

CRS Report for Congress

Ballistic Missile Defense Deployment Options

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BALLISTIC MISSILE DEFENSE DEPLOYMENT OPTIONS

SUMMARY

When Congress debates the Strategic Defense Initiative (SDI), it will review a number of alternative concepts for ballistic missile defenses (BMD). These will include defenses against short-range ballistic missiles, defenses against limited strikes on the United States or other targets around the world, and defenses against a larger strike launched against the United States by the Soviet Union. Although a single BMD system might be able to counter all the potential threats aimed at the United States, its allies, and its forces overseas, different BMD systems could be designed to counter different threats. Because the different threats may not be equally likely to materialize over the next 10-15 years, it may be possible to design a BMD system to counter only those threats that appear to create significant risks for U.S. national security.

This report outlines three alternative paths for BMD deployments. These three paths generate different benefits, in terms of the threats they might counter, and different costs, including both dollar costs and arms control costs. The paths would also employ different technologies. Nonetheless, the paths can be viewed as steps along a single path of increasing BMD protection.

Path 1 emphasizes the deployment of defenses against short- and medium-range tactical and theater ballistic missiles (ATBMs). Because the United States has already deployed the Patriot system, it would be on this path even if it did not develop or deploy new types of BMD technologies.

Path 2 emphasizes the deployment of ATBMs and land-based systems that could defend against a limited strike on the United States. This type of system could provide insurance against an accidental or unauthorized launch of Soviet missiles and the possibility that a country other than the Soviet Union might acquire missiles with the range needed to attack the United States.

Path 3 emphasizes the deployment of ATBMs along with land- and space-based systems that could counter small-scale missile attacks launched from any country at targets worldwide. With the addition of greater numbers of sensors and interceptors, the systems on this path might also counter a large-scale Soviet attack on the United States.

Few of the threats identified in this report would pose an immediate risk to U.S. national security. In addition, in the near term, the existing Patriot system would be the only technology available to counter ballistic missile threats. Consequently, the United States could take advantage of the years available before threats materialize to consider non-defense alternatives, such as arms control or economic incentives, that might alter or counter the potential threats. This report concludes with a section that describes several of these alternatives.

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BALLISTIC MISSILE DEFENSE DEPLOYMENT OPTIONS

INTRODUCTION AND OBSERVATIONS

INTRODUCTION

In the continuing debate over the Strategic Defense Initiative (SDI), Congress will consider a number of alternative concepts for ballistic missile defenses (BMD). These will include defenses against short-range ballistic missiles launched against U.S. allies, interests, or forces overseas; defenses against limited, possibly accidental, strikes launched against the United States by the Soviet Union or other U.S. adversaries; and defenses against a larger strike launched against the United States by the Soviet Union.

There is considerable division over the range of plausible ballistic missile threats facing the United States today. Although some of the threats might be remote, few would argue over the potential damage and harm to U.S. interests, particularly if attacked by nuclear weapons. Consequently, most observers believe that the deployment of ballistic missile defenses merits serious attention and debate. Ultimately, though, the extent to which the United States develops and deploys BMD systems may reflect a consideration of how great a cost the United States should bear to hedge against known and possible threats.

The debate about the different BMD concepts reflects changing perceptions of the threats faced by the United States. Many believe that while the threat of a large scale, intentional attack by the Soviet Union has diminished, new threats, created by the proliferation of ballistic missile technologies, have grown.¹ In response, the Bush Administration has proposed that SDI shift away from the development of a BMD designed to blunt a large-scale Soviet attack and toward a system that could counter a small-scale attack launched by any adversary against targets anywhere in the world. This system, providing global protection against limited strikes (GPALS), would combine land- or sea-based antitactical ballistic missile defenses (ATBMs) with land- and space-based

¹ See the remarks of President George Bush, Raytheon Missile Systems Plant, Andover, MA, Feb. 15, 1991. Reprinted in Congressional Record, Daily Edition, v. 137, Feb. 26, 1991. p. S2290. See also Nunn, Sam. The Changed Threat Environment of the 1990s. Congressional Record, Daily Edition, v. 136, Mar. 29, 1990. p. S3444.

BMD systems to counter longer-range ballistic missiles.² Others, who agree that the United States should consider deploying ATBM systems that could protect U.S. allies and forces overseas and limited BMD systems to protect against small-scale attacks on the continental United States (CONUS) itself, differ over the scope of possible deployments and the need for space-based interceptors.³

This report outlines three alternative paths for BMD *deployments*. The report does not include an in-depth analysis of BMD technologies or the different BMD concepts. Instead, it provides an overview of the principal deployment options available to Congress and the United States by reviewing the threats that may be countered, the technologies that may be deployed, the costs that may arise, the benefits that may be gained, and other implications that may appear along each path. The report concludes with a description of other military, political, economic, and arms control measures that the United States might pursue, as an alternative to ballistic missile defenses, to counter emerging ballistic missile threats.

OBSERVATIONS

1. *The United States, its allies, and its forces overseas face different types of ballistic missile threats.* These threats range from single-warhead short-range missiles armed with conventional warheads that might attack U.S. forces or allies engaged in a regional conflict to multiple-warhead long-range missiles armed with nuclear warheads that might attack the United States.
2. *The different types of ballistic missile threats do not create the same risks for the United States, its allies, or its forces overseas.* Some ballistic missiles, such as those delivering conventional weapons during a regional conflict, would be far less destructive than other missiles, such as those delivering nuclear warheads in an all-out Soviet attack. However, a regional conflict with attacks by conventionally-armed ballistic missiles is relatively more likely to materialize than a U.S.-Soviet conflict with nuclear weapons.
3. *Different types of BMD systems can be used to counter different types of ballistic missile threats.* Although there can be similarities between BMD concepts, particularly with respect to the technologies they would employ, they can be separated into distinct programs with distinct missions, objectives, and

² U.S. Department of Defense. SDI Program Focus: Global Protection Against Limited Strikes (GPALS). News Release, Office of the Assistant Secretary of Defense (Public Affairs). January 30, 1991. Washington. pp. 1-3.

³ Representative Les Aspin, Patriots, Scuds, and the Future of Ballistic Missile Defense, speech before the National Security Industrial Association, Arlington, VA, Apr. 24, 1991. See, also, the proposal of Senator William Cohen, Senator Richard Lugar, and Senator John Warner, in Congressional Record, Daily Edition, v. 137, June 12, 1991. pp. S7522-S7525.

costs. It may be possible to design one BMD system that could counter most or all of the threats, but it may not be necessary to be so comprehensive. Still, the different BMD concepts can be viewed as incremental steps towards increasing levels of protection.

4. *There are three distinct paths for BMD deployments.* One path, which the United States is currently on, emphasizes deployment of ATBMs; a second path emphasizes deployment of ATBMs and land-based BMD systems that provide limited protection of the United States; a third path emphasizes the ATBM deployments along with land- and possibly space-based BMD systems that might provide protection against small-scale strikes aimed at targets worldwide. This last path could expand into the deployment of more comprehensive defenses to counter a large-scale attack on the United States. The different paths generate different benefits, in terms of the threats they might counter, and different costs, including both dollar costs and arms control costs.

