Viewpoint

Assessing the Assessment: The 1999 National Intelligence Estimate of the Ballistic Missile Threat

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In summer 2000, the Clinton administration is scheduled to decide whether to authorize deployment by the United States of a limited national missile defense (NMD) system. This date arose from a "3+3" policy announced in the midst of the 1996 election campaign: under it, the administration would conduct research and development on missile defenses until 2000, then decide whether to proceed to a deployment that would become operational in 2003 (the date of initial operational capability has since been revised to 2005). The administration said it would base its decision on the threat, the maturity of the technology, the program's impact on US-Russian nuclear arms reductions, and the projected cost.

Of these criteria, the public and congressional discussion is increasingly being driven by the first. The perception of a rising, imminent missile threat from "rogue" states is adding to the momentum for NMD deployment. Within the Executive branch, the major threat assessment comes from National Intelligence Estimates (NIEs)—documents produced by the National Intelligence Council, whose members come from the Central Intelligence Agency (CIA) as well as all the other agencies that make up the US intelligence community.

The most recent NIE on the missile threat has been seen as supporting the proposition of an increasing, near-term threat. However, closer examination will show that it is incorrect to infer from the latest NIE a rising missile threat to the United States. The unclassified version of the 1999 National Intelligence Estimate, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015," released on September 9, 1999, reflects a lowering of previously established intelligence agency standards for judging threats. It thus presents known missile programs as more immediate threats than did previous assessments, but this is more a function of the change in evaluative criteria than of actual change in others' missile capabilities. The estimate also contains critical findings that may be overlooked or misused if the report is viewed solely as a justification for a decision to deploy a national missile defense system.

The assessment projects forward some current technological and development trends, but, by assessing "projected possible and likely missile developments by 2015 *independent* of significant political and economic changes,"[1] (emphasis added) it may overestimate potential ballistic missile threats from still developing coun-

tries such as Iraq, Iran, and North Korea, underestimate the dangers from existing arsenals in Russia and China, and poorly prepare policymakers for the sharply deteriorated international security environment that would emerge should the nonproliferation regime weaken or collapse.

Two of the most important findings are found only at the end of the assessment:

- Any country that could flight test an intercontinental ballistic missile (ICBM) will be able to develop "numerous countermeasures"[2] to penetrate a missile defense system.
- There are several other means to deliver weapons of mass destruction to the United States that would be more reliable, less expensive, and more accurate than potential new ICBMs over the next 15 years.

These two observations imply that, to the extent the missile threat is increasing, NMD may still not be viable as a means to protect the United States.

OVERESTIMATING ICBM THREATS FROM DEVELOPING NATIONS

The NIE repeatedly cautions that it tries to balance what *could* happen, with what is most likely to happen. This shift to give greater emphasis to the possible, rather than the probable, reflects the impact of the congressionally mandated Commission to Assess the Ballistic Missile Threat, which was chaired by former Defense Secretary Donald Rumsfeld. The Rumsfeld Commission report, released in July 1998, asserted, somewhat hysterically, that a new nation could plausibly field an ICBM "with little or no warning."[3] Ever since, government analysts have struggled to cover all possibilities, while still preserving their value for policymakers by reporting what is most likely to happen. This conflict is evident in the introduction to the NIE, which notes a dissenting opinion from one of the intelligence agencies involved in producing the consensus report: "Some analysts believe that the prominence given to missiles countries 'could' develop gives more credence than is warranted to developments that may prove implausible."[4]

This "could" issue is perhaps the most striking difference between the 1999 NIE and the two previous NIEs on the missile threat, published in 1993 and 1995. "Could" is a highly ambiguous word. For some it means "remotely possible," for others it means "will."

The shift to the "could" standard is just one of three major changes made to the assessment methodology from previous assessments. The other two shifts are: (1) substantially reducing the range of missiles considered serious threats, by shifting the standard from threats to the 48 continental states to threats to any part of the land mass of the 50 states; and, (2) changing the timeline for when a threat exists from when a country would first *deploy* a long-range missile to when a country could first *test* a long-range missile.

The shift on potential US targets represents a range change of some 5,000 kilometers (km) (the distance from Seattle to the western-most tip of the Aleutian island chain in Alaska). It essentially means that an intermediate-range ballistic missile, such as the Taepodong-1, could be considered the same threat as an intercontinental-range missile. The Taepodong-1 tested on August 31, 1998, impacted 1,320 km from its launch point, and tried but failed to put a small satellite into orbit. This missile does not have the range to strike any part of the United States with a large payload (for example, a nuclear warhead), though it might be able to strike the western-most parts of Alaska and Hawaii with a very small payload. The Taepodong-2 is theoretically judged to have a range of 4,000 to 6,000 km, allowing it to strike parts of Alaska and Hawaii. A three-stage Taepodong-2 would have longer range.

The timeline shift represents a difference of five years (what previous estimates said was the difference between first test and likely deployment). According to the section on "Threat Availability before 'Deployment'" in the 1999 NIE, "With shorter flight test programs—perhaps only one test—and potentially simple deployment schemes, the time between the initial flight test and the availability of a missile for military use is likely to be shortened." The Indian experience with the Agni missile provides some indication the original standard may be the more accurate. The Agni program began in the mid-1980s. An Agni-1 missile was flight tested in February 1994 and a medium-range, 2,000-km version, the Agni-2 was tested in April 1999. Despite Indian declarations of intent to deploy and substantial financial and scientific resources devoted to the program, the missile has yet to enter production.

