

Missile Defense and American Security A Sensible National Policy

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A matter of grave import to American security appears to be caught in a dangerous game of election year political posturing and hyperbole. Like the "bomber gap" and "missile gap" of Cold War election years, fearmongering about a new "window of vulnerability" may cloud Election '96. More than a decade and \$38 billion after the Reagan Administration began its controversial Strategic Defense Initiative (SDI), popularly known as "Star Wars," a renewed debate over ballistic missile defenses has erupted, with Republicans seeking to overturn Pentagon procurement decisions and requiring deployment of a national missile defense by 2003. Then-Senate Majority Leader and presidential candidate Bob Dole said on unveiling new missile defense legislation, "At present, the United States has no--I repeat--no defense against ballistic missiles." House Speaker Newt Gingrich, sponsor of the same "Defend America Act," dubbed Clinton's policy "a scandal," charging that, "today this administration is worse than the Baldwin [government of Britain] of the 1930's in blocking the development of the defense systems necessary for us to survive."

Legitimate concerns about unpreparedness in the face of emerging or potential threats may underlie this initiative. But the Republican mantra about inadequate missile defense also appears to be burdened by flawed logic, false promises, and significant partisanship. Moreover, it risks endangering American security by engendering new security threats in response to the U.S. policies advocated. At the same time, it risks important opportunity costs by diverting defense dollars that might otherwise go to accelerating deployment of more urgent theater defenses, investing in new technologies, or to other "here and now" defense needs such as readiness. According to a recent Congressional Budget Office report, the Republican missile program would cost between \$31 billion and \$60 billion, more than double current planned missile defense spending.

Beneath this obsession is a deeply rooted American psychology. Historically, Americans have been accustomed to feeling insulated from fear of foreign threats to their physical security. In the ages of sail and steam, the oceans to our east and west provided an ample buffer against foreign threats and furnished a sense of permanent security, a circumstance which endured until World War II. It was then, first dramatized at Pearl Harbor, that the long-range aircraft made direct attacks on U.S. territory possible using conventional weapons. (The only bombs to fall on the contiguous 48 states during World War II were Japanese, carried by balloons in the still-to-be-explored jet stream.)

When the long-range bomber was mated to Soviet nuclear weapons in 1949, the threat became palpable, ushering in an era of genuine fear of nuclear holocaust. The nuclear-tipped ballistic missile destroyed the utility of air defenses almost overnight, and led to the development of a family of ballistic missile interceptors. But those interceptors were properly judged to have little chance of intercepting attacking missiles and warheads, and it was quickly understood that effective defenses would lead to strategic instability in a crisis as well as to an unconstrainable ballistic missile arms race.¹ This, in turn, led to the 1972 Anti-Ballistic Missile (ABM) Treaty and the closing of the single U.S. anti-missile site at Nekoma, North Dakota, near the Grand Forks Air Force Base ballistic missile field. Yet in the 1980's, President Ronald Reagan raised new hopes of achieving absolute security with an anti-missile shield over America.

But this is a false hope. Technically, the United States is vulnerable to missile attack and has been for almost half a century. American security has been based principally on a calculus of deterrence, which maintained the peace during the Cold War, and continues to be effective. Credible deterrence is also a key factor in protection against missile attack. Moreover, even the most advanced missile defense systems that Republicans and other advocates are eager to build provide no absolute security. Indeed, the threat of a ballistic missile attack is substantially more remote than that of an Oklahoma City-type terrorist act in which nuclear, chemical, or biological weapons are employed--a nightmare scenario against which missile defenses offer little protection. There is no silver bullet, no technology able to make us invulnerable. Such promises can provide only a leaky Maginot Umbrella.

Missile defenses--strategic or theater--are an insurance policy. As with any insurance policy, one must weigh costs and risks. It is necessary to buy fire insurance even when there is a low probability of a fire. But if the cost of insurance were very high and the policy only protected one room in your house--and only under certain conditions--you might think twice about purchasing that policy.

The Gulf War illuminated the troublesome reality that middling Third World rogue states increasingly have access to missile technology and weapons of mass destruction (WMD) that could threaten U.S. troops or allies in regional conflicts. The specter of Israeli and Saudi towns threatened by Saddam's Scuds--possibly tipped with chemical weapons--highlighted the new dangers from these WMD. More recently, Chinese missile tests in the Taiwan Straits brought the problem into sharper focus.

The Patriot Advanced Capability (PAC-2)² missile enjoyed limited success against the Iraqi *al-Husayn*³ missiles during the Gulf War.⁴ This prompted a broad reassessment of the importance of ballistic missile defense programs by both the Bush Administration and Congress. The modest success of Patriot missiles shifted the focus of the Ballistic Missile Defense Organization (BMDO) from defense against strategic missiles to defense against the more technically manageable tactical ballistic missile threat. This led to the expansion and planned improvement of existing Anti-Theater Ballistic Missile (ATBM) weapons (PAC-2, PAC-3), and later to the introduction of several ATBM systems such as Theater High Altitude Anti-Missile Defense (THAAD), Marine Surface to Air Missiles (CorpSAM), Mid-Extended Air Defense Systems (MEADS), Navy Upper and Lower Tier,⁵ and Air Force Boost-Phase Intercept, intended to improve the defense of expeditionary forces against ballistic missiles. It led, as well, to a reexamination of national missile defense (NMD) against prophesied threats from rogue states and leaders thought not to be deterred by the threat of nuclear retaliation.

Stripped of political posturing, in policy and budget terms, the differences between the Pentagon program and the Republican legislation appear to be small, largely nuanced questions of timing. Indeed, there is now something approaching a rough consensus on the imperative to build and deploy defensive systems to intercept effectively short- and intermediate-range missiles. But *strategic* missile defenses are at best premature, and at worst, could prove counterproductive by generating new strategic threats. These realities are reflected in the \$14 billion the Pentagon plans to spend between fiscal years 1996 and 2001 for missile defense systems.⁶ Some such as the Patriot Advanced Capability (PAC-3) and the Navy Lower Tier should be deployed over the next two to three years; others such as the Army's controversial and risky THAAD and the even more controversial Navy Upper Tier system can be developed for "deployment readiness" within the next decade.

The questions this paper seeks to assess are: What are the current and plausible emerging threats? Which theater missile defense systems promise to be effective and affordable responses to those threats? Which technologies merit future investment? Is there a missile threat that warrants abrogating the ABM Treaty and building a national missile defense?

It takes a unified approach that considers the *plausible and probable* threat spectrum, as well as the *feasible* and *desirable* technological responses to those threats. Investment in these missile defenses should be approached as one would any insurance policy, weighing costs, risks, and benefits. This paper addresses the issue of missile defenses as an important element in the larger (and equally flawed) debate over post-Cold War defense planning and budgeting.

This PPI study offers the following assessment and recommendations regarding missile defense:

- *There is no current ballistic missile threat--nor is there likely to be one over the next 10 to 15 years--that warrants U.S. deployment of missile defense systems beyond those compatible with the ABM Treaty as it may be clarified by the United States and Russia.* Six years after the Gulf War, however, no new, more capable theater missile defense systems have been deployed. It is imperative that the United States develop and deploy improved theater missile defense (TMD) systems at the earliest possible date.
- *Deployment of a NMD is likely to be counterproductive and would likely make America less, not more, secure.* Developing the technologies to achieve what the Pentagon defines as "deployment readiness" to counter emergent new threats is the boundary of prudent action. The scrapping of the ABM Treaty, a precondition for NMD, would likely unravel the strategic relationship with Russia, which still poses the greatest nuclear threat to the United States. It would also likely have other adverse, unintended consequences that do not appear to have been duly considered by anti-ABM and pro-NMD proponents. Most dramatically, it could stimulate a buildup of Chinese nuclear forces.
- *The Department of Defense's (DOD) missile defense program announced last February reflects appropriate choices and priorities and ample flexibility in light of budgetary and strategic realities.* Accelerating deployment of the PAC-3 and Lower Tier systems, while stretching out development and deferring deployment of THAAD and Upper Tier systems, are long overdue choices. However, the United States should actively research systems that could destroy theater ballistic missiles in their boost phase, but which would be inherently incapable of countering strategic ballistic missiles.
- *The United States needs to develop a more comprehensive approach to TMD cooperation with allies* (outlined below). Allies, particularly those hosting U.S. forces, should be encouraged to acquire U.S. missile defense systems. There should be an understanding that allied contributions to U.S. development of next generation versions of such systems will be a factor in decisions to allow co-production of such systems.
- *Any attempt to deploy U.S. national missile defenses beyond the limits proscribed in the ABM Treaty would terminate the Strategic Arms Reduction Treaty (START) I and START II, leaving the Russian Federation with some 8,000 more warheads and more threatening ballistic missiles than it would otherwise retain.*
- *Deployment of a NMD could trigger a Chinese nuclear buildup and also reinforce China's desire and ability to hold American targets at risk.* It could have a ripple effect stimulating nuclear proliferation throughout Asia, and more broadly undercut the global nonproliferation regime. In addition, the probable consequence of U.S. abrogation of the ABM Treaty, or of U.S. deployment of a nationwide defense, would be an increase in the number of strategic missile warheads pointed at the United States as compared to the enormous decrease in Russian forces that the Republican-engineered nuclear build-down can ensure.
- *Finally, an activist agenda of nuclear arms reductions beyond START 2 levels should be pursued,*