5. *The choice, in Congress, among alternative BMD deployment paths may reflect the relative weights attached to defenses and strategic arms control.* Those in Congress who attach a greater weight to arms control may prefer a path where the BMD concepts conform to the restrictions in existing and potential arms control regimes. Those in Congress who attach a greater weight to defenses may prefer a path that contains only those arms control agreements that can exist along side the deployment of the full range of BMD concepts.

6. *The choice among alternative BMD deployment paths may also reflect a balancing of the costs and benefits to be found on each path.* Because the primary benefit to be gained along each path is the ability to achieve national security goals, the United States may follow a particular path if the risks to national security created by the threats justify the costs of pursuing the path. However, several political, arms control, and foreign policy considerations that may be difficult to measure and quantify will also affect this decision.

7. *The requirements for, and choice among, alternative BMD deployment paths can change over time.* The passage of time may affect assessments of emerging threats, the availability of cost-effective BMD technologies and the strength of domestic and international support for BMD systems. For example, some threats, such as the unauthorized launch of Soviet missiles, may generate significant support for BMD deployments in the near-term. Yet, BMD deployments that could counter such a threat would not be available for several years. If conditions in the Soviet Union stabilize, the threat may not generate concern or support for BMD deployments once the defenses become available.

8. *The availability of time before many ballistic missile threats provides an opportunity to explore alternatives to counter ballistic missiles without the deployment of ballistic missile defenses.* Many of the ballistic missile threats facing the United States, its allies, and its forces overseas will not materialize for several years. During that time, the United States may pursue other military, political, economic, and arms control measures that could either counter the threats or slow their development.

This report begins with a brief overview of the different types of ballistic missile threats the United States might face over the next 10-15 years and the different BMD concepts that might counter those threats. It divides these BMD concepts into three alternative BMD deployment paths. As table 1 indicates, the paths can be seen as incremental steps on a single path towards increasing levels of defense because the choice of a particular deployment option does not preclude continued research and development on more extensive defenses.

Table 1
Alternative BMD Deployment Paths

	PATH 1	PATH 2	PATH 3
Threats	Tactical or theater missiles used in regional conflicts	Tactical or theater missiles used in regional conflicts; Accidental or unauthorized launch of Soviet missiles; Long-range third country missiles	Missiles of any range launched from any country at targets worldwide
Deployment Option	ATBMs	ATBMs <i>and</i> 100 to several hundred land-based interceptors	ATBMs <i>and</i> 500 - 1,000 land-based interceptors <i>and/or</i> 1,000 - 2,000 space-based interceptors
Future Options	Develop CONUS or worldwide defense	Develop worldwide defense	Develop worldwide defense against large-scale Soviet attack

OVERVIEW: DIFFERENT THREATS AND DIFFERENT DEFENSES

THE DIFFERENT BALLISTIC MISSILE THREATS

The United States might face several types of ballistic missile threats over the next 10 to 15 years. These threats can differ in several ways:

- Ballistic missiles could deliver conventional, chemical, or nuclear warheads;
- Ballistic missile attacks could consist of tens of warheads, hundreds of warheads, or thousands of warheads;
- Ballistic missiles could travel from tens of miles to thousands of miles;
- Ballistic missiles could be launched against either military targets or civilian areas.

This report divides these different types of ballistic missile attacks into 5 distinct ballistic missile threats. Two are from Soviet strategic nuclear missiles; the remaining three reflect the proliferation of ballistic missiles among third countries (i.e., not the United States or the Soviet Union).

Soviet Threats

The threat of a large-scale Soviet ballistic missile attack on the United States rested on a confrontational superpower relationship. That relationship has improved, so the likelihood of a nuclear war between the two countries is greatly diminished. Nonetheless, the Soviet Union continues to maintain and modernize its ballistic missile force, which could strike the United States. These missiles are the source of two distinct threats, one which might be deterred by the U.S. ability to retaliate and one which might not.

Large-Scale Soviet Attack

Few believe the Soviet Union would launch a large-scale nuclear attack on the United States. Yet the capability to do so remains. Such an attack would probably seek to disrupt or destroy the U.S. ability to retaliate and to limit any likely U.S. response. Because of this threat, the United States seeks to preserve a credible nuclear deterrent force: one that could survive a massive Soviet attack with enough capability remaining to launch a retaliatory strike against the full range of targets in the Soviet Union.⁴

⁴ U.S. Office of the President. National Security Strategy of the United States. Mar. 1990. Washington, 1990. p. 24.

Accidental or Unauthorized Launch

The Soviet Union maintains tight command and control over its nuclear weapons.⁵ Nonetheless, the sheer numbers of these missiles combined with the growing turmoil in the Soviet Union has raised concerns among some that the threat of an accidental or unauthorized missile launch exists.⁶ These threats probably would not be deterred by the threat of retaliation.

Third Country Threats

The proliferation of ballistic missiles has raised concerns about the possibility that countries may use these missiles to attack the United States, its allies, or its forces overseas. These missiles create the threat of three types of attacks that might not be deterred by a U.S. ability to retaliate.

Attacks Against Theater Targets During a Conflict

Countries in the Far East and the Middle East, where U.S. and allied forces are more likely to be involved in conflicts, possess missiles that could attack forces on the battlefield or support facilities, such as airfields and supply depots.⁷ These missiles would probably carry conventional warheads, but a few countries might be able to arm them with chemical and, eventually, nuclear warheads. Attacks with these missiles could disrupt the ability of the United States or its allies to fight in the conflict.

Attacks Against Strategic Targets During a Regional Conflict

Countries with ballistic missiles might also threaten civilian targets and areas that might not be involved directly in a regional conflict. This threat was evident during the Persian Gulf war, with Iraqi missile attacks against Israel. This type of attack might affect a country's willingness to participate in a conflict. Unless the attacker feared retaliation against its own civilians, the threat of retaliation might not deter these attacks.

⁵ Rahr, Alexander and R. Alex Bryan. Concern over Security of Soviet Nuclear Arms. Report on the USSR, v. 2, Oct. 12, 1990. p. 6.

⁶ Nunn, Sam. The Changed Threat Environment of the 1990s. Congressional Record, Daily Edition, v. 136, Mar. 29, 1990. p. S 3444.

⁷ For a detailed review of ballistic missile proliferation see U.S. Library of Congress, Congressional Research Service. Missile Proliferation: Survey of Emerging Missile Forces. CRS Report 88-642 F, by Foreign Affairs and National Defense Division, Revised Feb. 9, 1989. Washington, 1989. See also the tables in Lennox, Duncan. The Global Proliferation of Ballistic Missiles. Jane's Defence Weekly, v. 12, Dec. 1989. p. 1385.

Attacks Against the United States

Some countries might eventually acquire ballistic missiles with the range needed to strike the United States. Many countries now have short- or medium-range ballistic missiles, which can travel hundreds or miles. A few, however -- such as India, Israel, and Brazil -- are developing longer-range missiles that could travel a few thousand miles or space-launch boosters that would be similar to longer-range missiles.⁸ China, Great Britain, and France already possess long-range ballistic missiles. Any threat posed by these programs would depend on the likelihood of an adversarial relationship developing between these countries and the United States. These missiles might also threaten CONUS if they were sold to countries that might use them against the United States.

