U.S. Arms Control and Disarmament Agency. *Soviet Noncompliance*. Publication 120, March 1986. p. 5.

¹¹⁴ One analyst said "intelligence sources estimate, in fact, that the new SA-X-12 could be used to defend SS-25 mobile ICBM bases, SS-18 ICBM silo complexes against SLBMs, or to intercept intermediate-range nuclear missiles such as the Pershing II [est. range 1,000 n.m.]". See Holmes, Kim R. *While Opposing Reagan's SDI, Moscow Pushes Its Own Star Wars*. Background. [Heritage Foundation], October 21, 1986. p.8. It was also asserted that the "SA-12 reportedly has been tested several times against the Scaleboard tactical ballistic missile [SS-12; estimated range, about 485 n.m.] and the SS-4 Intermediate-Range Ballistic Missile (IRBM) [estimated range, 1,080 n.m.]. The SA-12, when linked to the Pechora-class radars, must be considered a capable defense against the U.S. Pershing II IRBM, SLBMs, and probably some ICBMs as well." See *The Nightmare of a Soviet Breakout*. National Security Record [Heritage Foundation], November 1986. p. 2. Another report said "the SS-X-12 was observed in 1983 and 1984 in tests against a missile similar to the SS-12 tactical ballistic missile." See *Compliance and the Future of Arms Control*, Report of a Working Group. Center for International Security and Arms Control. Stanford University. Feb. 12, 1987. p. 30.

In contrast, the Patriot ATM might be considered to be effective against missiles of around 500 miles. The Soviet Union denied that the SA-12 had such capabilities and asserted that it was not planned as a strategic defense weapon.¹¹⁶ In addition, considerable doubt was raised about the SA-12's capability in 1987 when it was reported that the Soviet SAM had tested only once successfully in about 20 times.¹¹⁶

The Pentagon was also alarmed by the near-term potential deployment of the SA-12 system. In 1985 and 1987, DOD stated that the SA-X-12B's "capability is a serious development because this system is expected to be deployed widely throughout the USSR."¹¹⁷ Indeed, some observers asserted that the SA-12 had already been under production since 1985,¹¹⁸ while others charged that it was actually deployed in 1986.¹¹⁹ In 1988, DOD said the SA-X-12B Giant would "soon become operational, thus further enhancing Soviet strategic defenses."¹²⁰ But since then, the Pentagon has not mentioned the SA-12 or the SA-X-12B in its annual Soviet Military Power. And to date, the SA-12 in either version apparently has not been deployed.¹²¹

The **second** Administration concern was with respect to Soviet arms control compliance. President Reagan charged in 1985 that while "Soviet actions with respect to SAM upgrade [i.e., the SA-10 and, particularly, the SA-12] is insufficient to assess compliance with the Soviet Union's obligations under the ABM Treaty . . . this, and other ABM-related Soviet activities suggest that the

¹¹⁶ For Example, see: Army Lt. Col. Yu. Yorkin. Still No Holding Back the Liars. *Krasnaya Zvezda*, June 16, 1987. p. 3.

¹¹⁶ Gordon, Michael. Defense Department is Rebuffed on Soviet ABM Threat. *New York Times*, Mar. 5, 1987. p. 10.

¹¹⁷ U.S. Department of Defense. *Soviet Strategic Defense Programs*. Oct. 1985. p. 20-21; and U.S. Department of Defense. *Soviet Military Power*, 1987. p. 61.

¹¹⁸ *Red Star Wars*. *Wall Street Journal*, April 10, 1985.

¹¹⁹ Operational deployments of the SA-12 began in 1986, according to James Hackett of the Heritage Foundation. See *Soviets Expected to "Walk Out" of ABM Treaty*. *Defense Daily*, November 24, 1986. p. 115.

¹²⁰ U.S. Department of Defense. *Soviet Military Power*, 1988. p. 81.

¹²¹ U.S. Library of Congress. Congressional Research Service. *U.S./Soviet Military Balance, Statistical Trends, 1980-1989 (As of January 1, 1990)*; by John Collins and Dianne Rennack. August 6, 1990. Washington, 1990. p. 32-33.

USSR may be preparing an ABM defense of its national territory.¹²² This remained the U.S. position until 1990 when a shift became noticeable. While the United States continues to express concern over "improving technology blurring steadily the technical distinctions between air defense and ABM systems," and continues to conclude that the evidence of Soviet SAM upgrade is insufficient to assess compliance, the present Administration no longer suggests that on this count the USSR may be preparing an ABM defense of its national territory.¹²³

While it's clear that the perceived threat of the SA-X-12 has waned since the mid-1980s, it is less clear why. Perhaps the Soviet SAM did not get deployed for technical reasons, such as the dismal intercept rate reported above. Another reason may be economic.¹²⁴

¹²² The White House. The President's Unclassified Report on Soviet Noncompliance with Arms Control Agreements. December 23, 1985. p. 8. The Soviet treaty obligation cited in the report is: "Under subparagraph (a) of Article VI of the ABM Treaty, each party undertakes not to give non-ABM interceptor missiles, launchers, or radars 'capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode.'"