conditioned on proportionate cuts among the five nuclear powers. In addition, further diplomatic anti-proliferation efforts should be explored, particularly assured and draconian sanctions against the use of chemical or biological weapons. There should be a rethinking of the Missile Technology Control Regime (MTCR) designed to strengthen norms against missiles. Such policies must be viewed as instruments of U.S. strategy to counter the missile threat complementing missile defense systems.

Myths and Realities: The Case Against a Large NMD System

Deterrence, arms control, and the nonproliferation regime may not shoot down incoming missiles, but they all contribute to American security in reducing the number and probability of missile attack. This is not to downplay the importance or the urgency of deploying more capable theater missile defenses, but merely to provide the context for considering the issue. For all the nightmare scenarios that can be conjured up, all the missile-borne nuclear, chemical, and biological warheads that can strike the United States are possessed by the declared nuclear powers, principally Russia, and secondarily, China.

The threat posed by the former Soviet Union has been transformed, but has not entirely disappeared. Through the darkest days of the Cold War, the United States coped with a massive Soviet nuclear threat with no significant missile defenses. Instead, the United States relied on deterrence and arms control. Yet even as Russia carries out its historic experiment with democracy and free markets, the Republican-dominated Congress now seeks to mandate the abrogation of the ABM Treaty and the deployment of a multi-site national missile defense system.

The ABM Treaty of 1972, signed and ratified as part of the Strategic Arms Limitation Treaty (SALT) I accords, provided for a stable strategic environment between the United States and the Soviet Union by ensuring that each side perceived itself just as vulnerable to a second strike as to a first strike. It also permitted the limitation of strategic ballistic missiles under SALT I and SALT II, and the actual reduction of strategic weapons under the START I and the START II accords, ratified by the Senate and now awaiting action by the Russian Duma. While it can and should be clarified and updated to reflect new technical realities, it is not in the U.S. interest to abandon it.

Russia is now dismantling nuclear missiles under START I, and under START II--if fully implemented--still deeper cuts would reduce the Russian arsenal to about 3,500 warheads. These reductions constitute the most reliable and cost-effective form of national missile defense available to the United States against the largest existing threat. The START reductions are, however, predicated on the continuation of the ABM Treaty--however it may be clarified or amended--and the mutual deterrent relationship it establishes. In the current and foreseeable threat environment, it is difficult to perceive any advantage to American security interests in deploying ballistic missile defense beyond what both sides agree is permitted under the ABM Treaty if the price is START II. In other words, should the United States abandon the ABM Treaty, Russia would almost certainly reject START II, resulting in Moscow keeping some 8,000 additional operational warheads.

As long as Russia retains a stockpile of ballistic missiles that can reach the United States, and as long as any possibility remains that an adversarial relationship between Russia and the United States could recur, retaining a relationship based on mutual deterrence is a necessity.⁷ Furthermore, because of drastically weakened conventional military capabilities, wounded pride at the failure of the Soviet Union, and the difficulties of the Russian economy and its democratic transformation, Russia perceives that much of its prestige and claim to great power status rests on possessing hundreds of nuclear missiles. However mistaken this view may be, it will be difficult to persuade Russia to reduce its strategic nuclear stockpile while the United States erects national missile defenses that could negate a significant fraction of a Russian

*retaliatory strike.*⁸

Moreover, amidst an authoritarian nationalist drift in Russia, expressed in its 1995 Duma elections and 1996 presidential campaign, it would be unwise for the United States to give credibility to the irredentist movements that wish to return to confrontation. Abrogation of the ABM Treaty and failure of the START accords would be interpreted in Russian nationalist circles as a clear signal that the United States wished to limit legitimate Russian ambitions. It would also reverse the logic of deterrence and prudent arms control of four Republican presidents over the past quarter-century.

Defending the United States--either all 50 states or just the lower 48--against a significant nuclear missile attack remains today what it was when President Reagan first proposed the SDI, technically impossible and fraught with both obvious and unpredictable political consequences. The technical impossibility of a nationwide population defense against even a few nuclear-tipped intercontinental ballistic missiles (ICBMs) arises from the certainty that some of those missiles would leak through any defense and would destroy their target cities. A secondary concern would be that an aggressor would attempt to defeat an ABM system in the cheapest way possible: by overwhelming it with more missiles than it could cope with. If the effectiveness of the defense rested on the employment of a series of tiers or layers, each capable of destroying a large fraction of the missiles that reached it, failure of an early layer would lead to catastrophic failure of the entire system, much as a pyramid sales scheme collapses.⁹ No existing or foreseeable technologies would allow the United States to have confidence that even a small nuclear attack could be defeated without several cities being consumed in a nuclear holocaust. In all probability the effectiveness of an ABM system would be no better than the Patriot ATBM was against small conventional warheads used during the Gulf War.

With the exception of the month the Nekoma ABM facility was operational, the United States has had no defense of its territory against ballistic missile attacks from any source. This country endured the Cold War and the Soviet threat, as well as increasing Chinese capabilities, without feeling it necessary to erect a defensive shield. Instead, American security has been, and continues to be, based on deterrence. That strategy of credible deterrence remains satisfactory today because any leakage through a defensive screen of even a small fraction of the missiles available to either China or Russia would be catastrophic for the United States. (One percent leakage of the roughly 8,000 additional nuclear weapons the Russians could possess under START I, as compared to START II, is 80 nuclear detonations; perhaps the destruction of 80 cities). No defenses could, of course, prevent leakage on the scale of 1 percent or 2 percent of the attacking force. However, the existence of American defenses which were perceived to be partially effective could lead an adversary to increase the scale of a missile attack to compensate for the maximum performance of the defenses. In this way the aggressor could still inflict the kind of damage his planners selected. Simply put, credible deterrence has worked and has actually reduced the number of nuclear weapons directed against the United States.

Even in the event the United States felt compelled to build defenses against missile attack, significant action could be taken under the terms of the ABM Treaty. The original text of this Treaty allowed each state party, the United States, and the Soviet Union to maintain two anti-missile sites with up to 100 interceptors at each base, one launch site defending an ICBM field (expressing American ideas of deterrence), and the other protecting the national capital (embodying the original Soviet notion of population defense). A subsequent protocol to the 1972 accord reduced to one the number of sites allowed each side. The United States maintained the option to have its defenses near Grand Forks, ND, although the site was decommissioned, and the Soviets retained the Moscow ABM site and have upgraded it. Both nations employed nuclear-tipped interceptors in their early deployments, and now the Russians have retained the use of nuclear weapons, which simplifies greatly the task of the interceptor missile.

Nothing in the ABM Treaty prohibits the United States from reactivating the Nekoma ABM base. Nor is the United States prevented from destroying the Nekoma facilities and building a new ABM site in a location near an ICBM deployment area. One could be chosen to provide better coverage of the contiguous 48 states than could be achieved from North Dakota. The United States also has the option to move its single site to a location within 150 kilometers (km) of Washington, DC. If well-chosen, such a deployment might protect a small fraction of the American population against a few nuclear warheads.

