

**Chapter 5**

**BMD Capabilities and the  
Strategic Balance**

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# BMD Capabilities and the Strategic Balance

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## INTRODUCTION

Since the President's March 23, 1983, speech there has been much discussion of the strategic implications of the steps along the way to his goal. In that speech he announced his "... ultimate goal of eliminating the threat posed by strategic nuclear missiles," while recalling the need to "... remain constant in preserving the nuclear deterrent and preserving a solid capability for flexible response."<sup>1</sup> He also warned that the pairing of offensive and defensive systems "can be viewed as fostering an aggressive policy."

Among those who see potential value in developing BMD there are some who argue that only a realistic prospect of defending the U.S. population against an all-out Soviet attack can justify both a major change in strategic direction and the massive program that developing and deploying BMD would entail. In their opinion, the United States has little or nothing to gain—and perhaps much to lose—by building less effective defenses. As they see it, in an attempt to reach the President's goal the U.S. strategic position may worsen before it gets better, since the Soviets also can be expected to build defenses. Other supporters of BMD maintain that the United States can benefit from any level of strategic defense and that U.S. security will improve as the strategic balance moves from offense-dominance toward defense-dominance. Critics of the President Strategic Defense Initiative (SDI) Program maintain that his ultimate goal is unattainable and that little could be gained by building lesser levels of defense.

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<sup>1</sup>Relevant sections of that speech reproduced in app H.

Almost all observers agree that reaching or approaching the President's goal would require a lengthy and complex transition period.<sup>2</sup> They do not all agree that we can be sure that the transition could ever be completed. But whether partially effective defenses are viewed as transitional stages or as the most we can in practice achieve, it is important to understand the strategic implications of various levels of U.S. strategic defense and Soviet strategic defense. This chapter discusses how various levels of U.S. and Soviet defense capability might affect the strategic balance as well as the choice of strategy available to the United States. Of particular interest are the implications for a transition from a condition of offense-dominance to one of defense-dominance.

To understand how U.S. and Soviet strategic defenses can affect the strategic balance, it is necessary to be able to specify what each defense can accomplish against the other's offense. Saying that we have a BMD system that can destroy some number of Soviet reentry vehicles (RVs), or that it has a given leakage rate, tells us little by itself. What it could accomplish would depend on how many ballistic missile weapons the Soviets had, what other nuclear delivery systems they had, how they attacked, and how we defended.

We cannot specify now what offensive and defensive weapons systems the two sides will deploy in future decades. What we can do, *for the sake of analysis*, is postulate various levels

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<sup>2</sup>In the President's March 23, 1983, speech he predicted that it will take year, probably decades, of effort on all fronts. For a discussion of the Administration's scenario for the transition, see ch. 9.

of effectiveness for strategic defenses. These levels might or might not be achieved in the face of the other side's offensive measures. But assessment of the BMD issue requires analysis of the strategic implications of various defense capabilities *if we could have them*.

This chapter is divided into two parts. The first examines and explains factors that affect

strategic defense capability: the major components of strategic defense (BMD, air defense, civil defense, etc.); basic modes for operating BMD; and the structure and possible evolution of strategic offensive forces. In the second part we specify illustrative levels of defense capability and discuss their implications.

## THE COMPONENTS OF STRATEGIC DEFENSE CAPABILITY

### The Role of BMD in Strategic Defense

Defense—reducing the damage an opponent can do in an attack—can be divided into three broad categories: passive defense, active defense, and preemptive destruction. Even if the Soviet Union struck first and the United States retaliated, the United States could attempt to defend against follow-on strikes by preemptive destruction of Soviet weapons not employed in the first strike.

Active defenses such as BMD and air defense seek to prevent launched weapons from reaching their intended targets, either by destroying them or by disrupting their operation. If the goal of the defense is to prevent all weapons—or the great majority of them—from reaching their targets, both BMD and air defense would be required. If, on the other hand, the goal is only to reduce the number of weapons reaching their targets, or to reduce the number of arriving weapons that have properties unique to ballistic missiles, then BMD alone may be sufficient.

Ballistic missiles are unique in their ability to kill targets at intercontinental ranges promptly—within 30 minutes or less of launch. Because of their accuracy, ICBMs can kill *hard targets* promptly, and it is likely that in the future SLBMs will also have that capability. Bombers and cruise missiles can kill hard targets, but it takes them much longer to reach their targets. Assuming that bombers and cruise missiles can be detected hours before they reach their targets, being able to defend against ballistic missiles would mean having hours rather

than minutes to take steps such as getting command authorities to safety, activating civil defense procedures, and deciding to launch a retaliatory strike. Today, ballistic missiles are the largest part of the Soviet strategic nuclear threat against the United States.

An alternative to reducing the number of weapons reaching their targets is to reduce the effectiveness of each weapon. This might be accomplished by passive defense techniques. We currently use some passive defenses to protect elements of our strategic forces. ICBM silos are hardened to reduce the effectiveness of nuclear weapons detonating nearby. Submarines are hidden in the open ocean to preclude the Soviets successfully barraging their deployment areas with nuclear weapons. Bombers, their tankers, and airborne command posts can be sent aloft so that very large areas would have to be barraged to destroy them. Civil defense applies similar techniques—dispersal and sheltering—to protecting civilians. Civil defense cannot protect the buildings and other structures within the cities.

Passive and active defenses can be alternative means to reach the same ends, or they can be combined. In general, the more ambitious the goal the more likely it is that some combination of both would be required. For example, consider population defense. The U.S. population is not evenly distributed over the United States, but is highly concentrated in cities. These cities are soft targets. A few nuclear weapons delivered in any way against a major population center would kill millions of people. City defense would therefore require

both BMD and air defense. That defense would have to be extremely capable to ensure that no weapons got through, especially if the Soviets launched many at each city they attacked. One reason an attack would kill so many people is that the population is concentrated, unprotected, in a small area. Even with highly effective active defenses, it would probably also be necessary to use civil defense to reduce the number of people killed by the few weapons that might reach the target. Civil defense alone would probably be of limited value against a large attack, since destruction could be spread over a large area. Active defense would have to be extremely good to protect against that attack. However, together the two types of defense might be much more effective than either alone.

### Operating Modes for BMD

Depending on its design, a BMD system may operate in one of several different modes. The simplest operating mode might be called "random subtractive." In this case the defense would shoot at as many enemy reentry vehicles (RVs) as possible, with no attempt to distinguish among them.<sup>3</sup> Random subtractive defenses can be characterized by a kill probability (i.e., the probability that any given RV is stopped by the defense), or, alternatively, by a "leakage rate" (the probability that any given RV gets through the defense). The kill probability is the same regardless of where the RV is aimed. It would depend on the size of the attack and the time over which it occurs.

At the other extreme is the "completely preferential" defense. A completely preferential defense shoots only at selected RVs, and can select them for maximum effect. A completely preferential defense can determine where all the RVs in an attack are aimed and can allocate its weapons so that all the RVs aimed at selected targets are destroyed, thereby saving those targets. This kind of defense

<sup>3</sup>Reentry vehicles carry the nuclear weapons. They are dispensed from ballistic missiles above the atmosphere, and are designed to shield the weapons from the effects of reentry into the atmosphere. A random subtractive defense would probably attempt to distinguish RVs from decoys.

would maximize the ability to save targets. In reality, a completely preferential defense would be very difficult—if not impossible—to achieve. Nevertheless, the idea is a convenient analytical tool because it represents the best that any defense could do.

A more likely situation would be "semi-preferential" defense. A semi-preferential defense would also shoot only at selected RVs, but the defense capability allocated to defend any particular target would be determined before the attack. To operate semi-preferentially the defense would have to be able to determine where individual RVs are aimed, but unlike a complete preferential defense it would not have to determine where they are all aimed before it begins firing. A semi-preferential defense would be less efficient than a completely preferential defense: some targets would be over-defended while others might be under-defended. When the defender has a semi-preferential defense, the attacker and defender play a double-blind game. Each allocates its weapons according to how it thinks the other will. This introduces an uncertainty into predictions of the outcome beyond the uncertainty stemming from ignorance of the precise capabilities of the offensive and defensive weapons. However, if the attacker knows how well each target is defended, or if he can destroy some of the defensive system with his RVs or other weapons, some of the advantage of a semi-preferential defense is lost because the attacker knows exactly how many RVs to allocate in order to overcome the defense and achieve his attack goal.<sup>4</sup>

<sup>4</sup>Although semi-preferential and completely preferential defenses can increase the number of assets (ICBM silos, for example) surviving a large-scale attack, neither can necessarily provide *enduring* survival. If the offense can exhaust the defense and determine which targets were not destroyed in the first strike, it can reattack those targets in a follow-on attack. A determination of targets surviving the first strike might be made by visual (or photo) reconnaissance. It has been suggested that it could be done more rapidly with space-based sensors that can accurately locate nuclear detonations, or by fitting warheads with devices that broadcast their location just prior to detonation. In planning his follow-on strike, the attacker would want to have some estimate of his opponent remaining defense capability.

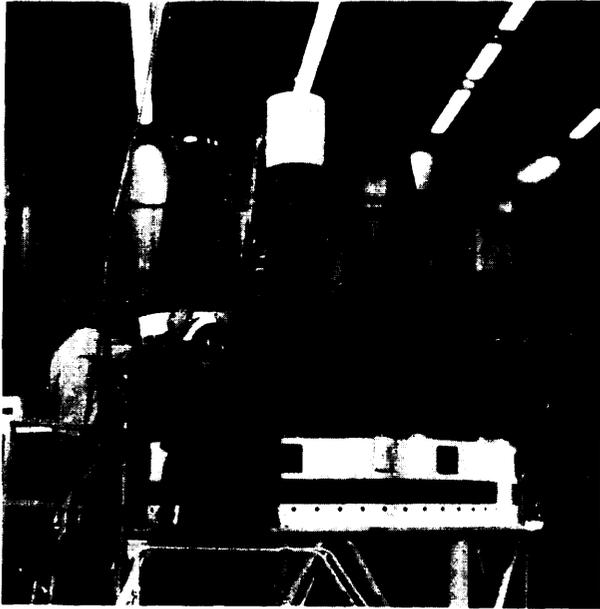


Photo credits: U.S. Air Force

Test reentry vehicles being loaded on "MX" or "Peacekeeper" nosecone indicate general scale and appearance of "RVs" referred to in this and other chapters.