¹²³ The White House. Text of a Letter from the President to the Speaker of the House of Representatives and the President of the Senate. February 23, 1990. p. 16.

¹²⁴ Jeanette Voas. Soviet Attitudes Towards Ballistic Missile Defense and the ABM Treaty. Adelphi Papers, No. 255. Winter 1990. p. 35.

APPENDIX C: ARMS SALES, TRANSFERS, & CO-PRODUCTION¹²⁵

THE PERSIAN GULF WAR

Because of the Iraqi invasion of Kuwait and Iraq's threat to use its tactical ballistic missiles against countries in the Middle East and coalition forces arrayed in the Persian Gulf War, Saudi Arabia, Israel, and Turkey received Patriot air and missile defense systems. A number of other countries are also reportedly interested in acquiring the Patriot system.¹²⁶

Saudi Arabia

In September 1990, the United States government concluded a \$6.7 billion arms sales package with Saudi Arabia. The agreement included \$984 million for 300 Patriot PAC-2 missiles, 6 fire units, 1 training fire unit, 8 phased array radar sets, 6 engagement control stations, 40 missile launchers, plus spare parts, training, and logistics support. The policy justification given by President Bush was that Saudi Arabia needed these missiles "to upgrade its air defense capabilities in view of the overwhelming threat posed by Iraq following the invasion and occupation of Kuwait."¹²⁷ Saudi Arabia has also stated its intent to procure a total of 26 Patriot fire units, including the 6 units in the September agreement.¹²⁸

Israel

In September 1990, President Bush notified Congress, in accordance with provisions of the Foreign Assistance Act that allows emergency military assistance, that the United States would transfer two fully equipped Patriot PAC-1 fire units from U.S. Army stocks to the Israeli Air Force at a cost of \$117 million. Training costs were not included. The policy justification given by the President for this transfer was the "unforeseen emergency of a possible attack by Iraq with ballistic missiles . . . [for which the U.S.] Government has hard information." President Bush said this action "at this time would also send a

¹²⁵ Data included in this section was confirmed by U.S. Army spokesman. May 1991.

¹²⁶ These include the United Arab Emirates, Egypt, Greece, Britain, Spain, South Korea, and Singapore. See Patriot Missile Maker Has Buyers Lining Up. Washington Times, March 11, 1991. p. 3.

¹²⁷ Defense Security Assistance Agency. Notice of Proposed Issuance of Letter of Offer Pursuant to Section 36(b) (1) of the Arms Export Control Act, to Hon. Claiborne Pell, Chairman, Senate Committee on Foreign Relations, Transmittal No. 90-93, September 27, 1990.

¹²⁸ Washington Times, March 11, 1991. p. 3.

strong signal to Iraq that the United States [would] not tolerate threats against friendly countries."¹²⁹

After the first Scuds landed in Israel in January 1991, the United States transferred several U.S. Patriot PAC-2 fire units and Army personnel to man them from Germany to Israel. Meanwhile, Israeli personnel worked to complete their training on the Patriot. In addition, Germany agreed to send an unspecified number of Patriot air-defense fire units from its own stocks to Israel. Now that the war is over, Israel reportedly wants to keep the Patriot fire units it was sent, although it has stated it is unable to pay for them. Negotiations are underway to determine the future of these Patriot missile systems.¹³⁰

Turkey

In mid-January 1991, the United States and the Netherlands began sending Patriot fire units and personnel to Turkey to operate them. U.S. Patriot systems were sent to defend the Incirlik Air Base against Iraqi attack, while two Dutch fire units (10 launchers) were sent to defend the Turkish Air Base of Diyarbakir in southeastern Turkey.

OTHER ARRANGEMENTS

Several European nations have deployed Patriot fire units. While most of these are for air defense, some of them have an ATM capability. It is likely that a number of new arrangements will be made with other countries over the next year.

Germany

In 1984, then West Germany signed an agreement to modernize its air defense network. Current plans call for 28 fire units and about 1,600 missiles.¹³¹ Acquisition of Patriot units began in 1989, and is not expected to be completed for several more years. Some licensed production of Patriot system components in Germany was also approved.

¹²⁹ U.S. President. Memorandum of Justification. Letter to Speaker of the House, Thomas Foley, September 29, 1990.

¹³⁰ Israel Wants U.S. Gift of 4 Patriot Batteries. Atlanta Constitution, March 8, 1991. p 11.

¹³¹ An additional 12 U.S.-owned fire units will be manned by German military personnel.

The Netherlands

In 1984, the Netherlands concluded an agreement with the United States to purchase 20 Patriot missile launchers and 160 missiles. All 20 were operational by the end of 1990. As noted earlier, some of these systems were transferred to Turkey in mid-January 1991 immediately prior to the start of Operation Desert Storm.

Japan

Japan is licensed to coproduce the Patriot missile and is currently planning to purchase 26 fire units and 1,400 missiles.

Italy

In 1988, the United States and Italy agreed to modernize air defenses around U.S bases in Italy. The agreement called for deployment of 20 Patriot fire units to be operated by Italy.