These three changes account for almost all of the differences between the 1999 NIE and earlier estimates. Thus, the new estimate, rather than detailing a new, dra-

matic development in the ballistic missile threat, represents a lowering of the standards for judging when a system would be considered a threat. This NIE may lead some observers to conclude that there has been a significant technological leap forward in Third World missile programs, when, in fact there has been only incremental development in programs well known to analysts for years.

For example, the 1993 NIE ("Prospects for the Worldwide Development of Ballistic Missile Threats to the Continental United States," NIE 93-17) said:

> Only China and the CIS [Commonwealth of Independent States] strategic forces in several states of the former Soviet Union currently have the capability to strike the continental United States (CONUS) with land-based ballistic missiles. Analysis of available information shows the probability is low that any other country will acquire this capability during the next 15 years.[5]

The 1995 NIE ("Emerging Missile Threats to North America during the Next 15 Years," NIE 95-19), as summarized publicly by Richard Cooper, chairman of the National Intelligence Council, found:

> Nearly a dozen countries other than Russia and China have ballistic missile development programs. In the view of the Intelligence Community, these programs are to serve regional goals. Making the change from a short or medium range missile—that may pose a threat to US troops located abroad—to a long range ICBM capable of threatening our citizens at home, is a major technological leap…. The Intelligence Community judges that in the next 15 years no country other than the major declared nuclear powers will develop a ballistic missile that could threaten the continuous 48 states or Canada.[6]

Several leading members of Congress harshly attacked the 1995 and 1993 estimates. In December 1996, a congressionally mandated panel headed by former Bush administration CIA Director Robert Gates reviewed the 1995 NIE and agreed that the continental United States was unlikely to face an ICBM threat from a third world country before 2010 "even taking into account the acquisition of foreign hardware and technical assistance, and that case is even stronger than was presented in the estimate."[7]

With the three altered measurement standards and in the wake of the Rumsfeld Commission report, the new 1999 NIE finds that over the next 15 years the United States "…most likely will face ICBM threats from Russia, China and North Korea, probably from Iran, and possibly from Iraq, although the threats will consist of dramatically fewer weapons than today because of significant reductions we expect in Russian strategic forces."[8]

By making the analysis so specific, the NIE does a real service. It highlights the very narrow nature of the missile proliferation threat, one confined to a few countries whose political evolution will be a determining factor in whether they remain threats to the United States. However, by projecting "possible and likely missile developments by 2015 independent of significant political and economic changes," the NIE limits its value as a risk assessment tool. The adoption of the "could" standard and the selective and partial inclusion of political factors in analyzing the threat are the two greatest weaknesses of this NIE.

Some might argue, for example, that diplomatic developments involving North Korea made the NIE obsolete within weeks after it was publicly released. On September 17, 1999, the US administration announced it would ease sanctions against the North in response to a pledge by Pyongyang to halt further testing of long-range missiles. If North Korea does not flight test the Taepodong-2 and if that nation can be further convinced not to export missiles or related technology, this would eliminate the greatest source of an additional ICBM threat to the United States. If North Korea were taken out of the equation, there would be very little left to the 1999 estimate. No mention was made in the report of these diplomatic efforts (whose outline was known at the time) or their potential significance.

Similarly, under some other plausible scenarios, North Korea may collapse; democratizing trends in Iran could alter the direction of that nation's program; or a post-Saddam Iraq could restore friendly relations with the West. These, of course, are political risk assessments, not the kind of technology estimates the 1999 NIE details—but they were included in previous NIEs. The international political, diplomatic, and legal environments are highly relevant to the prospects for global development of ballistic missiles.

UNDERESTIMATING THE THREAT FROM EXISTING MAJOR ARSENALS

Not including political and economic conditions in the evaluation of the threat from Russia and China also results in underestimating possible missile developments in those countries. The assessment assumes that China and Russia will follow essentially status quo paths. The Russian threat will continue to be "the most robust and lethal" according to the NIE, "considerably more so than that posed by China, and orders of magnitude more than that posed by the other three [states explicitly named as potential threats]."[9] The report notes that budget constraints will force the Russian government to reduce the number of deployed missiles and concludes that an unauthorized or accidental launch "is highly unlikely so long as current technical and procedural safeguards are in place."[10]

However, there is considerable evidence of major problems with Russian command and control systems, and the continuing Russian decline could severely weaken current safeguards, increasing the risk of launches in error. If US-Russian relations deteriorate or if central government controls weaken, Russian entities could also renew missile sales to third countries. As the 1995 NIE cautioned after it made a similar assessment of the low risk of accidental or authorized launch: "We are less confident about the future, in view of the fluid political situation in both countries [Russia or China]. If there were a severe political crisis in either country, control of the nuclear command structure could become less certain, increasing the possibility of an unauthorized launch."[11]

The 1999 NIE also finds that China will only field a few tens of ICBMs (which is its current "minimum deterrent" plan). That, too, could change dramatically if the United States and Japan deploy theater missile defenses in East Asia. China might well believe it must preserve its nuclear deterrent by increasing the number and sophistication of its missiles. Because Russia and, to a lesser extent, China still pose the greatest potential missile threats to the United States, it will be important to consider whether a limited NMD would truly be effective against potential missile launches from those countries, or might instead provoke responses from them that would only exacerbate the threat.