Artist's concept of the missile, right, shows in cut-away how multiple, independently targetable reentry vehicles (MIRVs) are positioned on upper stage (post boost vehicle, or "PBV") of the rocket.

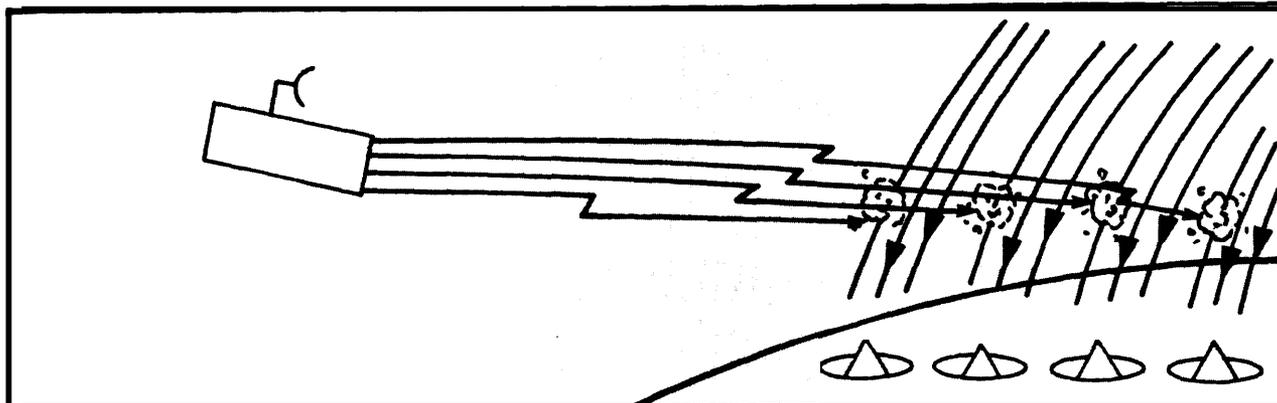
The key to a preferential (or semi-preferential) defense is the ability to destroy any RV that is shot at with near 100 percent confidence. This ability might come from highly capable interceptors or from using a less capable defense to shoot several times against each of the selected attacking weapons. In this latter case, a random subtractive defense might kill more attacking weapons than a preferential defense, but would save fewer of the targets from destruction.

Distinctions between random subtractive and preferential defenses are most important for light and moderate defenses. Defenses that can destroy in excess of 90 percent of an attacker's RVs are likely to be random subtractive. If the defense were composed of highly capable interceptors each of which had close to a 100 percent probability of killing any RV that was shot at, it would be unlikely that the defender would only build enough interceptors to destroy 90 percent or 95 percent of the at-

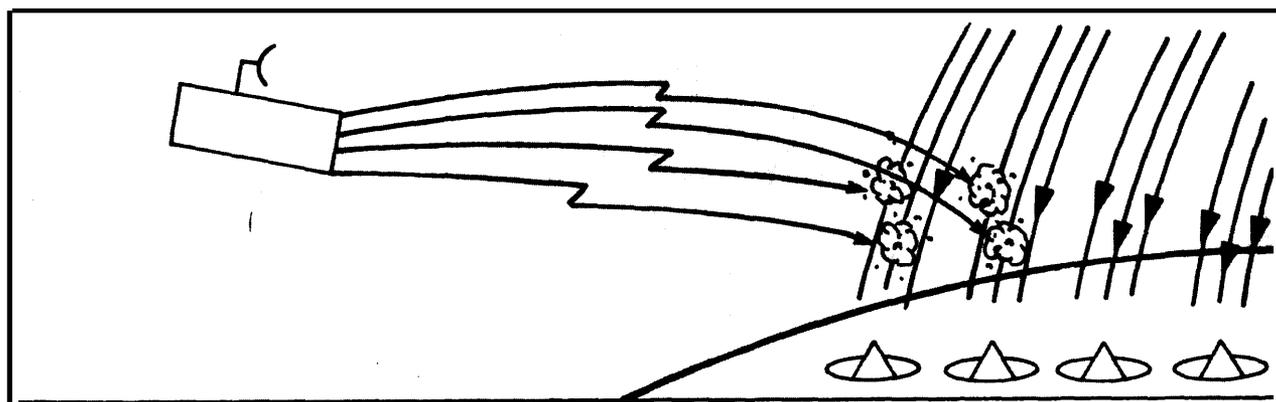
tacker's force. It is more likely that he would build more than enough interceptors to kill all of the attacker's RVs. If, on the other hand, the single shot kill probability were substantially less than 100 percent, but the defender had enough shots to assure a very high kill probability against 90 percent of the attacking RVs, he could achieve a kill probability almost as high against all of the attacker's RVs. Shooting at all of them would simplify his battle management problem but not concede any targets to the attackers

<sup>6</sup>For example, assume that the attacker has 10,000 RVs and the defender can shoot a total of 81,000 times with a .4 kill probability per shot. If he elects to shoot nine times at each of 9,000 RVs he can achieve a .99 kill probability against each RV and expect to kill 8,910 RVs. If he elects to shoot eight times against each of 10,000 RVs, he can achieve a .98 kill probability, which is not substantially different, and can expect to kill 9,800 RVs. If, on the other hand, he has only 8,000 shots rather than 81,000, by shooting eight times at each of 1,000 RVs, he can be reasonably sure of saving some targets. If he shoots randomly, he will kill more RVs, but he is unlikely to save many targets if several RVs are used against each.

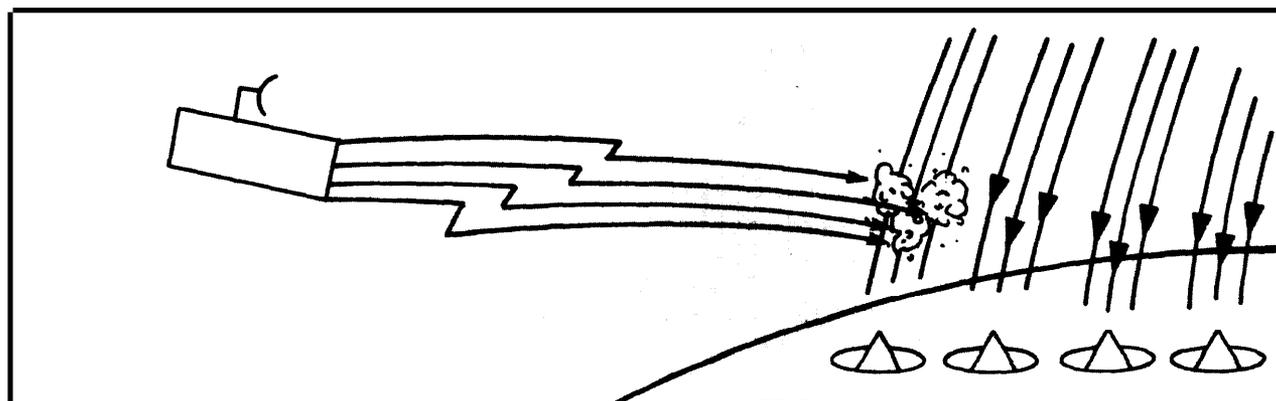
## BMD Operating Modes



*Random subtractive defense.* The defense cannot distinguish among RVs, and therefore attacks them randomly. This shows one possible outcome. All the silos are destroyed. It is possible, although not very likely, that all the RVs aimed at one silo would be shot, thereby saving the silo.



*Semi-preferential defense.* The defense can determine the targets of the individual RVs, but cannot determine where all the RVs are going before some of them reach their targets. The defender decides in advance of the attack how many shots to defend each silo with. In this case he has not allocated enough, and the silos are destroyed. If the attacker had decided to use fewer RVs against each defended silo, those silos would have survived.



*Completely preferential defense.* The defense can determine where all the RVs are aimed before it has to shoot. In this case the defender elects to use all his defensive capability to ensure that the leftmost silo survives.

SOURCE Office of Technology Assessment

Defenses exact an "attack price. By reducing the effectiveness of the attacker's weapons, they force him to use more weapons to achieve his attack goal. The attack price can be raised both by destroying weapons and by forcing the attacker to waste weapons because he does not know in advance which of his weapons will be destroyed. When the attack price exceeds the number of weapons the attacker has available, survivability increases and the attacker's confidence in achieving his attack goals decreases. One advantage of semi-preferential defenses (assuming the attacker does not know the defense allocation and cannot destroy the defense) is that the attacker does not know which targets he will have to attack with additional weapons and how much defense each target will have. Hence, the attack price may be substantially higher than the number of RVs the defender can actually destroy. Furthermore, some targets may survive at almost any level of attack. Completely preferential defenses, if they could be achieved, could ensure the survival of at least some targets.

#### Current Strategic Forces and Possible Future Developments

The value of future strategic defenses to the United States would be highly dependent on the nature of future offensive forces, but it is difficult to predict with any confidence what those offenses would be. Moreover, the nature of future defenses is at least as uncertain as the nature of the offenses they will oppose. This section discusses current strategic forces, near-term modernization programs, and the problems of predicting future forces.

The United States and the Soviet Union both have a variety of strategic nuclear delivery systems. Although both use the same types of weapons, there are important differences between the ways the two sides structure their forces. In the future, both will be able to make the same types of force improvements. However, if history is any guide, we can expect the two sides to exploit their opportunities in different ways. Projecting force

structures more than a few years into the future is highly speculative.