NOTIONAL BMD SYSTEMS

Although a large-scale BMD system may be able to defend against all the threats described above, separate systems could be designed to counter one or a few of the individual threats. These are briefly described below.

Systems to Defend Against Tactical/Theater Ballistic Missiles (ATBMs)

ATBM systems might seek to protect various targets from attacks by either Soviet or third country missiles during regional conflicts. These systems would seek to intercept missiles with ranges of hundreds, to possibly a thousand miles, that fly to altitudes of less than a few hundred miles and with flight times of less than 15 minutes. ATBMs could be deployed in areas where a missile threat exists, or they could be moved to such an area during a crisis or conflict.

The development and deployment of ATBMs would not violate the 1972 Anti-Ballistic Missile (ABM) Treaty because that agreement only limited systems designed to intercept strategic ballistic missiles. However, if ATBMs acquire capabilities against missiles with ranges of a few thousand miles, or if they are tested in conjunction with strategic defense components, questions about compliance could arise.

The U.S. currently has deployed an ATBM system, the Patriot antitactical missile (ATM), which is an upgraded air-defense system.⁹ The United States is designing new interceptors specifically for the ATBM role. These systems might intercept incoming missiles at higher altitudes and greater ranges than

⁸ Ibid.

⁹ The Soviet Union has reportedly adapted air defense systems, such as the SA-10 and SA-12, for the ATBM mission. See U.S. Library of Congress, Congressional Research Service. The Patriot Air Defense System and the Search for an Antitactical Ballistic Missile Defense. CRS Report 91-456 F, by Steven A. Hildreth and Paul Zinsmeister, June 13, 1991. Washington, 1991. Appendix B.

the current Patriot system. As will be discussed below, these changes would improve the effectiveness of the ATBM systems.

Land-Based Systems to Protect Against Small Attacks on CONUS

Limited, land-based BMD systems might protect CONUS from accidental or unauthorized Soviet launches and attacks from third countries. This type of system would seek to intercept missiles with ranges of several thousand miles that fly to an altitude of several hundred miles and with flight times of 20 to 30 minutes. The attacks could include up to tens of missiles and, possibly, hundreds of warheads. Such a system could be based at the existing U.S. ABM site at Grand Forks, North Dakota (the system was shut down in 1975, but the infrastructure remains), and at new sites along the U.S. coasts.

The United States is developing sensors and ground-based interceptors under the SDI program that could be used in this type of BMD system. If the United States wanted to maintain the existing limits in the ABM Treaty, this system would be limited to 100 land-based interceptors at one site.¹⁰ The ABM Treaty would permit the United States to dismantle or destroy the site at Grand Forks and deploy an ABM defense of Washington, D.C.¹¹ According to most assessments, however, a system deployed at one site would leave significant gaps in coverage.¹² To deploy more than 100 interceptors at more than one site, or to deploy space-based components, the United States would either have to seek to amend the ABM Treaty or withdraw from the agreement.

Systems to Provide Worldwide Protection Against Small Attacks

The decline in the Soviet threat and the spread and wartime use of third country ballistic missiles have combined to generate interest in systems that could defend against relatively small attacks launched from any country and aimed at targets worldwide. These would include attacks against military or civilian targets during regional conflicts and accidental, unauthorized, or third country attacks against CONUS. The Bush Administration has proposed that the United States counter these threats with a system, called GPALS (global protection against limited strikes), that combines ATBM systems with space-

¹⁰ The ABM Treaty initially permitted two sites -- one around an ICBM field and one around the nation's capital -- but a Protocol signed in 1974 reduced the permitted sites to one. For the text of the ABM Treaty see U.S. Arms Control and Disarmament Agency. *Arms Control and Disarmament Agreements; Texts and Histories of the Negotiations*. 1990 Edition. Washington, 1990. pp. 155-166 and 181-182.

¹¹ Ibid., p. 182. The Soviet Union has deployed its permitted ABM site around Moscow.

¹² Against a limited Soviet ICBM attack, Alaska, Hawaii, and perhaps parts of Florida might remain undefended. A single site also would not defend these areas or the East and West coasts of CONUS from a limited SLBM attack.

based sensors and land- and space-based interceptors.¹³ Alternatively, the United States could deploy a greater number of land-based interceptors, without any interceptors in space. In either case, the numbers of interceptors and the use of space-based components would not be consistent with the ABM Treaty.

Systems to Protect Against a Large-Scale Soviet Attack

Until recently, SDI focused on developing a system -- known as Phase I -- that could defend against a large-scale Soviet attack. This system was not intended to intercept every attacking warhead, just a large enough proportion to disrupt the attack. The Administration held that such a system would enhance deterrence because Soviet planners would not be certain they could attain their goals and also limit damage from a retaliatory strike.¹⁴ Phase I would include thousands of land- and space-based interceptors. The Phase I technologies would be the same as those included in GPALS; only their numbers would be greater in Phase I.¹⁵ With the decline in the likelihood of a conflict with the Soviet Union, the Bush Administration has refocused SDI towards GPALS. However, the military requirement for Phase I has not been altered and the deployment of the Phase I BMD system remains an option.

ALTERNATIVE PATHS FOR BMD DEPLOYMENT

This report identifies three major BMD deployment paths. A number of factors distinguish the paths. First, each deployment path would seek to counter a different combination of threats. Because all threats may not be equally likely or equally devastating, this approach allows Congress to identify the path that responds to the risks associated with different threats as they evolve over time. Second, the paths emphasize different BMD systems, so they would differ both in the types and numbers of sensors and interceptors they would use. Consequently, the paths also differ with respect to whether the United States would continue to adhere to the ABM Treaty.

Path 1: Emphasize ATBM Systems

The first path would emphasize ATBM systems. Because ATBM systems, such as the Patriot system, are already deployed, the United States would be on this path even if it did not develop new BMD technologies. By choosing this

¹³ U.S. Department of Defense, Strategic Defense Initiative Organization. Briefing on the Refocused Strategic Defense Initiative (Edited Transcript). by Ambassador Henry Cooper and Honorable Stephen J. Hadley, Feb. 12, 1991. Washington, 1991.

¹⁴ National Security Strategy of the United States. Mar. 1990. pp. 24-25.

¹⁵ For information about Phase I, see U.S. Library of Congress. Congressional Research Service. SDI: Issues for Phase I Deployment. Issue Brief 88033, by Steven A. Hildreth, updated regularly. Washington, 1988.

path, Congress would indicate that the threat of a ballistic missile attack during regional conflicts created a sufficient risk to justify the continued costs of development and deployment. The choice of this path could also indicate that an attack on the United States by the Soviet Union or third countries would not create enough of a risk to justify the costs of deploying defenses that could protect CONUS. Such a choice might also indicate that the technologies needed to defend against attacks on the United States have not yet proven to be cost-effective. Nonetheless, this path would not preclude continued research, development, or even later deployment of more extensive BMD systems.

Path 2: Emphasize ATBMs and Limited Protection of CONUS

A second path would emphasize ATBM systems along with a land-based, limited BMD to protect against accidental, unauthorized, or third country attacks on CONUS. By choosing this path, Congress would indicate that the continued deployment of ATBM systems appeared justified. This choice could also reflect a determination that the potential threats against CONUS were sufficient to justify a limited land-based BMD system and that the technologies appeared to be cost-effective. This path would sanction deployments of systems that are consistent with existing and potential arms control arrangements. Proceeding along this path would not necessarily preclude continued research, development, or later deployment of more extensive BMD systems.