THE WORST-CASE SCENARIO

Other countries do not make their missile policy decisions in a vacuum. Whether more nations acquire more and longer range missiles depends fundamentally on the perceived vitality of the international nonproliferation regime. If, for example, the US Senate does not reconsider its refusal to ratify the Comprehensive Test Ban Treaty, the treaty cannot enter into force. With the treaty's future highly uncertain, India is unlikely to sign and ratify the treaty and, without India, Pakistan will not. Russian and Chinese ratification of the treaty also becomes unlikely. Over the next two years, it is possible that one or all of these nations will resume testing of nuclear weapons. Faced with a weakened international regime, uncertain US adherence to international commitments, and the emergence of new nuclear nations, Japanese leaders may believe that they have no choice but to develop their own nuclear deterrent, fundamentally altering the global strategic landscape.

The NIE does not deal with Japan, nor have previous unclassified NIEs. This is not because Japan is not capable of developing an ICBM with a nuclear warhead. It could—and in a very short time. Rather, as NIE 95-19 stated: "Three countries not hostile to the United States—India, Israel and Japan—could develop ICBMs within as few as five years if they were motivated, but we judge that they are unlikely to make the necessary investments during the period of this estimate."[12]

That is, military capabilities in these countries are evaluated in light of political and economic considerations. Thus, while these countries *could* develop ICBMs, the intelligence agencies concluded that, in their political judgment, they would not. If, however, the international moratorium on nuclear testing ends, the negotiated nuclear reduction process with Russia collapses, funding is slashed for cooperative threat reduction programs in Russia, missile defenses are deployed in large numbers, and the nuclear Non-Proliferation Treaty appears to be an empty promise, India, Israel, Japan, and other nations would likely have strong motivation for developing or accelerating the development of indigenous nuclear weapons and delivery vehicles.

The catastrophic collapse of the nonproliferation regime would have a far more profound influence on the spread of nuclear weapons and advanced long-range missile technology than would the test of an intermediate-range missile in North Korea, even one with the theo-

retical capability of reaching the continental United States with a small payload. However, the latter is analyzed in the NIE, but the former is not. This results in an incomplete and distorted picture of the influences and constraints on national missile programs. Before the United States rushes to deploy a costly NMD system, it is vital that US leaders think carefully about how US policy and other international political developments, especially in relation to nonproliferation and arms control, will influence the scope of the future missile threat. With respect to proliferation, an ounce of prevention could obviate the need for a pound of cure.

COUNTERING MISSILE DEFENSES

The 1999 NIE provides the most elaborate unclassified intelligence description to date on the steps nations are likely to take in response to deployment of US theater and national missile defenses. First, it notes: "We assess that countries developing ballistic missiles would also develop various responses to US theater and national defenses. Russia and China each have developed numerous countermeasures and probably are willing to sell the requisite technologies."[13]

This possibility should not be lightly dismissed. Over the decades the United States, Russia, the United Kingdom, France, and China have all developed and deployed sophisticated countermeasures to overcome the defensive systems erected by their adversaries. The inability to discriminate among decoys and overcome other likely countermeasures remains the Achilles' heel of all currently envisioned ballistic missile defense systems. This is not a hypothetical contest. This is the experience of the existing nuclear arsenals when confronted by defensive systems.

For example, in March 1987, Lawrence Woodruff, then deputy undersecretary of defense for strategic and theater nuclear forces, described the contest between the offense and the defense to the House Armed Services Committee this way:

> The Soviets have been developing their Moscow [ABM] defenses for over ten years at a cost of billions of dollars. For much less expense we believe we can still penetrate these defenses with a small number of Minuteman missiles equipped with highly effective chaff and decoys. And if the Soviets should deploy more advanced or proliferated defenses, we have new penetration aids as counters under development…. We are developing a new maneuvering re-entry vehicle [RV] that could evade interceptor missiles.[14]

For these reasons, the Joints Chiefs of Staff were always supremely confident of US ability to overwhelm and penetrate the Moscow anti-ballistic missile system.

Countries attempting to develop medium- or long-range missiles would not, however, have to rely on the purchase or transfer of countermeasure technology. The NIE lists eight distinct currently available technologies that such countries could employ: "Many countries, such as North Korea, Iran and Iraq probably would rely initially on readily available technology—including separating RVs, spin-stabilized RVs, RV reorientation, radar absorbing material, booster fragmentation, low-power jammers, chaff, and simple (balloon) decoys—to develop penetration aids and countermeasures."[15]

The NIE further concludes that these countries could develop these countermeasures "by the time they flight test their missiles."[16] Moreover, foreign espionage and other collection efforts are likely to increase, says the NIE, increasing the likelihood that adversary nations could use critical information about US defenses to improve their ability to overcome such defenses.