#### Current Forces and Near-Term Trends

U.S. strategic offensive forces consist of about 1,000 intercontinental ballistic missiles (ICBMs); 600 submarine launched ballistic missiles (SLBMs); and 325 long-range bombers carrying gravity bombs, short-range attack missiles, and air-launched cruise missiles (ALCMs).<sup>7</sup> The strategic command, control, and communications (C<sup>3</sup>) system manages these forces. In addition to offensive weapons, we have limited strategic defenses—small air defense and passive defense of strategic forces.<sup>7</sup>

Soviet strategic forces include the same major elements, but with different emphases. Roughly three fourths (about 6,000) of our ballistic missile warheads are deployed on SLBMs, and we try to keep a large fraction of these at sea at all times. The Soviets, by contrast, have about two-thirds of their ballistic missile weapons mounted on 1,400 ICBMs, and they tend to keep a smaller fraction of their ballistic missile submarines at sea during peacetime.<sup>8</sup> Furthermore, most of the Soviet firepower is concentrated on fewer than half of their ICBMs. While no U.S. ICBM currently has more than 3 warheads, more than 80 percent of the Soviet ICBM warheads are on missiles with 6 to 10 warheads each.<sup>9</sup> Soviet ICBM silos are generally thought to be harder (i.e., more resistant to nuclear attack) than U.S. silos. "The U.S. strategic bomber force is a substantial leg of the triad of offensive forces, and is now being equipped with air-launched cruise missiles (ALCMs). Soviet bomber forces appear to play a less prominent—although probably increasing—role.

Both nations' offensive forces are undergoing modernization. The United States is now building the 10 warhead MX ICBM, the B-1

<sup>7</sup>*United States Military Posture FY1986*, Organization of the Joint Chiefs of Staff, pp. 19-33.

<sup>8</sup>*Ibid.*, p. 33.

<sup>9</sup>*Soviet Military Power*, Department of Defense, 1985, p. 29.

<sup>10</sup>*Ibid.*, p. 29.

bomber, the ALCM, the submarine-launched cruise missile (SLCM), and the Trident I (C-4) SLBM. A small single warhead ICBM—possibly for mobile deployment—an “advanced technology” bomber, an advanced ALCM, and the Trident II (D-5) SLBM are in various stages of development. The D-5 will have longer range and higher accuracy than the C-4.<sup>11</sup> The Soviets have in development a single warhead ICBM and a 10 warhead ICBM—both believed to be for mobile deployment—a new SLBM, a long-range bomber similar to the B-1, and several cruise missiles. They are building a new class of ballistic missile submarine, as well as a new variant of their existing long-range bomber, the BEAR.<sup>12</sup>

The Soviets have put much more emphasis on strategic defense than the United States has. In the aftermath of the ABM Treaty and its protocol, the Soviets chose to build and maintain the one ABM site permitted, a limited ballistic missile defense of the Moscow area. They have emphasized both homeland air defense and civil defense. The Organization of the Joint Chiefs of Staff estimates that Soviet strategic air defenses consist of 6,300 radars, 9,600 missile launchers, and 1,200 interceptor aircraft, including six new types of aircraft deployed since 1975. The United States saw no purpose in maintaining an operational BMD as constrained by the treaty, and little purpose in building extensive defenses against bombers as long as we had no defense against Soviet missiles. The U.S. air defense system consists of about 100 radars and 300 interceptor aircraft. Both radars and aircraft are currently being upgraded with modern equipment.”

A coordinated nuclear strike requires a functioning command system that can communicate with the forces and exercise control. According to the Organization of the Joint Chiefs of Staff:

The Soviets expect to be able to communicate with their forces during a strategic nuclear exchange and to direct all operations. Toward this end, the Soviets have constructed hardened, deep-underground facilities for their primary military authorities. The Soviets have developed air- and ground-mobile systems that can serve as alternate command posts if primary sites are destroyed. Soviet systems emphasize survivability, redundancy, and flexibility and provide extensive internetting of communications from the high Soviet command to lower echelons.”

The U.S. and Soviet C<sup>3</sup> systems have many features in common. However, recent unclassified publications have reported that parts of the U.S. system are soft, few in number, and easy to locate.<sup>16</sup> In a nuclear attack the C<sup>3</sup> system would be a prime target.

#### Projecting Forces Into the Future

According to the Administration, decisions to begin full-scale development of a BMD system might be made in the early to mid- 1990s. These decisions could be expected to produce initial deployments during the first decade of the next century. More extensive and more technologically advanced systems could be expected to follow according to a time scale roughly marked in decades.

The strategic offensive forces that those defenses face could be very different from today's. By 2005, almost all currently deployed forces would have been replaced, and many of those now in early production or in development would be in the process of replacement. By 2020, most systems deployed by the turn of the century would have been replaced. While we can predict with moderate certainty the rate at which individual units will be replaced, it is much more difficult to predict how different those replacements will be. While we may have some confidence that we can predict many of the technical options for future forces, we cannot confidently predict

<sup>11</sup>*DOD Annual Report to the Congress Fiscal Year 1986*, p. 52.

<sup>12</sup>*Soviet Military Power*, Department of Defense 1985, pp. 29-36.

<sup>13</sup>*United States Military Posture FY 1986*, organization of the Joint Chiefs of Staff, p. 33.

<sup>14</sup>*Ibid.*, pp. 31-33.

<sup>15</sup>*United States Military Posture FY 1986*, organization of the Joint Chiefs of Staff, p. 28.

<sup>16</sup>Detailed information that could allow one to distinguish major differences between U.S. and Soviet C<sup>3</sup> systems is classified.

which will prove workable and which will not, which will be exploited and which will not. The offenses faced by future strategic defenses could be very much different from today's forces (although they need not necessarily be), and the serious pursuit of strategic defenses will influence the nature of the offenses.

Offensive forces might evolve in response to actual or anticipated BMD developments in three general ways: proliferation of weapons; changes in the mix of weapons in the force; and improvements or changes in existing weapon types.

An obvious, "brute force" response to defense is to build more offense. The Soviets have said that that is what they would do. Ballistic missile warheads can be proliferated by adding more boosters, or by increasing the number of warheads carried by each booster. Between 1980 and 1984 the Soviets built 875 ICBMs, 950 SLBMs, and 2,175 theater-range ballistic missiles, an average of 800 new ballistic missiles per year.<sup>17</sup> Much of this production has apparently gone to replacing existing missiles as they age. However, this production rate indicates a capacity to increase their force levels and to modernize by incorporating countermeasures. The Soviet SS-18, their largest ICBM (currently restricted to 10 warheads under the terms of the SALT II Treaty), is reported to have eight times the throwweight of the U.S. Minuteman III.<sup>18</sup> Under the terms of SALT II the United States reserves the right to deploy Minuteman III with seven warheads, the maximum number with which it has been tested.<sup>19</sup> This indicates considerable room for expansion in the number of weapons carried by the SS-18.<sup>20</sup>

Another possible response to BMD development would be to reemphasize weapons that BMD might be effective against and to increase the role of other weapons. If these other weapons were less effective, less threat-



Photo credit: U.S. Department of Defense

Artist's concept of Soviet BEAR bomber launching cruise missile. One possible effect of BMD deployments might be to lead the Soviets to emphasize bombers and cruise missiles for delivery of strategic nuclear weapons. Higher levels of strategic defense protection for the United States would require effective air defenses in addition to BMD.

ening, or less destabilizing in a crisis than ICBMs, then building BMD would have accomplished something. However, the nature of the strategic relationship would have changed. The Soviets might emphasize bombers and cruise missiles. They currently have two types of bombers in production (including the BACKFIRE, whose range is a matter of controversy), and one in flight test. They have four cruise missiles in development, including two large missiles that are probably for long-range operation.<sup>21</sup> Another possibility might be the deployment of shorter range ballistic missiles on submarines and other platforms close to the United States. Finally, less conventional weapons might be used, such as orbital bombing systems (now prohibited by the Outer Space Treaty), and very high-speed aerodynamic vehicles that are launched on ballistic missile boosters but stay within the atmosphere.

Technology may offer a variety of methods to improve the ability of ballistic missiles and their warheads to penetrate defenses. It may also offer counters to those countermeasures.

<sup>17</sup>*Soviet Military Power*, 1985, p. 38.

<sup>18</sup>U. S.-Soviet *Military Balance*, John Collins, Elizabeth Ann Severns, Congressional Research Service, 1980, Book II, p. 123.

<sup>19</sup>First agreed statement to paragraph 10, Article IV.

<sup>20</sup>The SS-19, which currently carries up to six RVs, has almost half the throwweight of the SS-18. See Collins, *op. cit.*

<sup>21</sup>*Soviet Military Power*, 1985, p. 35.

In some cases the countermeasures will win and in others they will be overwhelmed by the counter-countermeasures. However, without knowing in advance what the countermeasures and counter-countermeasures are likely to be, evaluating the effectiveness of the defense will be difficult.

While it is important to understand the range of options the Soviets would have available to them, it would probably be erroneous to assume that they could and would exploit all of them to the fullest. Soviet efforts would be limited by the resources they could allocate to strategic forces and by their rate of success in new developments. They might also be lim-

ited by arms control agreements. This range of available options, however, implies a broad range of uncertainty about future forces.

The value of BMD to the United States may also be affected by technical advances that offer ways to improve the ability of potential targets to survive a ballistic missile attack. Mobility and hardening of ICBMs and other potential targets are obvious examples, but others may emerge. While these developments will not directly affect the ability of a ballistic missile defense to destroy enemy missiles, they may reduce the payoff for doing so, and therefore affect the potential value of BMD.

## HOW BMD MIGHT AFFECT THE STRATEGIC BALANCE

Assessments of the value to the United States of acquiring BMD rest on comparing what the strategic balance might be like if BMD were built to what it would be like without BMD. In order to make this assessment, we would like to know:

1. how the balance is currently assessed and how it might evolve in the continued absence of BMD;
2. how we might use various levels of BMD if we had them; and
3. what the balance might be like if the United States and the Soviets had various levels of BMD.

These topics are the subject of this section.