The original Spartan ABM interceptors based at Nekoma had a "foot-print"--coverage encompassing about one-twelfth of the continental United States (the contiguous 48 states, or CONUS) using the radars and rockets built by 1976. In order to cover all of CONUS from two sites, a new missile would have to be much more capable than the Spartan. Such an interceptor would appear to breach the Treaty's provision against constructing a base for a defense of the national territory. However, Harold Brown, one of the negotiators of the ABM Treaty, remarked that he felt keeping the number of interceptors and launch sites small was a more effective way to protect against breakout than was limiting the specifications of the interceptors themselves.¹⁰ In this view, an interceptor capable of covering all of CONUS from one or two sites would be permitted as long as no more than 100 missiles were deployed.

It is also not improbable that the United States and Russia (plus the former-Soviet Republics of Ukraine, Belarus, and Kazakhstan) could agree upon reversion to the original two-site text of the Treaty. If an ABM site were built within 150 km of Washington, DC, and if Nekoma were replaced with a base located further to the west (e.g. Frances Warren AFB), the two sites could provide a thin umbrella over virtually all of the lower 48 states if appropriate long-range radars were built in Alaska, Southern California, and conceivably on the Gulf Coast.¹¹

Congress has sought study and research and development (R&D) funding (\$450 million in Fiscal Year 1996) of a multi-site ABM system capable of protecting not merely all of CONUS, but Alaska and Hawaii as well. This clearly would require a difficult-to-negotiate amendment to the ABM Treaty or the abrogation of it. It is suggested by some advocates that such a defense would make the United States immune to threats made by rogue states armed with a few nuclear missiles. The facts are not nearly as simple as the rhetoric.

Systems that appear to split the difference--designed to counter theater ballistic missiles, but capable of forming the basis of a national defense--may not be unambiguously compliant with the ABM Treaty. For example, one potential attribute of the Navy's Upper Tier system in the face of future threats is that its interceptor will have sufficient capability to function as a national defensive system in case of emergency, but could be defined as nonstrategic if the United States and Russia agreed to geographically limited deployments. Sea-based ABM interceptors are prohibited under the Treaty.

Alternatively, some sort of augmentation to the existing space-based early warning satellites could be agreed upon by both countries. The improved space-based sensors would have to provide more trajectory information than the present system, but less than that of ABM radar at a missile site in order to be both useful and permitted under the existing text of the ABM Treaty. Such a system could serve only as a hedge against a very small attack, probably resulting from an accidental launch of only a few missiles. It would have at best a poor ability to counter a limited but deliberate attack by an aggressor, and no ability at all to protect Alaska and Hawaii (although it is difficult to envision a deliberate limited attack against the United States being directed against relatively minor targets in the Aleutian Islands or hundreds of kilometers west of Oahu as opposed to being aimed at the great cities of the East and West Coasts). This type of a system would be essentially ineffective against intercontinental missiles with multiple independent reentry vehicles (MIRV). By itself, this is no greater cause for concern or reaction than was the U.S.-Soviet standoff which lasted more than 25 years. While Chinese strategic thought remains poorly understood in the West, all

evidence suggests that Beijing, whose top priority is sustaining economic growth, would think many times before launching a nuclear attack against either its neighbors or the United States.

If, however, the United States (and Russia) were to build NMD systems threatening the utility of Beijing's nuclear deterrent capability, the likely Chinese response would be to add substantial numbers of warheads to its current, relatively modest arsenal. This would in turn affect the U.S., Russian, and Indian strategic calculations regarding future nuclear deployments.

It is not, however, threats from the declared nuclear powers that have animated the missile defense debate. Rather, it is a purported threat from regimes such as Baghdad, Tehran, and Pyongyang. Furthermore, the ballistic missile threat to the United States and American forces from hostile Third World states has been inflated to justify some acquisition programs and to rationalize an end to the ABM Treaty, which appears to have become something of an ideological litmus test for Republicans. The ABM Treaty limits defenses against long-range (strategic) missiles, but not against short-range (theater) missiles and does not clearly differentiate between the two categories.

No other threat facing the United States is as great as the level of warheads on the remaining Russian missile forces. Therefore, negotiating their destruction through further strategic arms control treaties is a surer--and cheaper--way to achieve the same end. This would be particularly true if the two nations could agree upon ways for the United States to assist in upgrading Russian command control over its remaining missiles in the same way as we are now assisting Russian nuclear laboratories in achieving greater control over fissile materials. Similarly, future arms reduction talks beyond START II should involve all five declared nuclear powers, which could reduce the Chinese arsenal as well. Missile defense must be viewed as one of several instruments for countering the proliferation of WMD, which include arms control and other vehicles that can reduce this threat.

Finally, the extension of the nonproliferation treaty and the bolstering of the nonproliferation regime--which has slowed the spread of nuclear weapons, stigmatized those opaque nuclear powers who remain outside its bounds, and provided the United States with the political and legal basis to criticize and act against new proliferators--is premised on the continuation of strategic and other nuclear arms reductions. That linkage was made explicit during the 1995 Nuclear Proliferation Treaty (NPT) extension conference, which extended the Treaty "indefinitely." However, the nearly explicit bargain was that nuclear arms reductions would continue, nuclear forces would not be increased, and a Comprehensive Test Ban Treaty would be completed in 1996. The great powers would fail to meet virtually every one of those conditions should START I or START II fail--a certainty if the ABM Treaty is abandoned--and erode the non-proliferation consensus.

However, the syllogism, "the great powers have nuclear weapons, therefore the smaller states will proliferate" is demonstrably false. States acquire nuclear weapons for national and regional reasons of perceived security or prestige benefit. However, further erosion of the nonproliferation regime will certainly make it easier for states to conclude that--in their particular regional circumstance--nuclear weapons make sense. Erosion of the regime will also make it far harder for the United States to act diplomatically, economically, or militarily against the next adversary such as North Korea or Iraq. Thus, abrogation of the ABM Treaty could have still wider unintended consequences.

The Nature of Emerging Threats

A succession of directors of central intelligence has pointed out that more than 20 nations, some of them real or potential adversaries of the United States, will possess ballistic missiles within the next decade. Some of these nations, according to these intelligence chiefs, may also possess WMD (nuclear, chemical,

and biological) with which to arm their missiles (see Table 1). All of the above is true.

But to discern its meaning, one must look more closely at specific nations and the weapons they might develop to determine whether a genuine threat to the United States exists and whether American security is significantly enhanced by deploying large numbers of defensive missiles, either to protect our national territory or American expeditionary forces abroad. After all, France possesses some of the most advanced missiles in the world, yet no one would argue that France is a threat to the United States. "New" or "emerging" threats to U.S. interests or to our allies exist principally as the product of worst-case analysis--for example, a rogue state converting a Russian SS-25 launcher sold for satellite-launch purposes back to being an ICBM.

The threat posed to the United States from ballistic missiles in the hands of hostile developing nations is not likely to change qualitatively before 2010 to 2015. This is because such a transformation would require not merely the proliferation of longer-range missiles but also the proliferation of WMD in forms suitable for missile delivery.

Lt. Gen. James R. Clapper, Jr., director of the Defense Intelligence Agency, concurred with this estimate in testimony to the Senate Select Committee on Intelligence on January 10, 1995. General Clapper said:

"We see no interest in or capability of any new country reaching the continental United States with a long-range missile for at least the next decade."

Then-Acting Director of Central Intelligence, Admiral William Studeman, responded to a question on the subject by saying:

"No new countries have emerged with the motivation to develop a missile to target CONUS, and the four that we previously identified--North Korea, Iran, Iraq, and Libya--are at least a decade away."

According to *Defense News*, the Joint Requirements Oversight Committee (JROC) believes that "with the current projected ballistic missile threat, which shows Russia and China as the only countries able to field a threat against the U.S. homeland, the funding level for [national missile defense] should be no more than \$500 million per year and TMD should be no more than \$2.8 billion per year through the [five year defense plan].¹² Such funding levels would allow, according to the JROC, appropriate funds to be given to the services for more essential war fighting programs.