Path 3: Emphasize ATBMs along with Worldwide Protection Against Small-Scale Attacks

A third path would emphasize ATBM systems along with land- and, possibly, space-based BMD systems to protect against small-scale attacks on targets worldwide. By choosing this path, Congress could indicate that the risks to U.S. national security interests created by global missile proliferation, along with the remaining Soviet missile threat, appeared to justify the costs of a worldwide BMD system. In addition, choosing this path would leave open the option of expanding U.S. BMD deployments to the Phase I BMD to counter a large-scale Soviet strike. This path would tend to emphasize defenses over arms control; new or modified arms control agreements could not interfere with the deployment of the full range of defensive technologies.

NON-DEFENSE ALTERNATIVES

The United States does not have to follow a path that emphasizes the deployment of any BMD systems. It could explore other policy options that would seek to counter the development of ballistic missile threats to the United States, its allies, and its forces overseas. These could include military options, where the United States would seek to attack and destroy missiles before they are launched; arms control measures, where the United States would support agreements that would either limit ballistic missiles directly or limit other military threats in regions where countries might respond by acquiring ballistic missiles; and other economic and political measures that might help discourage

the proliferation of ballistic missiles. This report concludes with a review of these non-defense alternatives to the deployment of ballistic missile defenses.

ALTERNATIVE PATHS FOR BMD DEPLOYMENT

PATH 1: EMPHASIZE ATBM SYSTEMS

The first path would emphasize BMD systems designed solely to protect U.S. forces, allies, and interests from tactical or theater ballistic missile threats.¹⁶ This section will review some of the plausible threats, the potential ATBM technologies, and the costs and benefits of following this path.

Threats to U.S. Forces, Allies, and Interests

The Persian Gulf War graphically illustrated the role and importance of missile defenses, specifically the Patriot antitactical missile system, in defending U.S. military forces engaged in a regional conflict and in preserving broader U.S. strategic interests by maintaining the allied coalition against Iraq.¹⁷ The likelihood of similar short-range missile threats to U.S. allies and interests increases should third world nations continue to acquire ballistic missile technology.¹⁸ Whether U.S. military forces would actually be threatened in the future would depend on the U.S. security commitment in a given region, including the deployment of forces at overseas U.S. bases.

While many countries might acquire ballistic missile technology, only a few represent a potential hostile adversary. Threats of ballistic missile attacks against U.S. bases and interests in NATO Europe, for example, might come from countries such as Libya in North Africa, or from countries in the Middle East. U.S. military bases and allies in Asia might be threatened by North Korea, for example. The only plausible third country threat to CONUS over the next decade or so from short-range ballistic missiles would come from Cuba, which, for instance, might acquire such missiles from North Korea.

¹⁶ There is no agreed upon distinction between theater and tactical ballistic missiles. In general, however, a theater missile is one with a range of hundreds to perhaps a few thousand kilometers and with the capability to strike targets of any sort within a theater of operations (e.g, within Europe or within the Middle East). A tactical missile is one with a range of less than a few hundred kilometers and with the capability to strike military targets within a military field of operations (such as a battlefield).

¹⁷ See Hildreth and Zinsmeister, Patriot Air Defense System. CRS Report 91-456 F.

¹⁸ U.S. Department of Defense, Strategic Defense Initiative Organization. Theater Missile Defense. Report to Congress, Mar. 30, 1991. Washington, 1991. pp. 1-3.

Technologies for ATBM Systems

A variety of ATBM technologies are being pursued by the United States. Currently these are: upgrades to the Patriot ATM system; the Extended Range Interceptor (ERINT); the Theater High-Altitude Defense Interceptor (THAAD); and the Israeli Arrow system along with its follow-on program (Arrow Continuation Experiments, or ACES).¹⁹ The primary difference among these technologies is their potential to intercept at various ranges and altitudes. A second difference is that one or two, including the Patriot ATM, rely on an explosive warhead to destroy its intended target, and the others, including ERINT, would have to collide with the intended target to destroy it.

ATBM systems could also include ground- or sea-based radars and perhaps additional sensors that might detect missile launches and incoming missiles along with sensors that could provide target information to interceptor missiles. Patriot antitactical missiles reportedly received some early warning of attack from Iraqi Scud missiles from U.S. satellites and other airborne sensors.²⁰ Future ATBM systems may be based on land or at sea, and are likely to be designed so that they could be deployed rapidly. They may also be deployed as a "layered" defense, where some ATBMs would seek to intercept attacking missiles at a high altitude while others would seek to intercept attacking missiles at lower altitudes.

Benefits, Costs, and Implications of ATBM Systems

Benefits: Countering the Threat

As long as the United States continues to forward-base its military forces overseas, preserve security commitments with allies and friends, and reserve the policy option to intervene in regional crises and conflicts, it can expect to have to deal with the proliferation of ballistic missiles and their use by potential adversaries. Although it remains unclear whether deploying ATBM systems might help deter regional aggression (Iraqi attacks on Israel and Saudi Arabia were not deterred by Patriot), ATBM systems would provide the United States an additional military option to deal with regional adversaries. In addition, ATBM systems such as the Patriot could be deployed anywhere in the United States if a short-range missile threat to CONUS appeared.

Budgetary Costs

The cost of pursuing this path would depend on the numbers and types of ATBMs included, as well as the mission required of an ATBM system. The cost of pursuing this path is unknown at this time. Nonetheless, one can get a

¹⁹ See Strategic Defense Initiative Organization. Report to the Congress, 1990. Appendix B, Theater and ATBM Defenses. Mar. 1990.

²⁰ See Covault, Craig. USAF Missile Warning Satellites Providing 90-Sec. Scud Attack Alert. Aviation Week and Space Technology, Jan. 21, 1991. p. 60.

rough idea of what such a system might cost. For example, the entire Patriot air and missile defense system, including research and development, will cost almost \$13 billion.²¹ About half of the 6,000 or so Patriot missiles will be deployed for limited defense of U.S. military forces and bases, as well as made available for rapidly deployable emergency, limited-area defense needs. Israeli estimates for an Arrow ATBM system approach \$3 billion.²² This system would seek to defend the entire country of Israel. Another indicator of system cost is the ground-based theater missile defense portion of GPALS, which is estimated at about \$10 billion.²³ A global theater defense capability would be aided, according to the Bush Administration, by the deployment of space-based missile interceptors. Presumably, a global ATBM capability without space-based interceptors would require more ground-based ATBMs, and would hence cost more than \$10 billion. Another factor to consider would be the degree to which U.S. allies and friends would be willing to share the cost of such a system that would presumably help in their own defense against regional adversaries.

Arms Control Treaty Implications

The 1972 ABM Treaty does not limit research, development, testing, or deployment of ATBM systems. There are restrictions, however, on testing ATBM systems or components in conjunction with strategic ABM systems and components. For example, the ABM Treaty precludes the operation of ABM radars in conjunction with ATBM interceptors. Consequently, if ABM Treaty restrictions are adhered to, the ground-based radar being considered for deployment in GPALS could not also serve as the ground-based radar for an ATBM system -- it would have to be distinctly different. As both the United States and the Soviet Union continue to develop, test, and consider deployment of increasingly effective ATBM systems, questions may be raised with increasing frequency about where to draw the line between unrestricted ATBM capability and restricted ABM capability.