### The Current Strategic Balance

U.S. strategic planning is based in part on a "worst case" massive Soviet strike on the United States. While other scenarios are certainly conceivable, this one is considered to be the most stressing to our forces. In overview the scenario is simple. The Soviets launch a large strike against a full range of militarily important targets in the United States, withholding some of their forces as a strategic reserve. The strategic reserve could have many purposes, but a primary one would be to re-

tain a threat to our cities as a deterrent to the United States retaliating against Soviet cities. A major purpose of the first strike would be to limit our ability to retaliate. Therefore, they would attack our ICBMs, bomber bases, and ballistic missile submarine bases. They would also attack the C<sup>3</sup> system in an effort to "disconnect" the surviving forces, or "decapitate" the United States. Attention has primarily focused on an attack on U.S. ICBMs, which the Soviets would attack with their own ICBMs.

Whatever U.S. forces survived could be used in a second strike against a full range of targets in the U.S.S.R. The Soviets might then use some part of their reserve forces in a follow-on strike, to which we might respond, and so on. Any attempt to construct a detailed scenario and predict its outcome would be very uncertain. No one really knows how well systems would operate in a nuclear conflict, let alone how military and civilian leaders would act. There are wide differences of opinion on basic issues like whether Soviet leaders are likely to be bold or conservative, and what it takes to deter them from attacking. (See chapter 4.)

Today, deterrence of a Soviet strike rests on the Soviets believing that there is a high prob-

ability that if they struck, thousands of U.S. nuclear weapons would reach targets in the U.S.S.R. in a retaliatory strike. Deterrence is aided by many factors that limit Soviet confidence in their ability to achieve their first strike goals, including limiting U.S. retaliatory capability.

Although analysts disagree over the credibility of this deterrent and its continued credibility into the future, everyone would agree that thousands of U.S. nuclear weapons would survive—primarily on submarines at sea, but also on bombers that are launched successfully and on those ICBMs that survive the attack. Analysts disagree on such issues as whether enough of our C<sup>3</sup> system would survive to support timely employment of those weapons, how effective SLBMs can be, how many bombers would survive the first strike and the Soviet air defenses, and whether the United States would actually retaliate knowing that the Soviets had a large reserve force.

Some argue that the degree to which the Soviets could be confident that they could destroy a large part of our ICBM force has been vastly overestimated. They point out that the Soviets do not really know how capable their weapons are or how hard our silos are, and cannot be sure that we would not launch our weapons when we detect a massive ICBM launch. As they see it, this uncertainty would contribute to deterrence. In this view, the Soviets would only launch a nuclear strike as a desperate act, not as a rational instrument of policy.

Others argue that Soviet capabilities may be even greater than official estimates state. They assess a Soviet capability to accomplish militarily useful missions and to limit damage to themselves through offensive strikes and various defensive measures. As they see it, the Soviets plan for the possibility of a nuclear war as they would plan for any war, taking account of the risks and opportunities. Once in a nuclear war, they would attempt to achieve certain objectives. In this view, the Soviets would attempt to fight and win a nuclear war, if necessary, despite the risks and uncertainties.

As chapter 4 discussed, some Soviet actions and statements are consistent with a first strike posture, while others are consistent with a retaliatory posture. Whether or not they expect to attack first, it would be imprudent for them to ignore the possibility that the United States might strike first. The Soviets are likely to be highly suspicious of developments that appear to increase their vulnerability to a U.S. first strike.

As these differences of view illustrate, assessing the outcome of a nuclear exchange (or assessing the credibility of our deterrent) is uncertain. Combining many uncertain factors leads to a wide range of possible answers. Different predispositions lead different analysts to draw very different conclusions from the same range of answers. Some point out that planners, wishing to be safe and plan conservatively, will make the least favorable assumptions. A U.S. or Soviet planner would be likely to assess the adversary as more capable than he assesses himself. Others point out that wars are often won by bold, decisive, actions.

#### Possible Future Development of the Offensive Balance

It is extremely difficult to project forces decades into the future. Whether in the absence of defense the strategic balance would become more or less favorable to the United States than it currently is depends on the results of several competing developments. Therefore, not unexpectedly, some analysts foresee the U.S. position improving while others think it will worsen. Soviet ICBMs may become more accurate, reliable, responsive, and numerous. On the other hand, their targets may become more difficult to destroy. Mobility, proliferation, and hardening can all be applied to making U.S. ICBMs and C<sup>3</sup> components more survivable. Improvements in SLBMs may give them capabilities similar to those of ICBMs. Soviet air defenses may improve, but U.S. bombers and cruise missiles are becoming more capable. Submarines may become harder or easier to find and destroy. On the other

hand, some kinds of targets in the U.S.S.R. may become more difficult to find and destroy, reducing the value of U.S. retaliatory forces.

### What Might We Want BMD to Defend?

We could build BMD to defend either military assets—such as ICBMs and other weapons and our strategic C<sup>3</sup> system—or our cities (or both). We might defend our military assets in an effort to improve our ability to absorb a first strike and retaliate, or to reduce Soviet confidence that their first strike could destroy their chosen target set. We might defend our cities to shift the basis of our security away from the threat of retaliation.

The capability to protect our cities would mean a major shift in our strategy away from retaliation and toward assured survival. However, we could not abandon retaliation until defenses gave us confidence that they could assure a high degree of protection. Protecting cities requires an extremely capable defense. Opinion differs as to how many nuclear explosions in populated areas in time of war would lead to unacceptable or intolerable damage. However, that number would be at most tens of weapons out of an attack measured in thousands. A defense that let through no more than 1 percent of the attack—and perhaps far less than that—would be required before the basis of our strategy could shift away from retaliation.

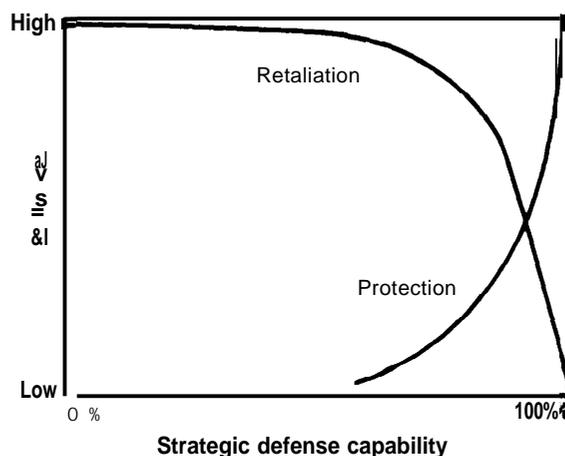
Protecting military assets puts less stringent requirements on defense than protecting cities does, since, for example, losing a few ICBMs would mean much less than losing a few cities. If we could protect enough of our retaliatory forces that it would no longer be worthwhile for the Soviets to attack them, we might change the strategic balance in a major way. Our security might depend somewhat less on the threat of retaliation, since there would be less reason for the Soviets to attack in the first place, but we would still need a retaliatory capability. Protecting our military forces to this degree would still require very capable defenses, but not as capable as those required to protect cities. At lesser levels of

defense, our security would still rely heavily on the threat of retaliation. (If offenses could be reduced by negotiation to extremely low levels, much less capable defenses would be required to produce the same results. See chapter 6.)

The implications of various levels of defense for the dependence of our security on retaliation and protection are shown schematically in figure 5-1. We could completely abandon our reliance on threatening retaliation only if our defense were nearly “perfect.” To do so at lower levels of defense would risk giving the Soviets an important advantage: they could threaten considerable damage to the United States with no risk of nuclear retaliation. Even a few nuclear weapons penetrating our defense could devastate several cities. At what point reliance on retaliation and reliance on protection would be equal is, of course, debatable, but it would have to be at a very high level of defense. A defense that allowed even a few percent of a large Soviet attack to reach our cities would provide little security directly through protection, although it might contribute to deterring the attack.

Some observers argue that the Soviets would be deterred from attacking U.S. cities if it were to cost them about 100 weapons for each

Figure 5-1.—Notional Reliance of U.S. Security on Protection and Threat of Retaliation



SOURCE Office of Technology Assessment

weapon that reached its target. If the United States were to abandon the threat of retaliation under these circumstances it would have to decide that this high cost would be sufficient to deter attack under all circumstances—that the Soviets would not attack even if we could not retaliate against them. To others, it seems likely that we would still have to rely heavily on the threat of retaliation for deterrence even if defenses were highly capable. Similarly, a defense that could preclude a meaningful attack on our military forces might aid deterrence by removing a major incentive for the Soviets to strike in time of crisis, but deterrence of an attack on our cities for whatever reasons would have to rely primarily on a threat of retaliation. Some argue that if the Soviets could not achieve some military objective—e. g., limiting damage to themselves—they would be much less likely to start a nuclear war.

Less capable defenses, although they could not prevent the Soviets from destroying large portions of our retaliatory forces, might still have a role by protecting some of those forces. Defending the forces could directly increase the number surviving the attack. Defending cities might indirectly increase the number of forces surviving the attack, since in order to maintain some minimum threat to our defended cities, the Soviets would have to reserve more weapons for that role leaving fewer available to attack our forces. The more weapons surviving the attack, the more we have available to retaliate with. However, if the Soviets also have defenses, their defenses will reduce the number of U.S. weapons that survive and penetrate to their targets. Thus, whether or not BMD enhances the U.S. retaliatory force will depend on the capabilities of both U.S. and Soviet defenses. Clearly, all other factors being equal, for a *given level* of Soviet defense we have a greater retaliatory capability if we defend our forces than if we do not, but it is not necessarily true that our retaliatory capability is greater if both have defenses than if neither does.