These "readily available technologies" could present severe problems for any missile interceptor. Again, these are not new technologies. An analysis prepared by the Office of Technology Assessment in 1988 confirmed that:

- "There are plausible decoy designs that would be very difficult to counter merely with passive infrared sensors in conjunction with radar."
- "It appears possible that chaff, if properly deployed with decoys, could be used to deny RV [re-entry vehicle] detection and more easily, deny RF [radio frequency] discrimination to the radar elements of a defense."
- "Whereas chaff would deny information to radar, aerosols would mask RVs and decoys from infrared sensors."[17]

The Defense Science Board also noted in 1987 in their review of sensor systems then under consideration, including the ground-launched Probe system and the satellite-based Space Surveillance and Tracking System (SSTS), (the predecessor of the Space-Based Infrared System now planned): "Serious questions remain unan-

swered about the ability of the passive IR [infrared] sensors on Probe and SSTS to carry out discrimination against anything but the most primitive decoys and debris. In addition, the presence of cooled RVs would greatly reduce the range of proposed sensors."[18]

These serious questions remain today. Some may believe that the United States has recently solved the discrimination problem. The first intercept test of a proposed national missile defense interceptor on October 2, 1999, contained a test element where the interceptor was to distinguish between the target and a decoy object. The interceptor vehicle, using "hit to kill" technology, successfully collided with and destroyed the target. In briefings before the successful October 1999 test, however, Ballistic Missile Defense officials provided important qualifying details of the test. In particular, there were four critical test enhancements that made the test conditions not entirely realistic:

1. the target followed a pre-programmed flight path to a designated position;
2. the interceptor missile also flew to a pre-programmed position;
3. a Global Positioning Satellite (GPS) receiver was placed on the target to send its position to ground control, and the necessary target location information was downloaded to a computer in the kill vehicle; and
4. the decoy released had a significantly different thermal signature than the target, making it easier for the sensors on the kill vehicle to distinguish between the objects.

Subsequent reports have made clear other problematic aspects of the test:

5. incorrect star maps loaded into the kill-vehicle's computer prevented the vehicle from ascertaining its position once it had separated from the booster;
6. back-up inertial guidance systems led to inaccuracies in pointing the sensors used to locate the target; and
7. the sensors finally saw the large, bright balloon decoy, re-oriented, continued searching, and only by virtue of the proximity of the decoy to the target did they locate the cooler warhead that the kill vehicle had been programmed to recognize as the correct target.

The interceptor failed to hit its target in the second intercept test, on January 18, 2000. Initial reports blamed the failure on faulty sensors.

For test purposes, there is nothing wrong with minimizing the number of variables in order to test key elements of the weapon system. It is vital, however, that test officials provide full disclosure of test limitations to policymakers at every stage of the process, lest test results be interpreted to have greater significance than, in fact, they do. The October test was much more a demonstration of two missiles intercepting each other than it was a test of intercepting an enemy missile under combat conditions. Until interceptor tests are conducted under real-world conditions in the presence of realistic decoys and countermeasures and independently assessed by objective evaluators, it will be impossible to ascertain the effectiveness of proposed ballistic missile defense systems.

FORWARD-BASED THREATS

As previous NIEs have reported (in 1993 and 1995), any new nation seeking to develop an ICBM faces formidable technological obstacles. These include, but are not limited to: propulsion technology; guidance and RV technology; and warhead construction (production of fissile material, warhead design and miniaturization, and weaponization to fit the warhead to a delivery system). The 1993 NIE also reported that Iran, Iraq, or North Korea could "significantly shorten their indigenous development timelines through the acquisition of foreign equipment and help."[19]

Given the difficulties of ICBM development, it is important to consider other delivery systems that emerging proliferators might pursue instead. In this regard, the 1999 NIE does a significant service by discussing in greater detail than previous unclassified assessments the dangers posed by delivery vehicles other than ICBMs. For developing countries, attractive options include forward-based launchers (sea-based short- or medium-range ballistic missiles, cruise missiles, and aircraft) and covert delivery by ship, plane, or land.

The assessment notes that these delivery methods, while not as prestigious as ICBMs, are "of significant concern," "might be the means of choice for terrorists," and offer many advantages over the development of long-range missiles, including that they:

- would be significantly less expensive;
- could be covertly developed and deployed;
- would be more reliable than ICBMs;
- would be more accurate than ICBMs over the next 15 years;

• would be more effective for disseminating a biological warfare agent than a ballistic missile; and
• would negate missile defenses.

Because of the availability and attractiveness of forward-based options, even an NMD that is at least partially effective against limited ICBM attacks will be irrelevant against much of the likely threat, and deployment may simply lead rogue states to choose these other options instead.

IS THE MISSILE THREAT ACTUALLY INCREASING?

The NIE refers in several instances to the "evolving ballistic missile threat." This is a more accurate term than the commonly used "increasing ballistic missile threat." It has become common wisdom and certainly common political usage to refer to the growing threat of ballistic missiles. But is this true? The threat is certainly changing. It is increasing by some measures, but by several important criteria, the ballistic missile threat to the United States is greatly reduced from the early 1980s.