The slow rate of improvement of missiles in the developing world, and the limited number of developing nations with serious missile programs, as underscored by Admiral Studeman's remarks and those of the JROC, implies that the threat environment for U.S. allies and interests is likely to change very slowly in the coming two decades.

In terms of numbers of missiles deployed, potential enemies or opponents, and warheads available to potential adversaries, the overwhelming ballistic missile threat to American forces comes from rockets with ranges under 1,000 km or from Russian and Chinese missiles. The first kind of threat can be categorized as a "theater ballistic missile," while the second is strategic. The ABM Treaty clearly does not limit deployment of defenses against missiles with ranges of 1,000 km; just as clearly, it forbids other than a single site deployment against strategic ballistic missiles of whatever origin.¹³ This threat environment combined with budgetary realities have led the Pentagon to scale back development of THAAD and Upper Tier.

The U.S. Response to the "Threat"

But what is the character of these probable theater missile threats? Are there new "undeterrable" states? Can defenses become so effective that they reduce the threat of ballistic missile-delivered WMD to a level so low that the United States can regain freedom of action lost to the deterrent effect of those WMD in the first place?

The Undeterrables. In August 1995, the defection of Saddam Hussein's sons-in-law brought about the revelation of shocking new information about stockpiled Iraqi WMD. In addition to the thirty *al-Husayn* warheads known to have been loaded with chemical agents, Iraq admitted to having loaded 191 bombs and warheads with biological agents including anthrax, botulinum toxin, aflatoxin, and mycotoxins.¹⁴ Despite being combat ready, none of the chemical and biological ordnance was used.

Various news reports suggest that the Iraqis exercised restraint after being told by Secretary of State James Baker, as recounted in his memoirs, that Iraqi use of WMD would result in severe retaliation by the United States. The form of retribution was not spelled out, but the Iraqis may well have concluded that it would include massive conventional bombing or--in response to particularly egregious offenses--a nuclear strike. One may reasonably conclude that Saddam Hussein, the epitome of the "mad dictator of a rogue state," *was indeed deterred* by the threat of U.S. retaliation, whether conventional or unconventional.

The Gulf War experience, an important example of deterrence outside of the U.S.-Soviet context, provides some confidence that even the international actors deemed least deterrable actually can be deterred by the threat of appropriate sanctions. Another example buttresses this tentative conclusion: After the Reagan-era bombing of a modest number of targets in Libya, Qaddafi himself retreated from his program of terrorist attacks, although he did not abandon it entirely. Even Islamic fundamentalist states can apparently be deterred by the notion of *credible* retaliation.

Deterrence at the nuclear, chemical, and biological weapon level is likely to function against even fairly irrational regimes. To deter, the threatened penalty must be credible and may need to be assessed by the other side as being potentially greater than the original attack.

Nuclear, Chemical, and Biologically Armed Theater Ballistic Missiles

These are the threats that are most worrisome. Nuclear weapons are more difficult to produce than biological agents, but nuclear bombs destroy their targets almost instantaneously. Both nuclear and biological weapons fall into a new class of "nation destroyers," while chemical agents have far less potential for disintegrating the targeted society. Nuclear and biological weapons surpass chemical weapons in their deadly effects, and some biological weapons are easier to produce than nerve gases such as Sarin. Biological weapons (BW) are also likely to be far more lethal than chemical agents, but are much less predictable in their specific effects. In addition, there is a natural incubation period of hours to weeks after exposure to most BW agents before the victim falls ill. It is of course true that some agents, such as anthrax, have an almost 100 percent mortality rate if not treated before symptoms appear, making them at least as terrifying weapons as nuclear bombs. Finally, if a state already has nuclear weapons, it is equally difficult to design and build efficient nuclear warheads and effective BW warheads for simple ballistic missiles of modest range (500 km to 1,500 km range).

Feasibility of Defenses Particularly Against Nuclear and Biological Weapons

The performance of the Patriot PAC-2 missile demonstrated that it is feasible to counter a fraction of a small tactical ballistic missile attack employing only conventional weapons. However, Patriot was a statistical and political success only under the specific and peculiar conditions prevailing in the Gulf War:

Attacking missiles carrying only small conventional warheads; inaccurate ballistic missiles incapable of being aimed at targets smaller than a city; a small total number of attacking missiles--one analyst using unclassified data arrived at a total of only 82 Scuds striking in the vicinity of target areas¹⁵ during the entire campaign from January 17, 1991 to February 25, 1991¹⁶--and a slow rate of fire. Apparently no more than ten *al-Husayns* were launched in any 24-hour period (January 20-21 and January 25-26),¹⁷ calculating from noon of one day until noon the following day, a rate of attack that would not be considered highly stressful to any of the defensive systems now being considered.

Unless extremely capable interceptors can be built and fielded (missiles with, for example, a single-shot kill probability (SSKP) greater than 0.7, the maximum value most qualified observers believe possible),¹⁸ it is doubtful that defenses can protect completely against attack by missiles carrying biological or nuclear weapons. Numerical simulations show that even with two interceptors dispatched against every attacking warhead, and using interceptors with an SSKP of 0.7, there is at least a 40 percent probability that the defense will get no more than nine of every 10 incoming missiles. The probability of annihilating the attack does not rise significantly if three highly capable interceptors are used against each attacker.

Based on an assessment of the technology and the low statistical probability of defeating all or most of an attacking missile force armed with nuclear or biological weapons, PPI concludes that more resources must be devoted to destroying tactical ballistic missiles (TBM) before launch. This is the so-called "reconnaissance-strike" mission. "Scud hunting" proved a failure in Iraq, but the lessons learned there should make another attempt far more successful if the United States ever needs to do it again. "Pre-boost phase" interception, or destroying a missile before its crew has it erected and ready for launch, is likely to be the most reliable way to thwart theater ballistic missiles, particularly those equipped with WMD.

While it may be unlikely that an emerging nuclear nation would have more than a handful of nuclear weapons, the number of BW warheads in its arsenal could be quite large, as Iraq demonstrated. BW agents and warheads are cheap, giving even small nations the ability to counter a defense simply by saturating it. A determined foe would be able to overwhelm any feasible defense by using biological warheads in quantity or by using nuclear weapons if a sufficient number are available to fire multiple shots at a single target.

Table 1 (19) lists those nations likely to possess ballistic missiles today, along with the (unclassified) probable maximum range for the longest-range missile owned by that nation. While many nations have ballistic missiles in their arsenals, most of them are variants of the Scud-B (300 km) or the Scud-C (700 km). A few countries other than the five permanent members of the U.N. Security Council have, however, developed their own indigenous missiles (e.g., Israel, India, Pakistan, and North Korea). It is probable that Iraq's missile-building capabilities have been capped at a maximum range of about 150 km by the actions of the United Nations Special Commission (UNSCOM), although the most recent data obtained by UNSCOM Executive Chairman Rolf Ekeus may force a reassessment, and certainly suggest continued Iraqi intent.²⁰

The North Korean *No Dong* has had one relatively unsuccessful flight test, reaching only about half of its designed maximum range. The *Taepo Dong I* and *II* are still in very early stages of design and development; any estimate made today of the range of either missile is highly speculative, as would be any estimate for initial operating capability (IOC). Estimates of *No Dong* performance and IOC may be on marginally firmer ground, since one test flight of the missile has been publicly acknowledged. However, those estimates still on the books, projecting that the *No Dong* would begin series production in 1995, are clearly wrong. Central Intelligence Agency Director John M. Deutch's comment that he "expects" deployment by the end of 1996 appears problematic in light of the nearly moribund flight test program, and may, like previous forecasts, be merely a "worst-case" estimate.²¹

Aside from the major powers, active indigenous ballistic missile development programs appear to exist in

Egypt, India, Iran, Iraq, Israel, North Korea, Pakistan, Syria, and Taiwan. Some of the countries mentioned have development programs designed to produce missiles with ranges in excess of 1,000 km. Thus, they have the capacity to strike not merely their neighbors, but in many cases states well beyond those adjacent to their own territory (e.g. Iraqi 600 km) range. (*Al-Husayn* missiles were able to bombard both Israel and Saudi Arabia, flying through the airspace of Jordan and Kuwait, respectively.) However, none of the missiles under development have an estimated range great enough to reach the continental United States from its country of production or from any other state likely to be hostile to the United States.²² Nor is the threat likely to increase substantially because of indigenous production by any potentially hostile developing nations for the foreseeable future.