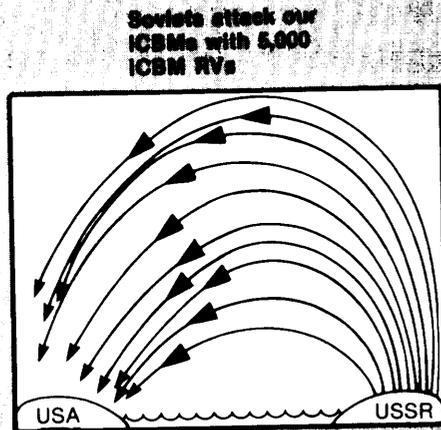
This can be illustrated as follows. Consider a Soviet first strike that includes an attack on our ICBMs. For a given U.S. defense capability used to defend ICBMs, the greatest number of U.S. ICBM RVs would survive a Soviet attack if the defense could operate completely preferentially. With completely preferential defenses the United States would be able to allocate the defense in response to the actual attack. Therefore we would be free to arrange our defense to achieve the greatest number of surviving RVs.<sup>22</sup> Furthermore, if our defense were completely preferential, the Soviets' best tactic would be to attack all the silos with the same number of RVs.<sup>23</sup> In this case, the number of RVs the defense could save from destruction would be the number of RVs residing in the silos the defense has the capacity to protect. The fraction of the silos that could be protected would be simply the fraction of the Soviet RVs aimed at the silos that the defense could destroy. If, for example, the defense could destroy 25 percent of the attacking RVs, it would preferentially destroy all the RVs aimed at 25 percent of the silos and save 25 percent of the silos. The number of U.S. RVs available to retaliate with would be the number of ICBM RVs the defense saved plus the number of SLBM RVs at sea. The number of U.S. RVs that survived the attack and penetrated to targets in the U.S.S.R. would be the number that survived minus the number the Soviet defense had killed.

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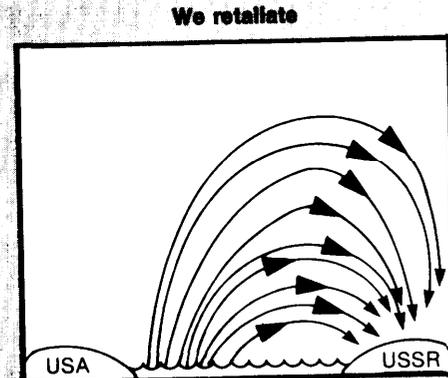
<sup>22</sup>“If they were to attack some silos more heavily than others, we could defend the more lightly attacked silos and save a greater number from destruction. For example, if they attacked 1,000 silos with 4,000 RVs, 4 per silo, and we could defend preferentially against 1,000 RVs, we could save 250 silos from destruction. We would destroy the 1,000 RVs aimed at those silos. If they attacked 500 silos with 2 RVs each and 500 silos with 6 RVs each, we could destroy the 1,000 RVs aimed at the first 500 silos, and save all of them. As long as the defense was completely preferential we could always defend the most lightly attacked silos first. Therefore, their best tactic would be to attack them all uniformly.”

**Illustration of the Effect of Defending ICBM Launchers on Retaliator Capacity**  
**Illustration of the Effect of Adding BMD**

**Without BMD**

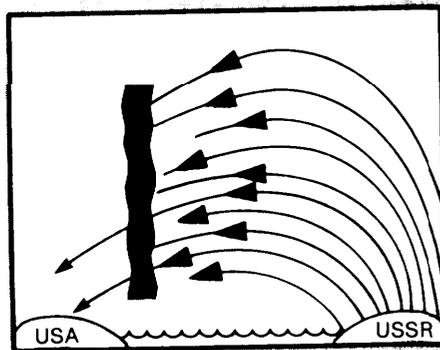


**IF** Soviets destroy almost all 2,800 ICBM RVs

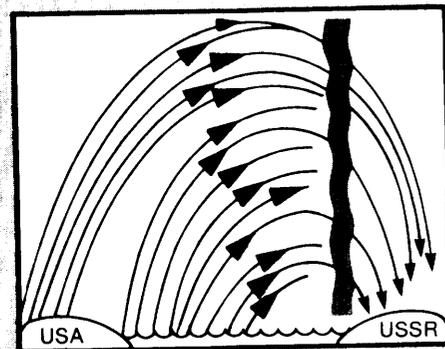


**THEN** 4,500 SLBM RVs reach targets in USSR

**With BMD**  
 -Each side's BMD can kill 4,000 RVs



**IF** 2,240 ICBM RVs survive



**THEN** 6,740 RVs launched at USSR; 2,740 reach targets

Note: Each symbol represents 500 RVs  
 SOURCE: Office of Technology Assessment

Therefore, the number of U.S. RVs that could survive and penetrate is given by the expression:

$$\frac{(\text{U.S. ICBM RVs}) \times (\text{Soviet countersilo RVs intercept})}{\text{Soviet RVs that attack U.S. ICBM silos}} + \frac{(\text{U.S. RVs destroyed by Soviet defense})}{\text{U.S. SLBM RVs at sea}}$$

The expression is independent of how the Soviet defense is operated. If the U.S. defense were not completely preferential, fewer RVs would survive and penetrate.

A specific example can illuminate the meaning of this expression. If the Soviets attacked our 1,000 undefended ICBM silos with 5,000 SS-18 and SS-19 ICBM RVs, they would probably destroy almost all of them. We could retaliate with our surviving SLBM RVs, perhaps 4,500. In the absence of Soviet BMD, almost all of these would reach their targets. If both sides had BMD capable of destroying 1,250 RVs, our preferential defense could pro-

tect 250 silos from destruction. Assuming we had a total of 2,800 ICBM RVs, 700 ICBM RVs would survive in addition to the 4,500 SLBM RVs.<sup>24</sup> However, of the 5,200 RVs surviving, the Soviet defense would destroy 1,250, and only 3,950 would reach their targets. Thus in this case, equal defenses on both sides would increase the number of U.S. RVs surviving the attack, but reduce the number that survive and penetrate to their targets. This is indicative of a general trend.

As long as the number of RVs the Soviets attack our silos with exceeds the number of U.S. ICBM RVs—which is quite possible with today's forces—adding defense to both sides in equal increments will decrease the number of U.S. RVs that survive and penetrate the Soviet defense.<sup>25</sup> As the expression shows, under these circumstances the number of surviving RVs added by the U.S. defense (the top line of the expression) will be less than the number of Soviet RVs the U.S. defense can destroy, and therefore less than the number of RVs lost to an equal Soviet defense. Thus, while defending U.S. ICBMs and other assets may aid deterrence, for example by increasing the uncertainties the Soviets face in planning an attack, it may well decrease our available retaliatory force if the Soviets also have defense.

Figure 5-2 shows the number of surviving and penetrating U.S. RVs for three cases: U.S. and Soviet defenses equal; U.S. defense double the Soviet defense; and Soviet defense dou-

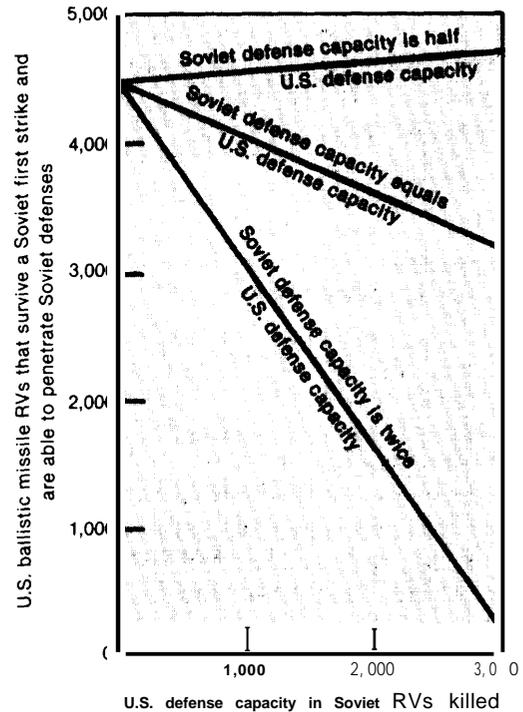
<sup>24</sup>We could have 2,800 RVs by replacing 100 Minuteman III missiles with 100 MX. The force would be:

Missile Type	Number	RV/missile	Total RVs
MX	100	10	1,000
Minuteman III	450	3	1,350
Minuteman II	450	1	450
Total	1,000		2,800

It is likely that under these circumstances the United States would defend MX silos first, defend MM III only after all MX had been defended, and defend MMII only after all MX and MMIII had been defended. This would produce considerably more than 700 RVS surviving if the Soviets attacked all silos uniformly. However, it is also likely that the Soviets would anticipate that the United States would allocate its defenses in this manner and would allocate its attack accordingly.

<sup>25</sup>The OTA staff is indebted to Glenn Kent of RAND for calling this to our attention.

Figure 5-2.—How Ballistic Missile Defense Affects U.S. Ballistic Missile Retaliatory Capability



Assumptions:

- 5,000 Soviet RVs shoot at U.S. ICBMs carrying 2,800 RVs
- U.S. has 4,500 SLBM RVs at sea
- U.S. defends completely preferentially
- Not shown: U.S. bomber forces—survivability will be affected by U.S. BMD and Soviet air defense

<sup>1</sup>Modernizing U.S. Strategic Offensive Forces, Congressional Budget Office, May 1983.

ble the U.S. defense. The figure assumes the replacement of 100 Minuteman IIIs with MX, for a total of 2,800 U.S. ICBM RVs. The Soviets attack with current SS-18 and SS-19 missiles, about 5,000 RVs. If the Soviet defense equals the U.S. defense in number of RVs it can destroy, larger defenses mean fewer U.S. RVs penetrating to their targets. This problem might be redressed by a defense asymmetry favoring the United States. However, in this case it would require a U.S. advantage of approximately two to one. Similarly, a major Soviet advantage in defense could result in large reductions in U.S. ballistic missile retaliatory capability. Unless the U.S. defenses could be operated completely preferentially, the number of surviving and penetrat-

ing U.S. RVs would be less than the number shown in the figure.<sup>26</sup>

Any reduction in U.S. ballistic missile retaliatory capability would have to be evaluated within the context of the total U.S. retaliatory force, including air-breathing weapons, and what it could accomplish. Opinions vary widely about the significance of various size reductions in numbers of retaliatory RVs for the U.S. deterrent and the ability to respond to a first strike.