For example, the number of ICBMs (with ranges over 5,500 km) has decreased dramatically since the height of the Cold War. In 1986, at that time Soviet deployments totaled over 9,540 nuclear warheads on 2,318 long-range missiles aimed at the United States.[20] Currently, Russia has fewer than 5,200 missile warheads deployed on approximately 1,100 missiles.[21] With or without the implementation of START I and II, Russia is expected to field fewer than 2,000 nuclear warheads on missiles and bombers by 2010, perhaps no more than several hundred, depending on political and economic factors.

During this period China has maintained a force of some 20 ICBMs. The NIE projects that this force will remain roughly the same size, although, as noted, military and political developments could result in significant increases.

The number of intermediate-range ballistic missiles (with ranges of 3,000 to 5,500 km) has also decreased dramatically over the same period. President Ronald Reagan negotiated and implemented the Intermediate-Range Nuclear Forces (INF) Treaty, eliminating this entire class of missiles from US and Soviet arsenals. The Soviet Union destroyed 1,846 missiles in this range, and the United States destroyed 846 ballistic and cruise missiles. China has some 20 DF-4 missiles in this range, the first of which was deployed in 1980. No other nation has deployed a missile in this range, though the launch of a two-stage Taepodong-2 could add a few missiles to this category.

Apart from China and Russia, a few countries have conducted tests of medium-range ballistic missiles (with ranges of 1,000 to 3,000 km), which do not threaten the territory of the United States. India intends to begin production of the Agni-2, with a range of about 2,000 km, and is believed to be working on a longer-range Agni-3 of 3,500-km range. The only other significant medium-range threats come from missiles derived from the North Korean Nodong (1,000-km range): Pakistan's Ghauri missile (1,300-km range) and Iran's Shahab-3 (also 1,300-km range). There are some speculative reports that Pakistan is working on a Shaheen-2 missile of 2,400-km range. Saudi Arabia is believed to have a number of DF-3 missiles (2,600-km range) purchased from China before that nation agreed to abide by Missile Technology Control Regime (MTCR) restrictions.

Almost all the other nations that possess ballistic missiles have only short-range ballistic missiles (as detailed in the Appendix). The blurring of short- and intercontinental-ranges for the world's missiles results in the misinterpretation of the oft-quoted assessment that over 25 nations possess ballistic missiles. This is true, but only China and Russia have the capability to hit the United States with a nuclear warhead. This has not changed since Russia deployed its first ICBM in 1959 and China its first in 1981.

The number of countries trying or threatening to develop long-range ballistic missile has not changed greatly in 15 years, and by some indications may actually be considered smaller than in the past. We now worry primarily about five nations, in addition to Russia and China: North Korea, Iran, Iraq, India, and Pakistan. Fifteen years ago, North Korea was not a concern, but Brazil, Argentina, Egypt, South Africa, and perhaps Libya were all involved in programs to develop long-range missiles. All have since terminated such efforts. Israel retains the capability to develop long-range missiles, but is not considered a threat to the United States nor a likely exporter of missile technology.

Fifteen years ago the threat confronting the United States from ballistic missiles was much greater than it is today. It is demonstrably not true that, as the NIE concludes, "…the probability that a WMD [weapon of mass destruction]-armed missile will be used against US

forces or interests is higher today than during most of the Cold War."[22] Many times in the past 40 years, the citizens of the United States were deeply fearful that a global thermonuclear exchange would be triggered through deliberate confrontation, miscalculation, or accident. Such an exchange would have destroyed the planet, not just the nation. While the possibility of an accidental or unauthorized launch of a Russian ballistic missile is increasing as economic and technological conditions in that country deteriorate, the possibility of an all-out nuclear war is remote. While the threats facing the United States are serious, they are orders of magnitude removed from the threats that Americans confronted and thankfully escaped during the Cold War.

Finally, it is also not accurate to conclude, as the NIE does, that "acquiring long-range ballistic missiles armed with WMD will enable weaker countries to do three things that they otherwise might not be able to do: deter, constrain, and harm the United States."[23] This confuses weapons of mass destruction with delivery vehicles. A nation that announced it had placed a nuclear weapon in downtown Washington, DC, would be just as able to deter, constrain, and harm the United States as a nation that announced it had an ICBM with a nuclear warhead—perhaps more so. Nor would the existence of a missile defense system fundamentally alter this situation. No defense system currently envisioned would give military commanders the confidence they would need to assure the president that a missile launched at the United States would definitely be intercepted.

IMPLICATIONS FOR DEPLOYMENT OF MISSILE DEFENSE SYSTEMS

Policymakers should prudently conclude that, given current technological options and threat estimates, it appears very likely that deployment of a limited NMD system will result in other countries increasing the numbers of missiles they deploy and improving their countermeasure capabilities. In short, anti-missile deployments are likely to exacerbate the very problem that missile defense proponents hope to deter.

To ensure confidence in the reliability and effectiveness of any proposed ballistic missile defense, Congress should request an independent review of ABM technologies and tests, similar to a review conducted by the American Physical Society in 1984-85 on directed energy weapons.[24] This would provide Congress with an objective assessment of available defense technologies, filtering out political agendas, contractor influences, and career considerations from this critical national security decision. The National Academy of Sciences and the American Physical Society are two organizations that could be considered for this role.