Political Implications

U.S.-Soviet Relations. Deployment of land- or sea-based ATBM systems is not likely to upset the strategic balance nor is it likely to upset the superpower

²¹ Hildreth and Zinsmeister, Patriot Air Defense System. CRS Report 91-456 F. p. 10.

²² The Israeli Air Force estimate reportedly exceeds \$2 billion, while other Israeli sources estimate that production and deployment will cost about \$3 billion. See Scotty Fisher. Israel's Defense Minister, Military at Odds over Stake in Arrow Project. *Armed Forces Journal International*, Dec. 1990. p. 30. See also Barbara Opall. U.S., Israel Approach Agreement on Continued Arrow Development. *Defense News*, Mar. 25, 1991. p. 48.

²³ U.S. Department of Defense. Strategic Defense Initiative Organization. The President's New Focus for SDI: Global Protection Against Limited Strikes (GPALS). June 6, 1991. Washington, 1991. p. 6.

relationship for two important reasons. First, ATBM defenses are not constrained by treaty nor do they appear to be on any future arms control agenda. Second, the Soviets have deployed a substantial ATBM defense network, consisting of their SA-10 and SA-12 interceptors, along with numerous mobile ground-based radars. Nonetheless, as ATBM capabilities increase in effectiveness, the countries might find it necessary to modify or clarify the ABM Treaty so that the constraints in that agreement do not interfere with future ATBM testing and deployment.

Alliance and Regional Security Relationships. Overseas deployment of the Patriot air defense/antitactical missile system has generally been seen as contributing favorably to alliance and security commitments. This has been true in Europe, where several countries have deployed Patriot systems since the mid-1980s without controversy, in the Middle East during the Gulf War, and in Japan, where the Patriot system will eventually be deployed.

However, many Europeans would probably prefer alternatives such as regional arms control aimed at slowing the spread of ballistic missile technology to future, widespread ATBM deployments in Europe and elsewhere. Some countries, such as France, would likely argue that nuclear weapons and strong conventional forces will deter missile attacks on Europe from the Soviet Union or elsewhere. Some would also point out that the Soviet short-range missile threat in Europe no longer exists, therefore, ATBMs would not be necessary. For other European countries, further ATBM deployments are not likely to arouse strong disapproval, as long as the ABM Treaty and the U.S.-Soviet relationship are not upset and as long as the economic costs to Europeans are minimal.

Widespread ATBM deployments might, however, raise several other questions. For example, do such ATBM deployments imply a greater willingness on the part of the United States to intervene militarily in regional affairs and crises because of the increased defensive potential (i.e., confidence) of U.S. military forces threatened by ballistic missile attacks? Also, what are the potential regional implications of widespread ballistic missile and ATBM proliferation? Could regional security and stability be affected by the spread of both missile and antimissile systems?

Domestic Political Concerns. Currently, there is considerable support in Congress for the continued development and deployment of effective ATBMs. This support has been evident since the mid-1980s.²⁴ Beyond the questions of which technologies may eventually prove most cost effective, the major policy question centers around whether to deploy ATBM systems in conjunction with limited ABM defenses, or as part of a more comprehensive ABM defense implied in GPALS. These two options are detailed in the last two sections of this report.

²⁴ Hildreth and Zinsmeister. Patriot Air Defense System. CRS Report 91-456 F, p. 13.

Implications for Expansion of BMD Systems

This deployment path would not preclude continuing research into new types of interceptors and more extensive BMD systems. Arguably, ATBM deployments would not necessarily overlap in capability with a limited BMD protection of CONUS. Hence, such efforts could be pursued concurrently, without duplication of effort. However, if GPALS were desired from the outset, it would probably be more cost-effective to pursue ATBM deployments together with GPALS because of the planned capability of GPALS to provide some ATBM defense.

PATH 2: EMPHASIZE ATBMS & LIMITED PROTECTION OF CONUS

The second BMD path would emphasize deployment of ATBM systems to protect U.S. forces, allies, and interests from tactical or theater ballistic missiles, along with the deployment of a limited land-based system to protect CONUS from accidental, unauthorized, or third country attacks. The preceding section reviewed the threats and the technologies related to ATBM; this section focuses on threats to CONUS and the limited BMD systems that might counter those threats.

Threats Against CONUS

Accidental Launch

The continuing presence of Soviet missiles has led to concerns that one or several of these missiles might be launched against the United States by accident.²⁵ Because Soviet missiles carry up to 10 warheads, the United States might be threatened by a few tens of warheads in this type of attack. Most observers believe that the accidental launch of Soviet missiles is highly unlikely. Both the United States and the Soviet Union have developed mechanical or electronic locks, known as Permissive Action Links (PALs), for many of their missiles, and operating procedures that are designed to prevent such an occurrence.²⁶ Nonetheless, some believe that a limited BMD system could serve as insurance against this possibility.

²⁵ Nunn, Sam. The Changed Threat Environment of the 1990s. Congressional Record, Daily Edition, v. 136, Mar. 29, 1990. p. S 3444.

²⁶ For a description of PALs see Cottor, Donald R. Peacetime Operations: Safety and Security, in Carter, Ashton B., John Steinbruner and Charles Zraket, eds. Managing Nuclear Operations. Washington, The Brookings Institute, 1987. pp. 46-52. See also Rahr, Alexander and R. Alex Bryan. Concern over Security of Soviet Nuclear Arms. Report on the USSR, v. 2, Oct. 12, 1990. p. 6.

Unauthorized Launch

Some observers have postulated that an individual Soviet commander could launch the missiles under his control without authorization from his superiors, or perhaps in collusion with a rebellious faction of superiors. An unauthorized launch might include between 100 and 200 warheads from a flight of ICBMs or a strategic submarine's full load of missiles. However, if the countries reduce the number of warheads deployed on some types of missiles, as they have stated they would like to do under a START II agreement, the number of warheads included in this type of threat could decline to between 20 and 50.

The United States and Soviet Union employ strict command and control procedures to prevent an unauthorized launch. Some have suggested that Soviet procedures might break down under conditions of political unrest, particularly if central control were to fragment and lines of authority became confused. However, many argue that the central authorities in Moscow would tighten control over nuclear missiles under these circumstances. In addition, even if dissidents or rebels gained access to nuclear weapons, they might not possess all the codes needed to launch missiles at the United States. Nonetheless, because the existence of a U.S. retaliatory force might not deter an unauthorized launch, some believe the United States should deploy a limited BMD system to defend against this type of attack.