Whether one believes that having defenses on both sides—when the result would be a reduction in the number of surviving and penetrating U.S. RVs—would aid deterrence, detract from deterrence, or have little or no effect on deterrence will depend on certain underlying attitudes and assumptions, as discussed below (see pp. 111-112). For example, some believe that the assets that the U.S. defense might protect—including but not limited to ICBM RVs—would be much more valuable than the RVs lost to Soviet defenses. Others believe that only a few surviving and penetrating RVs are sufficient to deter and that additional retaliatory forces beyond that small number add little to our deterrent. Neither of these groups would be likely to view the reduction in U.S. retaliatory capability as being significant for deterrence.

### Levels of Strategic Defense Capability

This chapter specifies strategic defense in terms of its “net defense capability.” Net defense capability is what the defense can do, taking into account all its characteristics as well as those of the other side’s offense. It will depend on a number of factors, including the opponent offense, the components of the defense, and the basic mode of operation of the defense. In many cases, the same net defense

<sup>26</sup>Under these same conditions—Soviet ICBM RVs outnumber U.S. ICBM RVs—adding equal defenses on both sides would increase the number of Soviet ICBM RVs that would survive a U.S. first strike and penetrate U.S. defenses. Put another way, it would decrease the ability of the United States to limit damage to itself by a first strike. OTA is not suggesting that the United States has a first strike posture, or that we should develop one.

capability can be arrived at in several ways. Since we are dealing with a time in the indefinite future for which we can predict neither offenses nor defenses with any certainty, we do not specify the architecture of the defenses or address the feasibility of obtaining them.

Ballistic missile defense alone could not provide a complete strategic defense of either the United States or our NATO Allies. Weapons other than ballistic missiles are part of the threat. Furthermore, passive defense techniques—e.g., civil defense—are potentially available either to augment active defenses (i.e., BMD and air defense) or to provide alternative means to the same defensive goals. This section is a general discussion of strategic defense. However, this report, like the current national debate, focuses primarily on BMD and on defense of the United States against ICBMs and SLBMs.

Drawing on the considerations discussed in the preceding section, we can identify five levels of protection against nuclear weapons to aid in understanding the implications of U.S. and Soviet defenses. These are listed in table 5-1. These are not absolute levels of defense, but rather net defense capability. The defensive system that the United States requires to achieve level 1, for example, maybe larger or more capable than the defensive system the Soviets would need to achieve the same level. Given the imbalance in ICBMs, this would certainly be true today. Furthermore, the defense required to achieve a given level can change as the offenses change. The defense that the United States requires to achieve level 1 in 1995 may be very different from the defense required to achieve level 1 in 2015. Negotiated reductions of offensive forces could raise the defense level without changes in the defense systems. Increases or qualitative improvements in the offense could lower the defense level.

In the *offense-dominated region*, the strategic relationship would remain basically as it is today. Although by adding defense we might make it more difficult for the Soviets to attack our military assets, the addition of defense

Table 5-1.—Levels of Defense Capability

Region	Level	Description
Offense-dominated	0 no defense	
	1 "some ICBMS"*	A defense capable of ensuring the survival of a useful fraction of the ICBMs, but not capable of protecting cities
Transition	2 "either/or"	A defense (including BMD) that can ensure the survival of most ICBMs or a high degree of urban survival against a follow-on (or simultaneous) attack, but not both
Defense-dominated	3 "most ICBMs/some cities"	A defense that ensures a high level of survival of military targets. Massive damage can only be obtained by concentrating the entire offense against cities
	4 "extremely capable"	Ensures a high level of urban survival against a full attack. The attacker cannot have high confidence that any cities can be destroyed

● Terms in quotes are a shorthand used to identify the levels

**NOTE** For simplicity the chapter often divides targets into ICBMs and cities. There are, of course, many other types of targets that might be attacked, but discussing them all in each case would greatly expand the text. ICBMs are representative of strategic military targets (although by no means an accurate model of them all). "Cities" is typically used as a short hand for people, economic assets, and social structure. A level 1 defense, for example, might be used to defend the C<sup>3</sup> system rather than the ICBMs.

could preclude neither a militarily useful strike nor the destruction of our cities. Similarly, the Soviets would still know that we could absorb a first strike and be able to devastate them. Thus in this region, the offenses (including retaliatory capability) dominate the strategic balance. In an offense-dominated situation, the value of strategic defenses to the United States would have to be judged on the basis of how well they supported our ability to absorb a first strike and retaliate (or supported Soviet perceptions that they could not prevent us from doing so), weighing the effects of our defenses against the effects of any Soviet defenses. In deciding whether defenses are worthwhile in an offense-dominated posture—other than as a part of the transition to higher levels of defense—it would be necessary to weigh whatever they might contribute to our retaliatory capability against the cost of building the defense. It would also be important to compare the effort to build such a defense with alternative ways to achieve survivability of our deterrent.

In the *defense-dominated region*, defenses would severely limit the ability to use offenses.

At level 3, the probability that the attacker could cause any useful level of damage to military targets would be so small that he would be limited to attacking cities. He could not hope to use his offensive forces to reduce the other's ability to retaliate. For a level 3 defense, air defense would certainly be needed in addition to BMD. At level 4, the defender would approach a condition of assured survival, but widespread civil defense would almost certainly have to play a prominent role along with BMD and air defenses.

If one side had level 3 or level 4 defenses and the other had no defense or very little defense, the side with the heavy defense could have a very significant advantage. It could attack the other and do a very good job of defending against any retaliatory attack. The level 3 defense, which could not preclude major urban damage from a full-scale strike, might be able to defend almost completely against a retaliatory strike by a force that had been significantly reduced by a preemptive strike. From the perspective of the weaker side this could be a very dangerous situation: its ability to deter an attack by the other could be seriously

in doubt. The stronger side might have the forces to adopt a prevailing strategy. However, some observers believe that the probability of completely defending against the retaliatory strike would have to be very high before the stronger side could be said to have an exploitable advantage.<sup>27</sup>

Because of all the uncertainties in predicting the outcome of a nuclear attack, it would be difficult for the defender to know with great confidence that he had indeed achieved a level 4 defense. A small number of weapons leaking through the defense would spell the difference between assured survival and widespread destruction. Two different sublevels—4A and 4B—can be identified. At level 4A the attacker has only low confidence that his strike against the defender's cities will cause unacceptable destruction. He would arrive at this assessment by making "offense-conservative" assumptions, giving the defense the benefit of the doubt. At this level, the low prospect of success would contribute to deterrence, but the defender—making "defense conservative" assumptions—would probably want to maintain his retaliatory threat. If he did not, the attacker would have little to lose by attacking despite his low expectation of success. At level 4B, the defender would be confident that his criteria for "assured survival" were met. He could then abandon his retaliatory threat. That level of confidence could probably only be achieved with a defense system believed effective even under the most conservative assumptions about enemy offenses.

The transition *region* encompasses those situations in which neither the offenses nor the defenses clearly dominate. The attacker would be much less confident of accomplishing most of his attack goals than he would be when offenses dominate, and the defender would be much less confident in his ability to deny the attacker major attack goals than he would be when defenses dominate.

<sup>27</sup>Some strongly disagree with the assessment that this situation would provide the attacker with an exploitable advantage. They argue that unless the defense were perfect, the attacker could not be sure that no nuclear weapons would reach his territory. The possibility that he might suffer some retaliation would still be a powerful deterrent,

A level 2 defense might operate semi-preferentially. The defender could choose to use this defense to defend his military assets or his cities, and the attacker would not know its allocation in advance. Other types of defenses, such as short-range fixed terminal defenses, lack this flexibility and could not be used to produce a level 2 defense. Building these other types of defenses might avoid the problems of the transition region. However, building a dominant defense would be more difficult with a defense that could not react flexibly to an attack.

With a level 2 defense the defender may be able to protect a great number of his assets, but he cannot come close to protecting them all from a full strike. In particular, he might save most of his ICBMs from destruction, but he could not protect his cities at the same time. Alternatively, he might sacrifice his ICBMs while gaining a high degree of urban survival, providing the attack on his cities was sufficiently limited. (The attacker might limit his attack on cities in order to increase his chances of destroying military targets he thought to be defended.) The defender might, however, do a good job of protecting against a strike conducted with much less than the full offensive force, such as a retaliatory strike with a force that had been seriously reduced by a first strike. *Perhaps the most important characteristic of the transition region is that if one side has a level 2 defense—and especially if both do—there is a wide range of possible outcomes of a nuclear exchange. Furthermore, the outcome would be especially difficult to predict in advance because it would depend on how each side chose to allocate its weapons, and each would allocate its weapons based at least in part on how it thought the other would allocate.* 28

<sup>28</sup>The outcome would depend on: the mode of operation of the defense; whether the defense were limited in capacity or engagement rate; whether the attacker elected to attack all at once, or to attack only military targets in a first strike and keep reserve forces to threaten cities with a follow-on strike; how much defense the defender allocated to cities and how much he allocated to military assets; how the defense was distributed among military targets; how good the attacker's and defender's intelligence estimates were regarding each other's capabilities and plans; how the attacker distributed his attack among and within target sets; etc.

Achieving a level 2 defense would probably require defenses against air-breathing weapons as well as BMD. We would not be able to defend our cities against a follow-on attack if we could not defend against bomber forces.

If we had a level 2 defense and we knew how the Soviets planned to attack, we might deny them success in destroying some target sets, but they would be successful against others. Even if we didn't know their plans, we might guess correctly enough to accomplish this. If they knew our defense plans, they could guarantee success against some target sets, but others would survive. If neither knew what the other intended to do, it would be very difficult to predict the result, except in the situation in which the Soviets concentrated their attack very heavily against a limited number of targets in order to ensure that they killed those targets while conceding the survival of the rest.

This situation could introduce great uncertainty into Soviet attack planning, and that uncertainty ought to enhance deterrence. If the Soviets kept a large reserve in order to be able to threaten our cities, they would have to reduce their attack on our forces. However, if we used our defenses to protect our forces, their counterforce strike might accomplish nothing. On the other hand, if they attacked our forces very heavily but we reserved our defenses to defend our cities, they might find themselves without a credible threat to our cities.