For the foreseeable future, the most reliable methods for preventing ballistic missile threats to the United States remain agreements to prevent and reduce the threat in the first place; strong conventional forces at the ready to deter the use of weapons of mass destruction; and counterforce weapons to destroy missiles and weapons before they can be launched. Finally, the most reliable assessments for predicting the future development of the threat will be those that are independently conducted free from political pressures and in which technical assessments are fully integrated with the best available economic and political analysis. A balanced and comprehensive assessment of this kind would be unlikely to conclude that the overall missile threat to the US homeland is increasing significantly.

[1] National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015," September 9, 1999, <http://www.cia.gov/cia/publications/nie/nie99msl.html>. This report and previous intelligence estimates and report are also available at the "Critical Resources" section of the Carnegie Non-Proliferation Project website, <www.ceip.org/npp>.

[2] Ibid.

[3] Report of the Commission to Assess the Ballistic Missile Threat to the United States, Executive Summary, July 15, 1998, p. 6, <ftp://fedbbs.access.gpo.gov/gpo_bbs/cia/bmt.htm> and available at the Carnegie Non-Proliferation Project website, <www.ceip.org/npp>.

[4] National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015," Preface.

[5] Central Intelligence Agency, "Prospects for the Worldwide Development of Ballistic Missile Threats to the Continental United States," NIE 93-17, <http://www.ceip.org/programs/npp/ciaprospects.htm>.

[6] House National Security Committee, Hearings on Ballistic Missile Defense, Statement for the Record by Richard N. Cooper, Chairman, National Intelligence Council for Hearings of 28 February 1996, "Emerging Missile Threats to North America during the Next 15 Years," <http://www.ceip.org/programs/npp/ciacooper.htm>

[7] Robert Gates, Chairman, Independent Panel Review of "Emerging Missile Threats to North America During the Next 15 Years," <http://209.207.236.112/irp/threat/missile/oca961908.htm>.

[8] National Intelligence Council, "Foreign Missile Developments and the

Ballistic Missile Threat to the United States Through 2015," Key Points, <http://www.cia.gov/cia/publications/nie/nie99msl.html#rtoc2>.
[9] Ibid.
[10] Ibid.
[11] Richard N. Cooper, Chairman, National Intelligence Council for Hearings of 28 February 1996, "Emerging Missile Threats to North America during the Next 15 Years."
[12] Ibid.
[13] National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015," Penetration Aids and Countermeasures, <http://www.cia.gov/cia/publications/nie/nie99msl.html#rtoc20>.
[14] See, Staff Report on the Strategic Defense Initiative, Democratic Caucus of the U.S. House of Representatives, "Strategic Defense, Strategic Choices," May 1988, available from author.
[15] Ibid.
[16] Ibid.
[17] See, Staff Report on the Strategic Defense Initiative, Democratic Caucus of the U.S. House of Representatives, "Strategic Defense, Strategic Choices," May 1988.
[18] Ibid.
[19] Central Intelligence Agency, "Prospects for the Worldwide Development of Ballistic Missile Threats to the Continental United States."
[20] Robert Norris and Thomas Cochran, *Nuclear Weapons Databook, U.S.-USSR/Russian Strategic Offensive Nuclear Forces, 1945- 1996*, Natural Resources Defense Council, January 1997, pp. 13 and 46.
[21] "NRDC Nuclear Notebook: Russian Strategic Nuclear Forces, End of 1998," *Bulletin of the Atomic Scientists* (March/April 1999), pp. 62-63.
[22] National Intelligence Council, "Foreign Missile Developments and the Ballistic Missile Threat to the United States Through 2015."
[23] Ibid.
[24] *Report to The American Physical Society of the study group on science and technology of directed energy weapons*, Reviews of Modern Physics, Volume 59, Number 3, Part II, July 1987.

Appendix: Countries Possessing Ballistic Missiles[1]

This chart is updated from *Tracking Nuclear Proliferation 1998* (Carnegie Endowment for International Peace, July 1998). It lists the countries, other than the five nuclear powers, that have operational ballistic missiles with range capabilities of over 10 kilometers. Although some countries have demonstrated the ability to use surface -to-air missiles in a surface-to-surface role, these systems are not listed unless they are deployed as dedicated ballistic missiles such as China's CSS-8. Range is given in kilometers and payload in kilograms. There is a key to abbreviations at the end of the table.

COUNTRY	SYSTEM	STATUS	RANGE/ PAYLOAD	COUNTRY OF ORIGIN	NOTES
Afghanistan	Scud B	O	300/1,000	USSR	
Algeria	Scud B	O	300/1,000	USSR	
Armenia[2]	Scud B	O	300/1,000	Russia	
Azerbaijan	Scud B	O	300/1,000	USSR	
Belarus	SS-21	O	70-120/480	USSR	
	Scud B	O	300/1,000	USSR	
Bulgaria[3]	Scud B	O	300/1,000	USSR	
	SS-23	O	500/450	USSR	Banned by INF Treaty
Czech Republic[4]	SS-21	O	70-120/480	USSR	
Egypt	Scud B	O/U	300/1,000	USSR	
	Project T	O	450/1,000	I/DPRK	
	Scud Mod C[5]	O	500/700	DPRK	
Georgia	Scud B	O	300/1,000	USSR	