Moreover, the nature of the threat from small powers with limited arsenals must be properly understood. To the United States and Russia, nuclear weapons are economic free goods; each nation not only has all of the weapons it can possibly employ, but also overkill capacity measured in factors of two to some very large number, depending upon the size of its opponent. The two great nuclear powers can accept the expenditure of delivery vehicles and warheads in any number in order to achieve destruction of a target set. The U.S. and Russian capacities are reminiscent of General Grant's position at Vicksburg: He would fight it out "if it took all summer" because the North had the men and material to win a war of attrition. To the United Kingdom, France, and China, nuclear weapons are valuable but still need not be rationed.

In stark contrast, a micronuclear power with only a handful of weapons must consider its devices as precious as the crown jewels. Thus, no state with only a handful of weapons would gamble using an improvised or untested delivery system, such as a space launcher hastily converted to be an ICBM. If the ballistic missile is the delivery system of choice, then it follows that other means of delivery are less desirable. We have already said that interceptors with capabilities experts believe to be achievable can so dilute a missile attack that a micronuclear power would likely lose most of its weapons to interceptors rather than see them reach their targets. Given the value of those nuclear arms to an opponent with a very small stockpile, and given the fact that all other methods of delivery have tactical and strategic disadvantages compared to ballistic missiles, a missile defense system that can force an opponent to shift his weapons to less-favored systems has achieved a significant amount for its owner.

But a micronuclear power could achieve a deterrent effect against the ability of the United States to deploy forces and mobilize a coalition of forces in a regional conflict. What would the response of the United States or coalition allies in the Gulf War have been if it were known that Saddam had even one or two nuclear devices? This dilemma poses a key challenge for counter-proliferation strategy.

Although more nations than ever before have conventionally armed ballistic missiles, the real threat value of the conventional ballistic missile is declining. However, practical missiles can be developed to intercept existing and likely conventionally armed tactical ballistic missiles. This would provide U.S. expeditionary forces and their allies with a valuable shield, useful for physical defense and psychological reassurance. Defenses against missiles armed with biological or nuclear weapons are in a different category, to be discussed below.

An anti-missile insurance policy which could defeat all or most of a conventional ballistic missile attack by a minor, developing nuclear power is politically seductive and may be technically achievable, although it would be useless against nuclear-armed missiles. The life cycle cost of such a system would, however, assuredly be far greater than the THAAD theater missile system, even if only 200 interceptors were deployed with another 100 spares and test vehicles being built. Not only will the defensive system--radars, other sensors, and missiles--be far more complex and expensive than THAAD, it will have to remain on 24-hour alert for its entire life.

An anti-missile system designed to counter a Soviet strategic attack did not in reality have to be powered up and at full alert at all times, for a true bolt-from-the blue attack was generally considered unlikely, if not impossible, during periods of low tension. In contrast, however, by definition we cannot know when a rogue state might decide to attack or threaten to attack in an attempt to blackmail the United States into some action. Neither can we anticipate an "accidental or unauthorized" missile launch from whatever quarter. Thus, the operations and maintenance, manpower, and training costs of a nationwide defense could certainly be astronomical.

Regional Conflict: Missiles as Coalition Busters

For a threat to the United States or its allies to become credible it would be necessary for a hostile nation to obtain a ballistic missile with sufficient range to reach its targets and to equip it with a warhead worth the effort of delivery by ballistic missile. In general, the only payloads worth transporting 200 km or more by relatively inaccurate ballistic missiles are WMD. As Iraq and North Korea proved, WMD, including nuclear weapons, are not beyond the reach of the nations in question.

Some argue that TBMs with significantly greater accuracy than the modified Scuds employed by the Iraqis in the Gulf War could be effective against area targets such as airfields and ports. While those missiles could be *psychologically* effective, particularly in the minds of U.S. coalition partners, it is unlikely that even massive attacks could significantly disrupt operations. The Third Reich launched an estimated 1,150 V-2 missiles (each carrying 900 kilograms of high explosives) against London with no significant effects on either military operations or morale.

Not all nations developing ballistic missiles are likely to attack U.S. or allied vital interests. For example, it is almost impossible to develop a scenario in which the United States or its allies would become involved in a war between India and Pakistan or between China and India. A direct threat to U.S. or allied interests from Indian- or Pakistani-built missiles would only arise if either of those states transferred missiles to a theater more likely to draw the United States into war. In the unlikely event that Pakistan sold *Hatf 2* missiles to Lebanon, for example, those missiles could be used against Israel, but Syria and Iraq already have more effective missiles for use against Israel.

If, however, North Korea was able to develop deployable *No Dong* or *Taepo Dong* missiles and sold them to Algeria or Libya, a situation could arise in which the present Libyan government or a Muslim extremist Algerian government could threaten targets in Israel, throughout NATO, and elsewhere in Europe. When fired from Libya or Algeria, North Korea's existing Scud-C missiles with a 700 km range, however, are primarily useful against European targets within the Mediterranean basin. They duplicate coverage of Israel which could be obtained using simpler and shorter-range missiles based in nearby "front line" nations (e.g., Syria, Iraq).

Today, Japan is not at risk from existing North Korean missiles, but will be if North Korea succeeds in deploying the *No Dong* or *Taepo Dong*, both of which are likely to be some years away, which can reach the Japanese home islands. However, it must also be kept in mind that the concept of "threat" requires both capability and intent. Would North Korea, desperately seeking aid, investment, and trade from Japan, South Korea, and the United States (which already are providing a multi-billion dollar aid package), risk all such benefits and almost certain political suicide by using or threatening to use a *No Dong* or *Taepo Dong* missile? One cannot rule out desperation blackmail attempts, but the likelihood of such an act must also be weighed.

China has been more troublesome as a provider of long-range missiles than any other nation except the former Soviet Union, which was largely responsible for the proliferation of the Scud family. The CSS-2

(*Deng Feng 3*) missile, sold to Saudi Arabia without nuclear warheads, has a range variously given as 2,600 km to 3,200 km; M-9 and M-11 missiles have ranges of 600 km and 300 km respectively, and, according to press reports, M-11 components or missiles have been sold to Pakistan by China. M-11 missiles in South Asia pose a threat to regional stability, but neither missile is likely to engender a war that would involve the United States on the side of India or Pakistan, nor involve American friends and allies. However, should China cease to exercise the restraint it has recently shown, the CSS-2 could appear in parts of the world other than Saudi Arabia and become more of a threat.

Allied Participation and Burden Sharing

There is a need for a more lucid and equitable policy regarding cooperation on missile defenses based on a sharing of responsibilities. From the initial SDI program, a number of allies and friends responded favorably to U.S. requests for cooperation and support. The United States funded national theater architecture studies for Western Europe as well as for the Western Pacific. Cooperative studies as well as major U.S. funding of the *Arrow* missile have been done with Israel. A substantial effort evolved between the United States and the United Kingdom with the latter receiving numerous contracts for technology projects relevant to missile defense. The United States and Japan have just signed an exchange of notes to allow Japanese industry to participate in a bilateral study of TMD architectures for Japan using real threat and U.S. system performance data. The United States, France, Germany, and Italy are on the verge of signing a Memorandum of Understanding to jointly fund and develop the MEADS with TBM and cruise missile engagement capabilities. As the United States moves toward completing development and entering into production of the first generation of true TMD systems (PAC-3, Standard Missile Block IV-A, THAAD, and Navy Lower Tier) it is time to develop a clear and consistent policy on the terms and conditions of making these systems available to our allies.