If the Soviets had a level 2 defense, it might appear to us to be part of a first strike posture, because if they could significantly reduce our forces by a first strike, they might be able to achieve high, or even total, success in defending against our "ragged" retaliation. Clearly, we would be alarmed by this prospect.<sup>29</sup> (Indeed, we would be alarmed by indications that the Soviets *thought* they had such a capability, even if we thought that in reality they did not.) Similarly, if the United States had a level 2 defense, the Soviets might suspect the United

<sup>29</sup> Some believe that the Soviets could not be highly confident in their ability to do this, and would be effectively deterred.

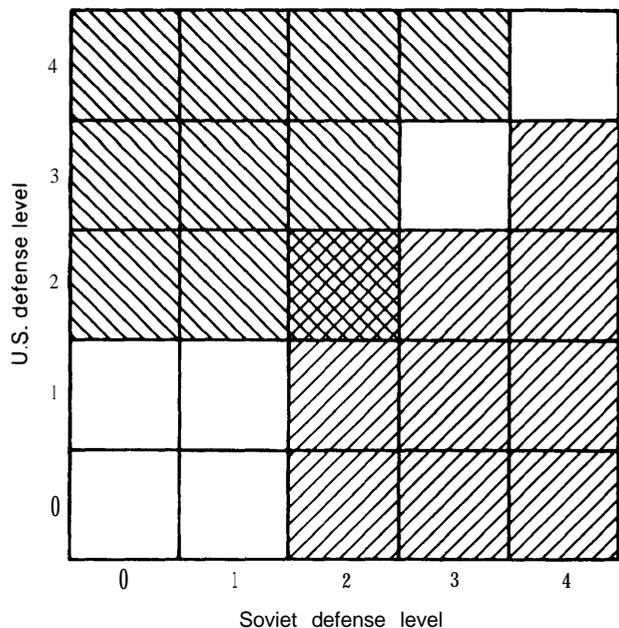
States of seeking a first strike posture. Whether or not we intended ever to strike first, this situation would be a very uncomfortable one for the Soviets.

If we and the Soviets both had level 2 defenses, our defenses might reduce the confidence of the Soviets that they could in fact successfully strike first, but we could not necessarily preclude it. Because of the uncertainties each side faced in planning its offense and defense, the broad range of possible outcomes might well include a successful Soviet first strike.

### The Effect of U.S. and Soviet Defense Levels on the Strategic Balance

Figure 5-3 illustrates schematically how different levels of U.S. and Soviet defense capability might affect the strategic balance.

Figure 5-3.—How Strategic Defense Might Affect the Strategic Balance



Possible U.S. exploitable advantage   
 Possible Soviet exploitable advantage 

SOURCE: Office of Technology Assessment.

If one side had a level 4 capability and the other had a lesser defense, the side with level 4 might have a clear advantage. It could cause heavy damage to the other, which in turn could do very little in retaliation. The greater the disparity, the more the options the stronger side would have. If one side had a level 3 defense and the other had level 1 or less, the stronger side might have a strong capability to attack the other and defend successfully against the retaliatory attack. The level 3 defense, which would let enough of a full-scale counter-city attack through to cause significant damage, might be much more capable against a retaliatory strike that had been reduced by a counterforce strike. Opinions differ as to whether this would constitute an exploitable advantage. If the other had a level 2 defense, the stronger might be able to do this, but not necessarily. As discussed in the preceding section, if one side had a level 2 defense, and the other had either level 2 or less, it may be able to attack successfully. However, it would be much less sure of its ability to do so than it would be if it had a level 3 defense.

We would, of course, wish to avoid situations in which the Soviets had (or thought they had) an exploitable advantage. Both situations of approximate parity and those in which the United States would have an advantage could be acceptable, except to those who believe that the United States should strive to achieve a clear advantage over the Soviets. However, if the transition to a mutually defended world is to be a managed, cooperative one, it is unlikely that the Soviets would agree to let situations of clear U.S. advantage emerge. If the evolution were not cooperative, we should expect that the Soviets would do everything in their power to prevent a U.S. advantage. Therefore, the regions of primary interest lie along the diagonal of the square in figure 5-3, where the two sides have equal defense capability. However, as discussed earlier, situations of equal levels of defense capability on the two sides are not necessarily situations of equal defense systems. If equivalent defense systems were added to today's offensive forces, it would result in unequal levels of defense capability.

### Offense-Dominated

The differences among the four offense-dominated situations shown in figure 5-3 (the United States having level 0 or 1 and the Soviets having level 0 or 1) are a matter of some controversy. The root of that controversy is found in differing assessments of the current situation and its evolution in the absence of BMD deployments.

Some believe that the current situation is acceptable, and likely to remain so—or improve—in the foreseeable future. Others think that the current situation is acceptable, but that the trends are adverse. In this view, sooner or later the strategic balance could become dangerously disadvantageous to the United States. Still others believe that the trends are disadvantageous and the balance has already tilted against us. These groups will differ in their assessments of the four offense-dominated situations.<sup>30</sup>

Those who believe that the current strategic balance is acceptable and likely to remain so believe that the Soviets know it is highly likely that were they to attack, thousands of U.S. nuclear weapons would survive and would be launched back at them. In this view the damage that those thousands of weapons could do would be so overwhelming that hundreds or even a few thousand more or less would make little difference. This damage would far outweigh anything the Soviets might hope to gain by attacking. Those holding this position see nothing in the future that would erode this situation, and some developments that reinforce it.

Those who see the current situation as eroding, point to Soviet developments that increase their ability to destroy our forces and our ability to use them, as well as active and passive defensive measures that decrease the effectiveness of our weapons against important targets. Some state that the Soviet leadership has a different value system than the United

<sup>30</sup>Yet another group finds the entire situation in which our security rests on a threat of retaliation to be unacceptable, and therefore may care little about changes that affect our ability to retaliate.

States does and therefore would not be as strongly deterred by certain threats as would the United States. Some fear that the Soviets would expect a U.S. President, faced with a threat to more than half the U.S. population from a Soviet follow-on strike, to be deterred from responding to a first strike.

From this perspective, a Soviet first strike might destroy most of our ICBMs, bombers and tanker aircraft, and all submarines in port. Soviet anti-submarine warfare before and after the strike might destroy some of the submarines at sea. The strike might also destroy most of our leadership and its strategic communication system, making a coordinated response impossible. Most important would be this decapitation and the loss of the ICBMs which are uniquely prompt and capable of killing hardened targets. In this view, Soviet defensive measures—including civil defense and similar passive defenses—would effectively protect their leadership and its communication system, as well as reduce civilian casualties and protect important war-related industrial capacity. These defenses would raise the price of attacking important targets to such a high level that our remaining forces would be incapable of covering the intended target set. Some who hold this position see current Soviet offensive and defensive developments as exacerbating the situation to an alarming extent.

If this is the case, a level 1 defense could perform a valuable function for the United States even if the strategic balance remained strongly offense-dominated. If used to defend our command, control, and communication system (C<sup>3</sup>) it might reduce or eliminate the Soviet ability to decapitate the United States. It could contribute to the survival of ICBMs and bombers. Denying the Soviets high confidence that they could decapitate the United States and eliminate the ICBMs would more than compensate for the decrease in the ability of U.S. weapons to reach their targets due to similar Soviet defenses. (However, if the Soviets had “level 1” defenses and we did not, it would make a bad situation that much worse). Some of those holding this point of view argue that

a combination of limited active defense and strong passive measures (such as mobile ICBM basing) could make it more or less impossible for the Soviets to achieve any militarily significant goal with a first strike. In effect, a level 3 defense might result from strong passive measures and the synergism between active and passive defenses. They see this as strongly enhancing deterrence by eliminating a major incentive for the Soviets to strike.

Those who believe the current balance is acceptable concede that a Soviet first strike would reduce the number of weapons the United States could retaliate with. But they think that the Soviets could only have very low confidence in their ability to decapitate the United States. In this view, neither United States nor Soviet defenses would make much difference as long as the balance remained offense-dominated. Some also point out that unless the structure of U.S. and Soviet offensive forces changes in a major way, deploying similar defenses on both sides is likely to result only in a decrease in U.S. retaliatory capability, which they see as reducing deterrence.

Whether or not those holding these two points of view would agree that building level 1 defenses would be worthwhile as a step to more capable defense, they disagree fundamentally over the value of having a level 1 defense. Those who see the current strategic balance as unsatisfactory or as eroding in dangerous ways see level 1 defenses as enhancing deterrence. Those who see the current strategic balance as satisfactory fear that level 1 defenses on both sides could harm our deterrent posture.

If one believes that having a level 1 defense would be useful, two other important questions need to be addressed. First, how much would the level 1 defense be worth? Second, are there less costly—or otherwise more attractive—ways to achieve the same benefit? For example, would passive measures suffice?

#### Defense-Dominated

If both sides had level 3 defenses, each would have an assured retaliatory capability.

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The strategic relationship would be one often referred to as "mutual assured destruction. Each side would have the ability to inflict widespread damage on the other, but could not prohibit the other from doing so in return. Nuclear weapons would pose the ultimate threat against populations and societies, but would have little or no use as a military tool. If both had level 4 defenses, the strategic balance would approach one of "mutual assured survival.

Whether a condition of mutual assured destruction is desirable, and whether that condition would differ from the present situation (or the future in the absence of strategic defense) are both issues of contention. A related issue is whether or not passive measures that increase the survivability of important assets could bring this situation about without investing heavily in BMD and air defense. As discussed above, most observers believe that the United States now has the ability to assure destruction of the U.S.S.R. in retaliation for a strike on the United States, and many believe it is likely to retain that capability into the future. Others believe the opposite.

Few would argue that assured survival is not preferable to assured destruction. The issue is whether assured survival is attainable by the technological approaches being pursued under SDI. The basic question the SD I program is supposed to answer is: how capable a strategic defense can we produce and what would it cost to get that defense? Answers to these questions do not as yet exist, and probably will not for a number of years. Later chapters discuss the types of BMD system capabilities that might be used to support assured survival.