COUNTRY	SYSTE	STATUS	RANGE/ PAYLOAD	COUNTRY OF ORIGIN	NOTES
India	Prithvi-150	O	150/1,000	I/USSR	From Russian SA-2
	Prithvi-250	D/T	250/500	I/USSR	From Russian SA-2
	Prithvi-350	D	350/500	I/USSR	From Russian SA-2
	Agni-2[6]	D/T	2,000/1,000+	I/US/France	From Scout
	Sagarika	D	300/500	I/Russi	From Prithvi/SA-2
	Surya	D	12,000/?	I	From PSLV
Iran[7]	Mushak-120	O/U?	120/500	I/PRC	
	Mushak-160	O/U?	160/190	I/PRC	
	Mushak-200	O/U?	200/500	I/PRC	
	CSS-8	O	150/190	PRC	Mod SA-2
	Scud B[8]	O/U	300/1,000	Libya	
	Scud Mod B	O/P	300/1,000	DPRK	
	Scud Mod C	O	500/700	DPRK	
	Zelzal-3	D	1,000-1,500/1,000	I/?	
	Tondar-68	D	1,000/500	I/PRC	Chinese M-18?
	Shahab-3[9]	T	1,300/700	I/DPRK	from Nodong
	Shahab-4	D	2,000/1,000	I/Russi	from Russian SS-4
Iraq	Ababil-100	P	100-150/300	I	
	Al Samoud	P	150/?	I	From Scud[10]
	Scud B	Hidden?	300/1,000	USSR	
	Al Hussei	Hidden?	600-650/500	I	From Scud
	Al Hijarah	Hidden?	600-650/250?	I	From Scud
Israel	Lance	O/S	130/450	US	MOU
	Jericho-1	O	500/500	France	
	Jericho-2	O	1,500/1,000	France/I	
	Jericho-3	D	2,500/1,000	I	
Kazakhstan	SS-21	O	70-120/480	USSR	
	Scud B	O	300/1,000	USSR	
Libya[11]	Scud B	O/U	300/1,000	USSR	
	Al Fatah (Ittisalt)[12]	D/T	950/500	I/?	
North Korea[13]	Scud Mod B	O/P	300/1,000	USSR	
	Scud Mod C	O/P	500/700	I	
	Nodong[14]	D/T	1,000/700-1,000	I	
	Taepodong-1[15]	T	1,500+/1,000	I	Nodong + Scud
	Taepodong-2	D	4,000-6,000/1,000	I	

COUNTRY	SYSTEM	STATUS	RANGE/ PAYLOAD	COUNTRY OF ORIGIN	NOTES
Pakistan	M-11	S	280/800	PRC	
	Hatf-1	O	80/500	I/France?	
	Hatf-1A	O	100/500	I/France?	
	Hatf-2[16]	D	280-300/500	I/PRC?	M-11 derivative?
	Hatf-3	D?	600/500	I/PRC?	M-9 derivative?
	Ghauri (MK-III)[17]	T	1,500/500-750	I/DPRK	From Nodong
	Shaheen-2[18]	D?	2,400	I/PRC?	
Poland	SS-21	O	70-120/480	USSR	
	Scud B	O	300/1,000	USSR	
Romania[19]	Scud B	O	300/1,000	USSR	Unilateral?
Saudi Arabia	CSS-2/ DF-3	O	2,600/2,150	PRC	Non-nuclear
Serbia	K-15 Kraijina	D	150/?	I	
	Scud Mod[20]	D	400/700	???	
South Korea	Nike-Hercules-1	O	180/300	US/I	Mod SAM
	Nike-Hercules-2	D	250/300	US/I	Mod SAM
Slovakia	SS-21	O	70-120/480	USSR	
	Scud B	O	300/1,000	USSR	
	SS-23[21]	O	500/450	USSR	Banned by INF Treaty
Syria	SS-21	O	70-120/480	USSR	
	Scud B	O	300/1,000	USSR	
	Scud Mod C[22]	O	500/700	DPRK	
	M-9	D?	600/950	PRC?	
Taiwan	Ching Feng	O	130/400	I/Israel?	Green Bee
	Tien Ma	D?	950/500	I/?	Sky Horse
	Sky Spear[23]	D	300/?	I	Mod SAM
United Arab Emirates	Scud B	O	300/1,000	Russia?	
Ukraine	SS-21	O	70-120/480	USSR	MOU
	Scud B	O	300/1,000	USSR	
Vietnam	Scud B	O	300/1,000	USSR	
Yemen	SS-21	O	70-120/480	USSR	
	Scud B	O/U	300/1,000	USSR	
Zaire	Scud Mod B	O	300/1,000	DPRK[24]	

Abbreviations

Status	Country of Origin	Notes
D: in Development O: Operational P: in Production S: in Storage T: Tested U: Used	I: Indigenous	Unilateral: Unilateral Commitment to MTCR MOU: Memorandum of Understanding on adherence to MTCR SAM: Surfac -to-air missile Mod SAM: SAM modified for use as a ballistic missile