Current Situation: TMD as NMD

An essential point to keep in mind is that the TMD systems that the United States will deploy to protect our troops in overseas theaters of conflict, in some cases, constitute an NMD capability for our allies. These same TMD systems will not be used to defend U.S. territory, except in some very odd and extreme scenarios, but they may be used to protect U.S. installations and forces stationed on allied territory in peacetime as well as to protect deployed troops in a crisis scenario. Furthermore, the United States should encourage its allies to deploy TMD systems commensurate with the threat. In some cases, the allies should be encouraged to deploy forces to protect U.S. personnel and installations as well as their own as an extension of current treaty air defense responsibilities. The situation differs greatly in the three major U.S. areas of treaty responsibility:

NATO: Until a threat emerges, probably from the south, NATO's primary TMD challenge is the protection of its deployed forces in situations such as Desert Storm. The MEADS program is designed to produce a defense against that threat. In addition, the two European NATO nations which currently field *Patriot*--Germany and the Netherlands--may want to acquire the PAC-3 capability. Further, if a midterm threat emerges, most NATO nations have the Hawk medium-range system and some actions can be taken to give it a modest TMD capability prior to MEADS entering service. In the long run, a THAAD or Upper Tier capability might be needed to meet a threat from the south--a concern of both France and Italy--but no such threat now exists.

Israel: As always, Israel is a special case. It faces numerous near and midterm, short- and medium-range potential threats both to its forces and population centers. Unlike the areas mentioned above there are no U.S. combat troops stationed in Israel, although some U.S. materiel is stockpiled there for possible contingencies. With a majority of funding coming from the United States, Israel is developing the *Arrow*

system to meet its own TMD needs. This troubled program now seems to be back on track and is likely to be deployed before development of THAAD can be completed. U.S. funding for *Arrow* will continue to be both a political and technical question.

East Asia: Japan clearly faces the opposite problem from NATO: a threat to its home territory. Japan is currently conducting a bilateral study with the United States to determine whether it needs a TMD system and, if so, what are the alternative architectures. That study is due to be completed in mid-1997. The current focus is on the obvious threat from North Korea, but there is also a growing concern about China. While Japan will probably decide to upgrade its Air Force-operated *Patriot* batteries to PAC-3, a more capable upper tier system may be needed if the Chinese threat becomes real. A complicating factor is that Japan faces some unique restrictions on its policies for peaceful use of space.

South Korea faces the most demanding short-term threat and has done the least to come to grips with it. While evidencing great interest in U.S. TMD programs (and in what the United States is doing with Japan), Korea has done the least in terms of action. When the Korean crisis heated up in 1994, U.S. *Patriots* were sent to defend Korea. This was despite many years of effort to get the Koreans to buy their own *Patriots*. Korea needs to be pressured to do more to address the TMD issue. However, the geography of the Korean peninsula makes missile defense of Seoul almost impossible.

U.S. Policy: Technology and Responsibility Sharing

It is clear that the United States has a vast technological lead in the TMD area. While *Arrow* is based on Israeli technology, it would not be possible without U.S. funding. The U.S. brings both essential technology and funding to MEADS. Neither Japan nor Korea has the technological capability to develop and field an entirely indigenous TMD system in the next 15 to 20 years. Any near-term systems solution available to NATO, Japan, and Korea will have to be U.S. funded and developed, as will be the case with the first generation of upper tier systems, should they prove desirable.

This central fact must be offset by political realities. The MEADS partners structured the program so that they would be guaranteed a production share proportional to their R&D funding contribution. If they procure PAC-3 in the near-term, or a U.S. upper tier system in the longer-term, they are certain to ask for licensed production or some other form of offset to secure the industrial benefits needed to maintain domestic political support. Japan is also likely to insist on a licensed production arrangement if they are to make such a major purchase from the United States. Recent Korean purchases of major equipment would indicate that they would also seek offset arrangements. Israel, of course, will produce the major portion of *Arrow*.

The United States needs to develop a coherent set of guidelines that will both encourage our allies to deploy TMD systems when warranted and meet U.S. and allied domestic political needs. One important part of such guidelines is clarifying the allocation of TMD responsibilities with each of our allies. Unless there is clear basis in a treaty, the United States should not assume the total allied TMD burden simply because it has the means to do so. Nor should the United States let short-term crisis deployments turn into long-term stationing simply because the allied nation does not want to procure its own systems. There should be a carefully considered equitable sharing of the TMD burden commensurate with the nature of the threat, fiscal realities, considerations of military interoperability, and treaty obligations.

In addition to these political criterion and meeting the need to make business, military, and economic sense, we suggest the following be used in determining whether TMD technology should be transferred in conjunction with licensed production:

- If a TMD system is jointly developed, the production shares should be worked out in advance. This has been done in the case of MEADS. In addition, any third country sales issues (approval process, R&D, and royalty recoupment, etc.) should also be worked out in advance. It would be helpful to clarify quickly what U.S. approvals might be needed for third country sales of *Arrow* or whether the United States would recoup some of the R&D costs if such sales were made.
- If there has been no R&D funding from our allies, the systems should either be sold from U.S. production lines or, if licensed production is to be permitted, compensatory steps should be taken by the allied nation. These steps could include some payment of R&D recoupment charges, even when the law allows these to be waived, and should be considered as the price of licensed production.
- Allies should agree to provide TMD point defense to U.S. forces and bases, purchasing American equipment. There is precedent for this. In the 1980s, the United Kingdom and Germany provided *Rapier* and *Roland* air defense protection to U.S. bases. Moreover, allies should contribute a significant share of the funding for R&D on any future P3I or other upgrades to the system.

Conclusion

The threat to U.S. expeditionary forces and to American allies from Third World ballistic missiles is real, but its nature has been distorted and its magnitude exaggerated. In fact, well into the next century, few likely foes will possess the combination of WMD and long-range ballistic missiles that could serve to deter U.S. actions abroad or destroy alliances. The greatest threat, in magnitude and likelihood, comes from missiles with ranges of about 1,000 km or less—not the 3,200 km of the Chinese DF-3 (CSS-2)—armed with BW. The principal reason for investing in theater missile defenses is to protect U.S. and allied interests, particularly expeditionary forces in a regional conflict scenario.

Theater defenses against ballistic missiles with ranges up to 1,000 km are technically feasible. Such defenses might be expected to destroy up to 90 percent of a small attacking force about 80 percent of the time,²³ and 100 percent of the attack about 40 percent of the time.²⁴ It is therefore plausible that such a defense would be robust enough to affect the strategic planning of a micronuclear power, causing it to forgo the use of nuclear-tipped ballistic missiles against defended U.S. interests. As the range of the targeted ballistic missile increases, the job of the defense is made more complex because the missiles themselves are faster, requiring a faster interceptor with more homing capability. Thus, defense against longer-range missiles becomes more difficult, expensive, and problematic. Achievable SSKP, the most important figure of merit, can be expected to decline as target reentry speeds increase.

Table 1 clearly shows that for the present and the foreseeable future the longest-range missiles likely to be found in the stockpiles of potential opponents have ranges of 1,000 km or less. It is never prudent to design a defense to meet exactly the existing threat with no margin should that threat evolve or turn out to be more capable than expected. However, development of ATBMs against theater missiles with ranges between 1,000 and 2,000 km would seem both less expensive and better matched to likely future threats than stretching today's technology to build interceptors capable of engaging 3,200 km range missiles. The same level of technology which just barely suffices to achieve a small capability against 3,200 km range rockets would likely provide a much higher SSKP against the most probable threats at a lower price per interceptor and at less technical risk. This is the logic behind recent decisions made by the DOD on its missile defense program, including the delay of THAAD.

Ground-based and sea-based interceptor systems based on systems in service (Patriot PAC-2) or under development (PAC-3, Navy Lower Tier) will provide adequate defense against threats over the next 10 to 15 years. Under the current missile defense program, development of wider area coverage

defenses--THAAD and Navy Upper Tier--will be stretched out, but prototypes could be deployed by Fiscal Year 1999 if unexpected threats should emerge. If the Navy requires a system with greater capability than its Lower Tier, a "marinized" version of THAAD might be cost-effective--always assuming that THAAD meets its design goals--as could a marinized version of a THAAD replacement.

While continental or nation-wide ballistic missile defense appeals to the understandable and deep-rooted American desire to maintain absolute freedom of action while remaining immune from weapons in the hands of others, such a security environment is a chimera. The consequences of deploying a thicker missile defense system than permitted by the ABM Treaty are likely to be counterproductive, generating new, more dangerous security threats. Embarking on a national missile defense program is an unwise, risky, and expensive proposition. It is rooted in political posturing, not technical reality.