Third Country Attack

A number of other countries are acquiring ballistic missile technologies. In most cases, though, it could be at least 10 years before countries acquire missiles that could reach the United States. Even then, the threat would depend on these countries' relationship with the United States. For example, Great Britain, France, and China already possess ballistic missiles that can reach the United States. No one fears a British or French attack against the United States; some observers have expressed concerns about China.²⁷ China was viewed as an adversary for many years and concerns about Chinese ballistic missiles contributed to the development of the U.S. ABM system in the late 1960s. More recently, China has sold shorter and medium-range missiles to other countries. Some fear that China might someday sell its longer range missiles to countries hostile to U.S. security interests.²⁸

Other countries, such as Israel, India, Japan, Brazil, and Argentina, are pursuing programs that could provide them with missiles that might reach CONUS during the next decade. Israel and India are developing medium-range missiles and space-launch vehicles. Japan and Brazil also have space-launch

²⁷ See, for example, the comments of Representative Duncan Hunter in Congressional Record, Daily Edition, v. 137, May 20, 1991, p. H3262.

²⁸ See, for example, the comments of Representative John Kyl, Congressional Record, Daily Edition, v. 137, May 20, 1991, p. H3265.

programs.²⁹ Argentina recently canceled its medium-range missile program, but it has also expressed an interest in developing space-launch capabilities.³⁰ None of these countries is considered to be a U.S. adversary, so it is extremely unlikely, under present circumstances, that they would turn their missiles towards the United States. Even so, this path could provide a hedge against the possibility that some of these countries might become an adversary in the future or sell space-launch technologies or missiles to other, less friendly, countries.

Technologies for ATBM and Limited Protection Systems

Sensors and Interceptors

A limited protection system for CONUS could be built around technologies that SDIO has pursued for a more comprehensive BMD system. Sensors in a limited BMD system would have to detect the launch of ballistic missiles, track the approach of incoming warheads, and, possibly, distinguish real from dummy warheads and overcome other penetration aids.³¹ Sensors would then guide the interceptors towards the incoming warheads. Planned improvements in the U.S. early warning satellite and radar network might support a limited protection system. Other sensors, including SDI's Ground Based Surveillance and Tracking System (GSTS) and possibly the space-based Brilliant Eyes sensor, might also be used.³²

SDIO has pursued two ground-based interceptor programs: the Ground-Based Interceptor (GBI) and the Exo-atmospheric Interceptor (E²I), that could be deployed in a limited protection system for CONUS. Although SDIO has indicated that it would eventually like to choose one of the two interceptors for deployment in a BMD, a limited protection system could conceivably consist of some of each.³³ A variety of cost-effectiveness questions and technical obstacles remain to be resolved.

²⁹ Lennox, Duncan. *The Global Proliferation of Ballistic Missiles*. *Jane's Defence Weekly*, v. 12, Dec. 1989. p. 1385.

³⁰ Nash, Nathaniel C. *Argentina, Acceding to U.S., Ends Missile Program*. *New York Times*, May 30, 1991. p. A9.

³¹ U.S. Library of Congress, Congressional Research Service. *Accidental Launch Protection System: Requirements and Proposed Concepts*. IB88079, by Amy F. Woolf, Mar. 28, 1989 (archived). Washington, 1988. pp. 5-6.

³² For information about these systems, see Hildreth, SDI: Issues for Phase I Deployment.

³³ *Ibid.*

System Characteristics

Interceptors and sensors could be combined in different ways to form a limited protection system. Within the limits of the ABM Treaty, the United States could deploy up to 100 interceptors in Grand Forks, North Dakota. Analysts who reviewed this option in 1988 concluded that it would protect much of the United States against a launch of a few Soviet missiles if the missiles were launched across the Arctic. The system probably could not protect U.S. coastal regions if a missile launch originated off the coasts or from south of the United States.³⁴ Hence, the number of sites and missiles, and amount of change needed in the ABM Treaty would depend on the magnitude of the threat to CONUS. Minor modifications to the treaty may permit the addition of a few sites and the deployment of a few hundred interceptors. More extensive modifications could call for the deployment of several hundred or a thousand interceptors at a greater number of sites around the United States. For example, some recent proposals, including one developed by Senators Lugar, Cohen, and Warner, suggest deployments of between 700 and 1,200 land-based interceptors.³⁵

Benefits, Costs, and Implications of ATBMs and Limited Protection of CONUS

Benefits: Countering the Threats

A principal benefit to be gained from following this path would be the ability to deal with the possibility of an accidental or unauthorized Soviet missile launch and the threat of a third country missile attack. Although the probability may be extremely low, the consequences of a small nuclear attack may warrant deployment of an "insurance policy." The consequences of a third country launch of missiles with conventional warheads may be less extreme, but the possibility that such an attack might occur may appear to be greater. Hence, the deployment of defenses to counter this threat may also appear to be prudent.

Budgetary Costs

The cost of a land-based limited protection system would depend on the numbers and types of interceptors, radars, and sensors included. Reviews conducted in 1988 concluded that a system consisting of 100 interceptors with supporting radars and sensors at Grand Forks would cost \$5 to \$10 billion (in 1987 dollars). Analyses concluded that additional BMD sites located along the coasts would cost \$2 to \$3 billion per site. The estimated cost of five coastal

³⁴ Postol, Theodore A. Testimony before the House Committee on Armed Services, the Panel on the Strategic Defense Initiative. Apr. 20, 1988. Prepared Text. pp. 2-3.

³⁵ See Congressional Record, Daily Edition, v. 137, June 12, 1991, pp. S7522-S7525.

sites, along with Grand Forks, ranged from \$15 to \$25 billion.³⁶ Recent SDIO estimates indicate that a land-based portion of GPALS might cost around \$25 billion (in 1991 dollars).³⁷ The costs of ATBM defenses, which would be added to the costs described here, were discussed in the Path 1 option.

Arms Control Treaty Implications

If the United States deploys a BMD system with more than 100 interceptors at one site, it would have to amend or abrogate the ABM Treaty. It is not possible to predict how many sites and interceptors could be added to the Treaty through the amendment process before the changes undermined the Treaty's stated purpose of prohibiting nationwide defenses. If the United States and the Soviet Union decide that they do want to provide for nationwide defenses against limited strikes, the task then becomes one of drawing the line between BMD deployments that could counter limited strikes and those that could serve as the foundation for a BMD system that could counter attacks that might be a part of a conflict between the United States and Soviet Union. If the countries cannot find this dividing line, efforts to amend the ABM Treaty could interfere with efforts to limit strategic offensive forces. Each country might be unwilling to cut its offensive forces if the other could deploy nationwide defenses that might counter an attack from the lower, limited number of warheads.

In addition to limiting numbers, the ABM Treaty bans testing, development, and deployment of space- or mobile land-based ABM systems or components. Early-warning sensors that cannot provide tracking and guidance information are not restricted. However, the treaty would ban the *space-based* Brilliant Eyes and the *mobile* ground-based radar. The United States could seek to amend the treaty or structure the system so that it relied on treaty-compliant sensors.

Political Implications

U.S.-Soviet Relations. The Soviet Union has long argued that extensive BMD deployments could upset the strategic balance and lead the Soviet Union to withdraw from arms control agreements limiting offensive nuclear weapons.³⁸ However, the Soviet Union might not pursue this course if the United States deployed a limited BMD system, particularly if the ABM Treaty continued to restrain the deployment of more extensive defenses. Although the Soviet Union might view a limited system as a first step on a path to more comprehensive BMD defenses, an explicit choice on the part of the United States to begin and end with limited protection could ease that concern. In addition,

³⁶ Information provided by Lockheed and McDonnell Douglas in briefings during 1988 and 1989.