It is difficult to define specifically what assured survival is. Some would argue that survival is assured only if the probability that one or more weapons will reach the United States is very low ( or, alternatively, that there is high confidence that no weapons can be expected to penetrate the defense). Others argue that survival is assured if society survives and the economy recovers in some number of years.

In this case, the United States might survive despite the detonation of tens of weapons. (Appendix D illustrates how urban destruction might be related to the effectiveness of strategic defense.)

If our defenses could keep the probability very low that even one nuclear weapon would reach the United States, our security would be largely independent of the level of Soviet defense. If we could expect tens of weapons to reach the United States, the level of damage we could inflict on the U.S.S.R. would be relevant. If we could "survive" that level of destruction, but the U.S.S.R. could go undamaged, they might have a significant political advantage.

Assured survival would probably be impossible to achieve if the Soviets were determined to deny it to us. By improving or adding to their offense, they could increase the number of weapons penetrating to the United States, forcing us to increase our defense, and so on. Another basic problem would be the difficulty of knowing with high confidence how well our defense would actually perform against their offense, since it could never be tested and we could never know in great detail the working of their offensive weapons. Many who advocate assured survival envisage it being achieved by agreements that limit offensive levels far below defensive capabilities.

#### The Problem of Transition

Both the offense-dominated region and the defense-dominated region are regions of crisis stability. Neither side would have the ability to damage the other with a first strike and defend completely against the retaliatory strike. Therefore, neither has an incentive either to try it or to take action to prevent the other from doing so.<sup>31</sup> However, in order to reach the defense-dominated region, the strategic balance is likely to pass through the transition

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<sup>31</sup>Some maintain that in the absence of U.S. defenses the Soviets might be able to strike the United States in such a way that the United States would be either unable or unwilling to respond, despite the fact that the Soviets could not prevent a large number of weapons from penetrating if we did retaliate.

region in which each side *may* have the capability to strike the other and defend completely (or nearly so) against the retaliatory strike. In this region there would be great uncertainty in predicting the outcome of a nuclear exchange, because it would depend strongly on how each side allocated its offense and defense. Each could be very mistaken in its assessment of how the other would make its allocations; therefore each could have a very different assessment of the outcome of an exchange.

While we would not necessarily fare worse in a nuclear exchange under these circumstances than if there were no defenses—indeed we might fare considerably better—we might fare worse. The Soviets might be able to strike first and defend completely against our retaliatory strike. In one view, the expanded uncertainty in the minds of the Soviets regarding the outcome of a nuclear exchange would aid deterrence. In another view, the possibility that the Soviets could strike first and suffer no damage, a possibility that does not exist if the offenses dominate, would undermine deterrence.<sup>32</sup> The knowledge by each side that the other might be able to strike and suffer no retaliation has important implications for stability.

The problem of passing through this transition region has been described as follows:

A third potential source of instability could arise during that phase of a transition when strategic defenses would be capable of effective area defense against an offensive threat that had been degraded by a previous first strike. Assuming that a comprehensive defense cannot spring forth fully formed, like Athena from the head of Zeus, both superpowers are likely to pass through such a transitional phase unless precautions are taken well in advance. The possibility that they might pass through such a phase (roughly) simultaneously makes this situation potentially even more dangerous. The premium for striking first, and the penalty for waiting,

could be powerfully destabilizing factors—particularly during an acute crisis.<sup>33</sup>

Precautions to avoid instability might include measures other than active defense that could reduce the ability of both sides to launch a first strike and defend successfully against the retaliation. Passive defense to reduce the effectiveness of a first strike might be one such measure. A shift in both sides' arsenals to much greater emphasis on air-breathing weapons might be another. Because of their slow speed, bombers and cruise missiles pose less of a massive first strike threat than ballistic missiles do, provided they can be detected when they are still far from their targets. Longer warning time provides more time to get bombers safely aloft and to launch a retaliatory strike.

Some implications of this transition problem are explored more fully in chapter 6.

### **The Effect of U.S. and Soviet Defenses on U.S. Strategy Choices**

In chapter 4 we discussed at some length both our present countervailing strategy, and three suggested alternatives—a “retaliation-only” strategy, a “prevailing” strategy, and a strategy based on defense dominance. If the defense were to dominate, two strategies would be possible. If our defense were extremely capable, we may be able to adopt an “assured survival” strategy. Otherwise, defense dominance could enforce a “retaliation-only” strategy by limiting any strike to urban targets only. This section discusses which strategies are available to us for the various combinations of U.S. and Soviet defense capability that are shown in figure 5-3.

A retaliation strategy would require that some number of U.S. weapons survive a Soviet first strike and penetrate to their targets. It is beyond the scope of this report to calculate the number required, and indeed advocates of this strategy differ on the retaliator,

<sup>32</sup>Some believe that while the United States currently has the weapons to retaliate for a first strike, the Soviets may believe that the United States lacks the will to retaliate.

<sup>33</sup>Keith B. Payne, “Strategic Defenses and Stability,” *Orbis*, summer 1984, p. 217.

capability required to make the threat of retaliation credible. If we can absorb the first strike and inflict great damage on the Soviets, we can have a retaliation strategy.

Countervailing would require more capability than retaliation only. In order to counter-vail, we must be able to execute a strike that will deny the Soviets their goals, or inflict damage beyond the value of whatever the Soviets might hope to gain. Countervailing would require more surviving and penetrating RVs than retaliating would, and it would probably require more specific capabilities to deliver those RVs against military targets. In the absence of Soviet defenses, neither countervailing nor retaliation would require U.S. strategic defense. However, U.S. defense might contribute to the extent that it helped assure that a sufficient number of weapons could survive. On the other hand, neither of these strategies would be viable if Soviet defenses could prevent the required number of RVs from surviving and penetrating to their targets.

In order to prevail, we would have to be able to defeat the Soviets while keeping our losses at a "tolerable" level. prevailing would require even greater capability in the force that survives and penetrates than countervailing would. Perhaps more significantly, it would also require a substantial defense of the United States in order to keep our losses "tolerable." The conditions for adopting a prevailing strategy are probably the most stringent, since it would require both that we achieve a high level of protection against Soviet attack and that we have substantial capability to penetrate Soviet defense. Conditions that would support a prevailing strategy would also support a countervailing or retaliation-only strategy. Conditions that would support a countervailing strategy would also support a retaliation-only strategy.

An assured survival strategy would require an even higher level of U.S. defense capability than prevailing would. An assured survival strategy would not require a retaliatory capability, so it could tolerate Soviet defenses that kept the number of penetrating U.S. RVs very low.

Each of these strategies would generate requirements for the capabilities of U.S. offensive forces and (in the case of prevailing and assured survival) for limits on the amount of damage the Soviets could inflict on the United States. These, in turn, would be determined at least in part by U.S. and Soviet defense capabilities. Thus, which strategies the United States could adopt are dictated by the defense levels on both sides. For example, a Soviet defense that prevented attack of military targets (i.e., level 3 or 4) would generally limit the United States to a retaliation-only strategy. Similarly, with a level 1 defense we could not limit the damage to ourselves to a "tolerable" level, and therefore could not have a prevailing strategy. Figure 5-4 shows which strategy choices would be permitted by various combinations of U.S. and Soviet defenses. Appendix E explains how this figure was generated.

From this figure, we can make the following observations:

**Figure 5-4.—How Strategic Defense Might Affect U.S. Strategy Options**

		U.S. strategy options				
		0	1	2	3	4
U.S. defense level	4	A P	A P	A P	A p <sup>2</sup> a	A R
	3	P <sup>b</sup>	P <sup>b</sup>	C	R	R? <sup>c</sup>
	2	P? <sup>b</sup>	C	?	R	R? <sup>c</sup>
	1	C	C	R	R	R? <sup>c</sup>
	0	C	R	R	R	R?C
		0	1	2	3	4
		Soviet defense level				

- A - Possible assured survival
- P - Option for prevailing, countervailing, or retaliation-only
- C - Option for countervailing or retaliation-only
- R - Retaliation-only
- ? - Unclear

<sup>a</sup> U.S. has a possibly large advantage but little capability for attack of military targets.

<sup>b</sup> Option for prevailing only if U.S. strikes first  
Ability to retaliate is in question.

SOURCE: Office of Technology Assessment

For the United States to have the option of a prevailing strategy, we would need a level 3 or 4 defense while the Soviets had a substantially less capable defense.<sup>34</sup> If we had a level 4 defense we could prevail even if they struck first. However, if we had a level 4 defense it seems highly unlikely that they would strike. If we had a level 3 defense we could prevail only if we struck first; if the Soviets struck first our level 3 defense would not limit damage to a tolerable level, but if we struck first it would. Developing the option for a prevailing strategy requires that our defense deployments substantially outpace Soviet offense deployments, and that our offense deployments limit the capability of Soviet defenses.

For the United States to have a countervailing strategy, as we now do, the Soviet defense

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<sup>34</sup>Or possibly a level 2 defense if the Soviets have no defense.

must be at level 2 or less. Enough Soviet defense precludes the existing U.S. strategy regardless of U.S. defense. This is one reason that BMD is opposed by some who see the existing strategy as the least dangerous option. Furthermore, countervailing requires that the U.S. defense level not be less than the Soviet defense level. We cannot fall substantially behind in an offense/defense arms race and maintain our current strategy.

A retaliation-only strategy is always possible unless the Soviets have level 4 defense. However, if the Soviets were to reach level 3 and we did not, we would be threatening retaliation from a position of inferiority. The combination of a Soviet first strike and the Soviet defense might limit our retaliation to a very low level (or even preclude it), but our defense would not be sufficient to keep the Soviets from inflicting great damage on the United States.

## CONCLUSION

Opinions will differ over whether the levels of defense capability discussed in this chapter are worth striving for. Other important factors will also influence decisions on the value and desirability of attempting to reach these defense levels. As the discussion of the transition region pointed out, crisis stability will be an important issue, as will the problem of

engineering a cooperative negotiated transition. Since some defense deployments can provide incentives to compete as well as incentives to cooperate, arms race stability will also be an issue. Finally, cost and feasibility must be taken into account. These subjects are addressed in subsequent chapters.