See Graph 1 and 2.

See Appendix.

Endnotes

1. Peter D. Zimmerman. November, 1990. "The Stable Transition to Strategic Defenses: An Example of the Empty Set." *Space Policy*. pp. 297-310. See pp. 298-301 on this point.
2. PAC means Patriot Advanced Capability today; it originally meant Patriot Anti-Missile Capability. The PAC-2 missile is based on the original Raytheon-built Patriot SAM. PAC-3 is based on Loral's ERINT (Extended Range Interceptor) hit-to-kill vehicle.
3. The *al-Husayn* is an Iraqi-designed and produced 600 km range variant of the Soviet-designed 300 km range Scud B. In the context of the Gulf War, "Scud" and "*al-Husayn*" are used essentially interchangeably since Iraq launched no ordinary Scuds.
4. The extent of the Patriot's success remains a subject of controversy, with some observers suggesting that it destroyed "none" or "perhaps one" Scud, and others claiming kill rates as high as 70 percent in the Saudi theater. The truth lies in between, and because adequate data were not collected during the conflict, it will never be known with certainty. This author believes that logical cases can be made for success rates between 20 percent and 40 percent but judges that data to be more definitive do not exist.
5. The Navy Lower Tier defense system is a straight-forward adaptation of the Standard Missile deployed on Aegis-equipped ships. It would take the PAC-3 level of capability to sea. The Upper Tier (or Theater-Wide) uses an exoatmospheric kill vehicle called the LEAP (Lightweight Exo-Atmospheric Agile Projectile) to intercept missiles at very long ranges and high altitudes. It clearly has more than residual capability against strategic ballistic missiles. It only has legitimacy if the United States and Russia can reach agreement on geographic deployment limits which prevent Upper Tier from being used as a nation-wide ABM defense. It will be a very expensive program, squandering scarce resources, which are likely to be terminated well before the advanced missile can be deployed.
6. The Fiscal Year 1996 Defense Appropriations bill increased President Clinton's \$2.44 billion request for missile defense funding to \$3.07 billion; the mandatory deployment of a national missile defense by 2003 has been stripped from the final version of the Fiscal Year 1996 Defense Authorization Act. The Pentagon estimates it will spend \$14 billion between Fiscal Year 1996 and Fiscal Year 2001.

7. Mutual Deterrence and Mutual Assured Destruction (MAD) are not the same thing and should not be confused, as they so often are. Mutual Deterrence is a *strategy* for avoiding nuclear confrontation and attack. Mutual Assured Destruction is the *consequence* of that strategy failing.
8. It is impossible for most Americans to conceive of our nation striking Russia first, even in a crisis; it is probably less difficult for Russian defense officials to conceive of an American first strike. It would, in any event, be negligent of them not to be able to deal with the contingency of an American first strike; and the United States must bear in mind the obligations of the Russian military to its government when considering mutually acceptable arms control or weapon deployment options.
9. Peter D. Zimmerman. 1986. "Pork Bellies and SDI." *Foreign Policy* 63, Summer, pp. 76-87.
10. Harold Brown, private conversation with the author, Spring 1994.
11. It is no longer possible to assume that any missile attack will come from Russia over the North Pole and to orient U.S. missile defenses accordingly. Russian Submarine Launched Ballistic Missile (SLBMs), as well as Chinese ICBMs and SLBMs, would follow different trajectories entirely. So would missiles launched from all other potentially hostile states.
12. Frank Oliveri. 1996. "Pentagon, Service Leaders Spar Over Missile Defense Funding." *Defense News*. January 22-28.
13. While the ABM Treaty does not explicitly define "strategic ballistic missile," most analysts accept that those missiles captured by the SALT I "Interim Agreement on the Limitation of Strategic Offensive Arms" would be considered covered by the ABM Treaty since the two accords were negotiated together, signed in the same ceremony, and given senatorial advice and consent in the same act. 1,200 km range SS-N-5s on Hotel Class Soviet submarines were covered, and the 2,400 km range SS-N-6 was termed strategic regardless of the submarine which carried it.
14. *UN: What the New Iraqi Disclosures Reveal*. Reuters (United Nations: 25 August 1995, 8:30 pm); Evelyn Leopold. *UN: Iraq had Enormous Biological Arms Program*, Reuters (United Nations: 25 August 1995, 8:21 pm). See also *UN Grapples with Iraq* (Associated Press: United Nations: 26 August 1995, 2:04 am) which puts the number of BW warheads and bombs at 199.
15. Patriot missiles were not used to intercept every Scud. Some incoming missiles were obviously going to land in uninhabited areas, and others were out of range of the defense.
16. Gregory S. Jones. 1992. *The Iraqi Ballistic Missile Program: The Gulf War and the Future of the Missile Threat*. Marina del Rey, CA: American Institute for Strategic Cooperation. p. 24.
17. *Ibidm.* pp. 81-87. Note that Jones's general chronology on pp. 79-80 is slightly inconsistent with the more detailed chronology on pp. 81-87.
18. Private conversations between the author and various anti-missile experts.
19. Robert Shuey. "Ballistic and Cruise Missile Forces of Foreign Countries." Congressional Research Service 95-688 F, p. 17. In addition, other unclassified sources have been consulted in an effort to approximate the ranges of various missile types.
20. *UN: What the New Iraqi Disclosures Reveal*. Reuters (United Nations: 25 August 1995, 8:30 pm).

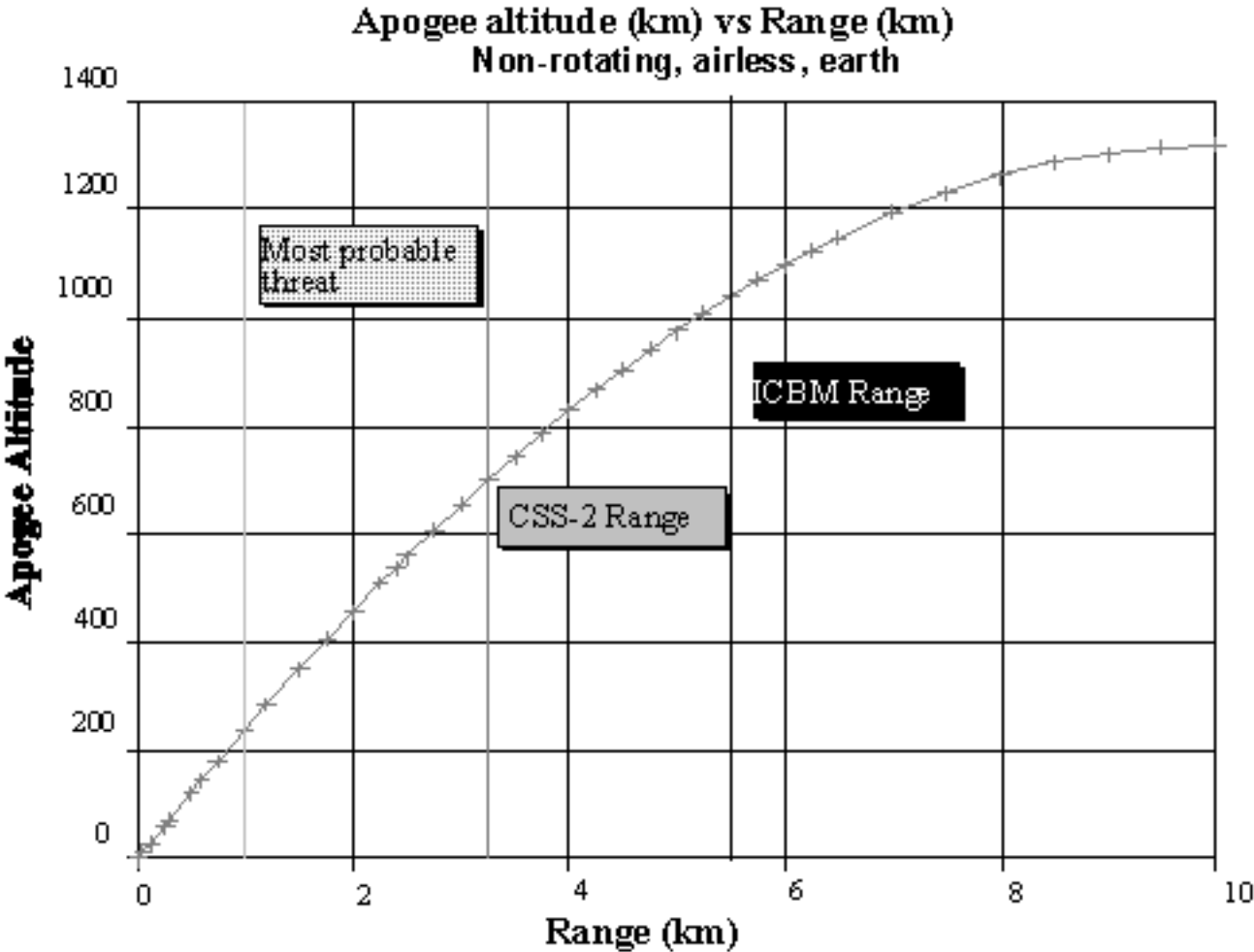
21. See Barbara Starr, *Jane's Defense Weekly*, November 11, 1995.