³⁷ Strategic Defense Initiative Organization. *The President's New Focus for SDI: Global Protection Against Limited Strikes (GPALS)*. p. 6.

³⁸ Soviet General Says Retaliation Considered if U.S. Pursues SDI. *Aviation Week and Space Technology*, v. 134, Apr. 8, 1991. p. 21.

the Soviet Union has itself deployed a land-based limited protection system around Moscow; thus, a treaty-compliant U.S. system may not spark new concerns in the Soviet Union. Ultimately, as was discussed above, the Soviet reaction to the U.S. deployment of a limited BMD system (and, similarly, U.S. reaction to the deployment of Soviet defenses) probably would depend on whether the ABM Treaty were amended to permit enough BMD sites and interceptors to form the basis for a nationwide defense.

Domestic Political Concerns. Many may find it difficult to support deployment of ATBM systems to protect U.S. forces and allies without actively defending Americans at home.³⁹ Although a limited BMD system to protect CONUS may cost more than \$25 billion, many may see a need for insurance against an attack on CONUS, even if the threat of a ballistic missile attacks against CONUS appears remote. As long as Americans believe that missiles can be used in conflicts, they will be concerned about missiles attacking the United States. A limited protection system for CONUS would address those concerns.

Implications for Expansion of BMD Systems

This path would not preclude continuing research into new types of interceptors and more extensive BMD systems. In fact, while the United States proceeded along this path, it could continue to examine emerging threats and assess the risks they might create for U.S. security. The United States could alter its choice, after a few years had passed, and proceed with the development of additional defenses if emerging threats to U.S. security indicated that such defenses were justified.

PATH 3: EMPHASIZE ATBMS ALONG WITH WORLDWIDE PROTECTION AGAINST SMALL-SCALE ATTACKS

This final BMD path emphasizes the global deployment of ATBM systems and BMD systems that might defend against relatively small attacks launched from any country at targets throughout the world. The Bush Administration's proposed GPALS system proposes to be able to provide such a defensive capability against a range of threats.

Threats to CONUS, U.S. Forces, Allies, and Interests

This BMD deployment path would seek to address all the threats described, in some detail, in the two previous sections, such as third country threats to U.S. forces and allies overseas, along with the possibility of third country attacks on the United States. It would also address possible accidental or unauthorized Soviet missile launches. In addition, this path might arguably

³⁹ In a speech before the Senate, Senator Dan Coats said, "It would be an irony indeed if we were permitted to deploy a robust defense overseas but were denied a similar degree of protection for American citizens at home." Congressional Record, Daily Edition, v. 137, Feb. 28, 1991, p. S2454.

protect against a more deliberate, limited Soviet attack against U.S. retaliatory forces. Many believe that the ability to intercept the attacking warheads in this type of strike would enhance the survivability of U.S. weapons, and therefore, enhance deterrence.

Technologies for Worldwide Protection

The BMD technologies considered for a global defense system include all those mentioned previously. For example, this system could include 500 to 1,000 of the U.S.-based ground-based strategic defense interceptors described in the previous section. In addition, the Administration has proposed deploying about 1,000 Brilliant Pebbles interceptors. These would be autonomous space-based missiles designed to identify and destroy attacking missiles and warheads outside the earth's atmosphere.⁴⁰ Consequently, each Brilliant Pebble would need to be able to detect, identify, locate, and destroy missiles in their early launch phase as they exit the Earth's atmosphere. However, the technology needed to accomplish these missions with Brilliant Pebbles could not be deployed for many years, so a BMD system that might be deployed in the near term would have to employ alternative technologies.

The Bush Administration holds that Brilliant Pebble interceptors would also be able to destroy theater ballistic missiles with ranges in excess 300 miles, thus relieving the demand for large numbers of ground-based ATBMs.⁴¹ To accomplish this mission, Brilliant Pebbles would have to be capable of locating, identifying, and destroying missiles that were, at most, 50-60 miles above the earth's surface. This altitude is well within the earth's atmosphere. However, when Brilliant Pebbles fly from space into the atmosphere, the friction will make them extremely hot and could damage the sensors on the missiles. Hence, the United States must develop a way to cool and protect the Brilliant Pebbles before such a system could be effective inside the atmosphere.

Benefits, Costs, and Implications of Worldwide Protection System

Benefits: Comprehensive Protection

Supporters of a worldwide BMD system believe that the primary benefit of a worldwide BMD system is that it would seek every plausible limited ballistic missile threat.⁴² These threats and their attendant risks are addressed in the

⁴⁰ See U.S. Library of Congress. Congressional Research Service. Brilliant Pebbles: Implications for the Strategic Defense Initiative, by John D. Moteff. CRS Report 89-563 SPR. Sept. 28, 1989. Washington, 1989.

⁴¹ Strategic Defense Initiative Organization. Briefing on the Refocused Strategic Defense Initiative (Edited Transcript). Feb. 12, 1991.

⁴²U.S. Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs). New Strategic Defense Initiative Program Focus: Global Protection Against Limited Strikes (GPALS). News Release, January 30, 1991.

preceding sections. In addition, this path would more readily afford the United States the option of deploying a more comprehensive Phase I system, which is basically a much larger GPALS in terms of numbers of ground- and space-based interceptors and sensors. In the event the Soviets sought a return to the Cold War confrontation and a more adversarial relationship, this path would help ensure some level of comprehensive protection.

Budgetary Costs

The Bush Administration has estimated the costs of developing and deploying a GPALS system at around \$46 billion (in 1991 dollars).⁴³ To deploy GPALS, the Administration has proposed spending no more than \$7 billion per year over the next decade or so.⁴⁴ This level of effort would permit development and deployment of GPALS, and development of follow-on systems as well.

Critics have charged that this figure is far too low and that the real costs would be considerably higher. The United States might also have to bear the added costs of renewed strategic offensive nuclear weapons buildup if the deployment of GPALS precipitated a renewed arms race.⁴⁵ Some have argued that even though such defenses may be worthwhile, they are simply unaffordable given U.S. budget deficits and the declining defense resources.

Arms Control Treaty Implications

The Administration acknowledges that deployment of GPALS is not consistent with the ABM Treaty, but argues that the ABM Treaty should be supplanted by a defense and space agreement permitting more comprehensive BMD deployments in space and on the ground.⁴⁶ Since 1985, the United States has unsuccessfully sought to negotiate this cooperative transition with the Soviet Union. Without mutual agreement to deploy worldwide defenses, the Soviets have consistently stated that they would withdraw from any constraints on offensive strategic nuclear weapons, such as START, if the United States deploys defenses that exceed the limits in the ABM Treaty.

Washington, 1991. p. 2.

⁴³ Strategic Defense Initiative Organization. *The President's New Focus for SDI: Global Protection Against Limited Strikes (GPALS)*. p. 6.

⁴⁴ *Ibid.* p. 6.

⁴⁵ Soviet General Says Retaliation Considered if U.S. Pursues SDI. *Aviation Week and Space Technology*, v. 134, Apr. 8, 1991. p. 21.

⁴⁶ Strategic Defense Initiative Organization. *The President's New Focus for SDI: Global Protection Against Limited Strikes (GPALS)*. p. 6.

Political Implications

Currently, a domestic consensus for deploying a worldwide BMD system does not exist. Furthermore, absent a mutually cooperative arrangement between Moscow and Washington, European governments and European public opinion could be expected to oppose worldwide BMD deployments. Nonetheless, in the wake of the Persian Gulf War, domestic concern over the risks of ballistic missile proliferation has heightened, and interest in BMD deployments that might address this problem has grown.

Potential opposition from other nations might arise if the perception grows that a U.S. GPALS system would grant the United States the ability to pick and choose which regional conflicts to engage in, and which countries merit U.S. missile defense. In other words, the deployment of GPALS might permit the United States to take an active, interventionist role in international relations throughout the remainder of this century and beyond. For instance, a GPALS system would give the United States the ability to choose which side to defend in a future conflict, such as one between India and Pakistan, where ballistic missile attacks were taking place. Alternatively, the United States could attempt to shoot down all ballistic missiles launched during regional conflicts, regardless of their origin or their intended targets.

ALTERNATIVES TO BMD DEPLOYMENTS

As the preceding discussion indicated, most of the technologies that the United States might include in a BMD system will not be available for deployment for several years. At the same time, many potential ballistic missile threats will not materialize for several years. Consequently, in the interim, the United States could pursue a number of alternative policies that may help it reduce or eliminate the threat of ballistic missile attacks without deploying ballistic missile defenses. In light of the likely budgetary costs of BMD deployments, these policies may be viewed as a more a cost-effective response to the possible threat of ballistic missile attack.

ALTERNATIVES TO ATBM SYSTEMS

Because many countries already possess missiles that could attack U.S. allies or U.S. forces, U.S. allies or U.S. forces may be the target of ballistic missile attacks before a BMD system (other than the Patriot system deployed today) could be deployed. If such a conflict were to occur, the United States could explore military options to counter an adversary's ballistic missiles. For example, it could develop strategies and weapons systems needed to attack and destroy an adversary's ballistic missile force at the start of a conflict. However, in light of the experiences in the Persian Gulf War, it is unlikely that this type of military response could substitute completely for ballistic missile defenses.

The United States might also explore nonmilitary options to reduce or remove the threat of ballistic missile attacks in regional conflicts. For example, regional arms control measures could include: regional confidence-building measures to reduce the likelihood that conflicts would begin between countries with ballistic missile forces; agreements that would ban efforts to acquire ballistic missile forces; and, more extensive agreements that might also mandate the elimination of existing missile forces. However, arms control measures can only prove effective if the countries in the region believe they would be more secure if they and their neighbors gave up ballistic missiles than they would be if they maintained their own missile forces. This condition may not hold in many regions because the countries have acquired ballistic missiles in response to long-standing regional disputes. If the United States wants to seek arms control restrictions on ballistic missiles, it may also have to seek measures that would reduce tensions and address the source of potential conflicts.

Because many countries may be unwilling to negotiate limits on their missile programs, the United States might employ economic or political incentives to slow or stop development of regional ballistic missile threats. These measures could include restrictions on the sale of weapons to countries that are attempting to acquire ballistic missiles, restrictions on other kinds of trade with those countries, and positive incentives, such as the provision of economic assistance or security guarantees to countries that forswear ballistic missiles.

ALTERNATIVES TO LIMITED PROTECTION OF CONUS

Accidental or Unauthorized Launch of Soviet Missiles

The United States and Soviet Union already employ crisis control mechanisms such as the Hotline communications link and Nuclear Risk Reduction Centers (NRRCs). Additional measures might be pursued. For example, the countries might establish procedures that would allow them to slow the actual release of control over nuclear weapons to local commanders. This would enhance central control and reduce the likelihood of an accidental launch during times of heightened tensions.

Other efforts, such as the installation of PALs on submarine-launched ballistic missiles, might also reduce the likelihood of accidental or unauthorized launches.⁴⁷ Others have suggested that the countries install destruct mechanisms so that missiles could be destroyed if they were launched by accident or without authorization. These proposals have also been resisted by military officials because they fear that an adversary could use these mechanisms to destroy missiles that are launched intentionally during a conflict.⁴⁸ Nonetheless, these approaches may gain favor as a cost-effective alternative to the deployment of a BMD system that would cost at least \$25 billion.

Third Country Threats

As the preceding discussion indicated, countries hostile to U.S. security interests are generally years away from deployment of ballistic missiles that could reach CONUS. As a result, the United States might seek to discourage or prevent the development of these missiles in the interim. For example, many countries that might develop long-range missiles would do so as a part of their space-launch programs. The United States could offer to provide space-launch services at reasonable cost or to help in the development of an international space launch program if these countries halted their own space-launch programs. Such efforts could also be supported through the Missile Technology Control Regime (MTCR), a coalition of Western allies that seeks to constrain the spread of ballistic missile technologies with export and trade controls.⁴⁹

⁴⁷ The U.S. Navy has generally resisted such changes due to concerns about its strategic submarines receiving launch authorization codes during a conflict. See Miller, G.E., Vice Admiral USN (retired). Who Needs PALs? Proceedings of the U.S. Naval Academy, July 1988. pp. 50-56.

⁴⁸ See the discussion in Frankel, Sherman. Stopping Accidents After They've Happened. Bulletin of the Atomic Scientists, v. 46, November 1990. pp. 39-41.

⁴⁹ For more information about the MTCR see U.S. Library of Congress. Congressional Research Service. Non-Proliferation Regimes: A Comparative Analysis of Policies to Control the Spread of Nuclear, Chemical and Biological Weapons and Missiles. CRS Report 91-334 ENR, by Zachary A. Davis, Apr. 1,

Slowing or stopping the sale of missiles could be more difficult, but the United States could continue to apply pressure to discourage such sales. Finally, the United States could encourage regional arms control measures to slow ballistic missile programs. U.S. diplomatic efforts might also help resolve regional problems that give rise to the perceived need to acquire ballistic missiles.

Even if the United States deploys a limited protection system or manages to stem the proliferation of longer-range ballistic missiles to countries that may threaten CONUS, it might not eliminate all possible threats. Countries that are hostile to the United States could still threaten U.S. territory or U.S. citizens; they would simply have to employ other means to deliver their weapons. For example, they might develop or acquire cruise missiles or weapons that could be delivered by aircraft or ships. Consequently, in the long term, the United States may need to look beyond ballistic missile defenses to counter the threats that might arise from third countries with sophisticated weapons.

ALTERNATIVES TO WORLDWIDE DEFENSES

The United States could pursue many of the measures described above to address the threats that might be countered by a worldwide BMD system. These include regional arms control measures, political and economic incentives, and measures that would reduce the risk of accidental or unauthorized launch of Soviet missiles. However, these measures would not alter the threat of a larger Soviet attack on the United States; many believe that a worldwide defense such as GPALS could expand into Phase I of SDI to counter that type of threat.

Critics of worldwide BMD deployments assert that U.S. strategic offensive nuclear capabilities have worked effectively for the past four decades to deter Soviet aggression in Western Europe and against the United States. These observers would argue for continuing the modernization of strategic offensive forces as the most effective means of ensuring the defense of the United States against the Soviet Union. Others, however, believe that the United States should pursue arms control agreements, with the Soviet Union and other countries, to reduce the number of ballistic missiles and the likelihood that they might be used in a conflict.