22. This recognizes the theoretical possibility that a *Taepo Dong II*, with a range at the outermost edge of the projected envelope of possibilities, could reach either Alaska or Hawaii from the Korean Peninsula, as well as the fact that no other missile known to be in development in the Third World can reach U.S. territory.

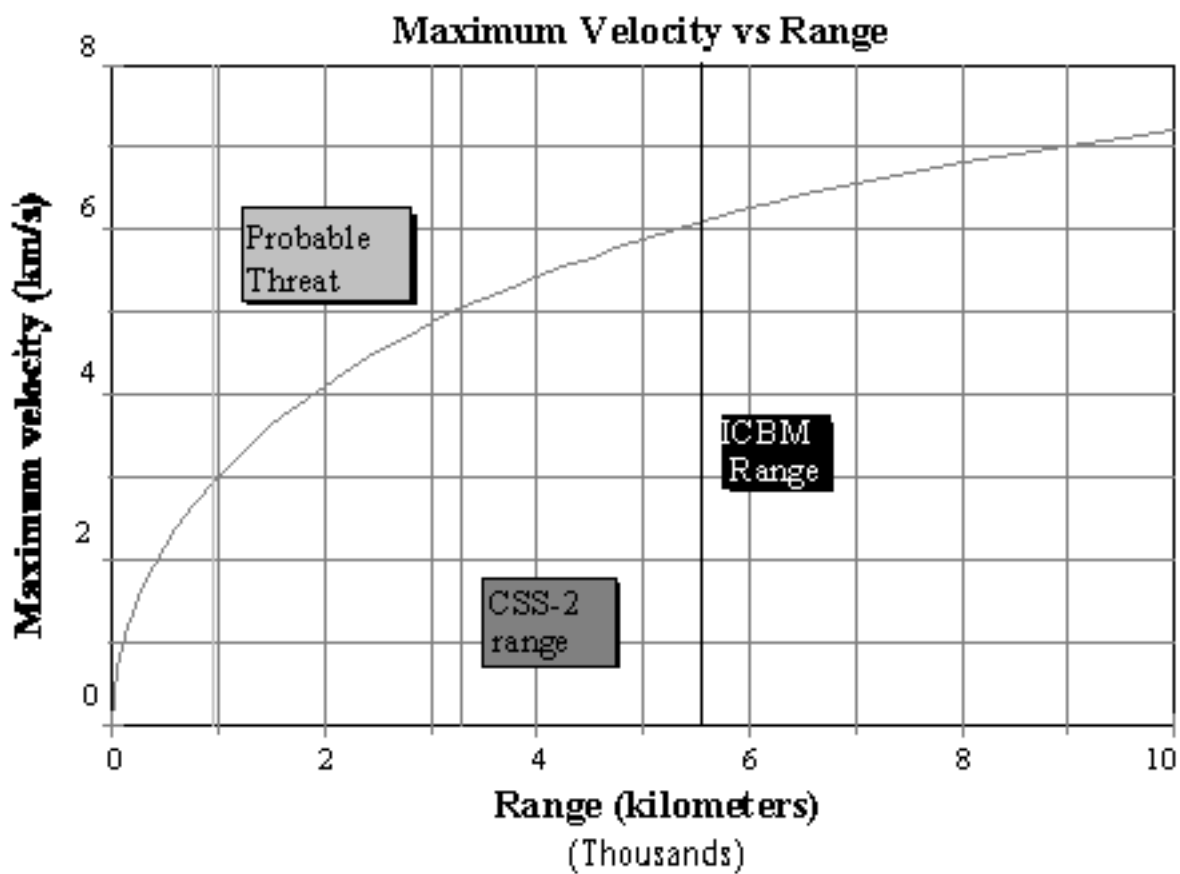
23. An SSKP of 0.7 is assumed for each interceptor and two interceptors are assumed fired at each incoming missile.

24. Peter D. Zimmerman. 1994. *Defending Against Ballistic Missile Attacks by "Micro-Nuclear" Powers*. Washington, DC: Center for Strategic and International Studies, unpublished.

GRAPH 1

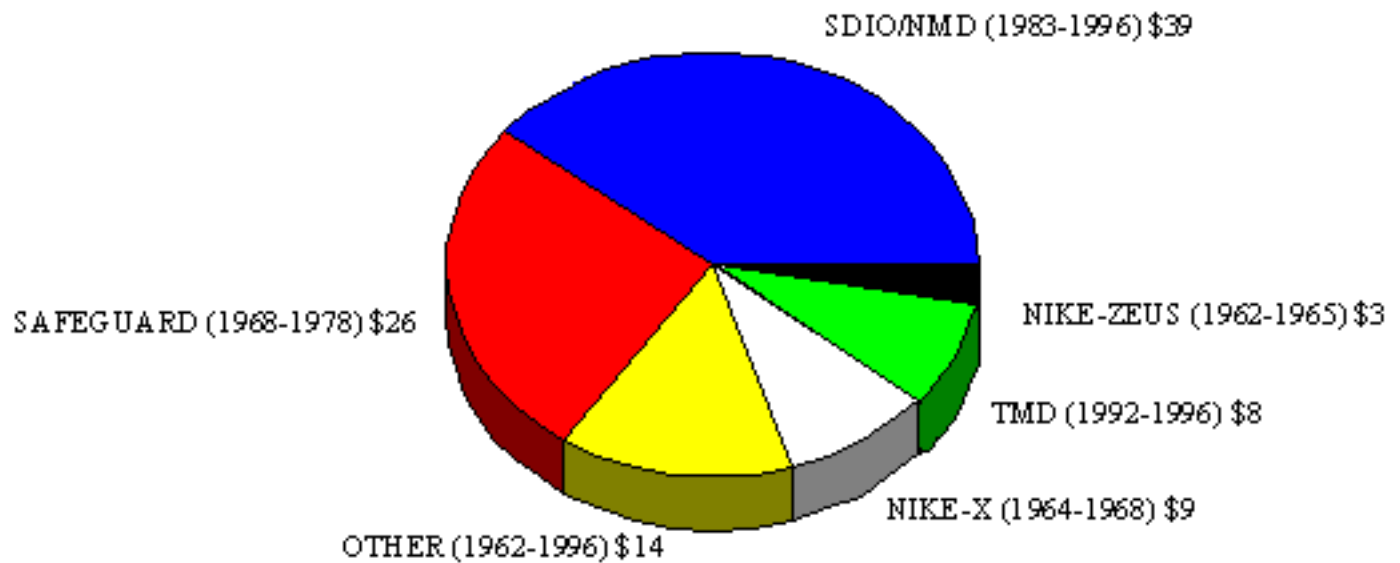


GRAPH 2



Cost of U.S. Ballistic Missile Defense Programs

FY 1962-FY 1996



Total--\$99 Billion

Figures in billions of FY95 dollars. "Other activities not directly associated with any specific major programs.

SOURCE: U.S. Nuclear Weapons Cost Study Project, The Brookings Institution, (202) 797-6030