[1] Principle sources for this table include Humphrey Crum Ewig, Robin Ranger, and David Bosdet, "Ballistic Missiles: The Approaching Threat," Bailrigg Memorandum 9, 1994, Center for Defense and International Security Studies (CDISS); Rober Shuey with Craig Cerniello, "Ballistic and Cruise Missile Forces of Foreign Countries," Congressional Research Service, June 5, 1995; US Defense Intelligence Agency (DIA), "Global Missile Proliferation Threat," presented to the Missile Technology Control Regime Transshipment Seminar, July 15, 1996; US Department of Defense (DOD) *Proliferation: Threat and Response*, November 1997; "Missile Proliferation" in *The Military Balance 1995-1996* (London: International Institute of Strategic Studies, 1995), pp. 281-284; "Ballistic and Cruise Missiles," in *The Military Balance 1999/2000* (London: International Institute of Strategic Studies, 1999); Duncan Lennox, "Ballistic Missiles," *Jane's Defence Weekly*, April 17, 1996, p. 40; National Intelligence Estimate, "Foreign Missile Developments and the Ballistic Missile Threat to the United States through 2015," September 9, 1999; "Artillery Rocket, Ballistic Missile, Sounding Rocket, and Space Launch Capabilities of Selected Countries," *The Nonproliferation Review* 3 (Spring-Summer 1996), pp. 162-165; and *The Proliferation Primer* (Washington, DC: US Senate Committee on Governmental Affairs, January 1998)

[2] Russia shipped eight Scud launchers and 24 missiles to Armenia between 1992 and 1995. Nikolai Novichkov, "Russia details illegal deliveries to Armenia," *Jane's Defence Weekly*, April 16, 1997, p. 15.

[3] Vaseil Lyutskanov, "Existence of Eight SS-23 Missile Complexes Viewed," *Trud*, September 13, 1996, in FBIS-EEU-96-179 (September 16, 1996).

[4] The Czech Republic dismantled its Scud-B inventory between 1988 and 1991. The last SS-23 and associated launcher and support equipment in the Czech Republic was destroyed by mid-1996. "Czechs Destroy Last Soviet Missiles," *OMRI Daily Digest*, July 26, 1996, p. 4.

[5] According to Admiral Studeman, "Pyongyang has provided Scud missiles and production equipment to Egypt." See Senate Committee on Armed Services *Worldwide Threat to the United States*, January 17, 1995, p. 39. The DIA lists Egypt as a recipient of missile-related transfers from North Korea. Egypt reportedly received seven shipments of Scud Mod C -related material, possibly including production equipment, in 1996. Bill Gertz, "Cairo's Missile Buy Violates US Laws," *Washington Times*, June 21, 1996, p. 1.

[6] The National Intelligence Estimate, "Foreign Missile Developments and the Ballistic Missile Threat to the United States thr 2015" of September 9, 1999 gives an estimate range of 2,000 km for the Agni-2. The missile w s flight tested on April 11, 1999. An Agni-1 was flight tested in February 1994.

[7] The DOD lists a 200-km Zelzal missile and a 150-km Nazeat missile, which may be variations of the Mushak series. Iran has also tried to acquire a complete North Korean Nodong system and the Chinese M-9 and M-11 missiles

[8] During the Iran-Iraq War, Libya and Syria shipped Soviet-built Scud Bs to Iran. DOD lists the Libyan-supplied Scuds as still in Iran's inventory.

[9] Range estimate provided in National Intelligence Estimate, September 9, 1999. The only flight test of the Shahab-3 was on July 21, 1998.

[10] A recent intelligence report called the Al Samoud a "scaled down Scud." See "Iraq's Weapons of Mass Destruction Programs," US Government White Paper No. 3050, released February 17, 1998.

[11] The DOD and DIA say Libya's only operational missiles are Scud Bs acquired from the USSR. However, then Director of Central Intelligence Deutch listed Libya as one of the recipients of North Korean Scud missiles (possibly the Scud Mod B or C). See Senate Select Committee on Intelligence, *Current and Projected National Security Threats to the United States and Its Interests Abroad*, February 22, 1996, p. 9. The DIA also lists Libya as a recipient of missile-related technology from North Kor , but according to a March 1995 CIA report, *The Weapons Proliferation Threat*, Libya possesses only Scud Bs. Libya has als sought to acquire the North Korean Nodong missile, but is not reported to have made the purchase yet.

[12] According to the DOD, Libya's indigenous missile program has only succeeded in producing missiles with ranges of about 200 km. Libya hopes that the Al Fatah will reach ranges of up to 950 km, but so far it has only been successfully tested to 200 km. A Serbian firm, JPL Systems, is reportedly aiding Libya's Al Fatah missile program. Bill Gertz, "Serbia Is Helping Libya With Ballistic Missiles, CIA Says," *Washington Times*, November 12, 1996, p. 3.

[13] "North Korea builds and is likely to offer for export earlier Scud-based, short-range ballistic missile systems in the 300, 500, and probably 800 kilometer range. We are talking here about what is known as Scud B, C and D systems." Admiral Studeman, Senate Committee on Armed Services *Worldwide Threat to the United States*, January 17, 1995, p. 18. An 800-km Scud Mod D has not been listed by any other sources

[14] A December 1995 DIA report estimates that the Nodong can carry a 1,000 -kg payload to 1,000 kilometers. Defense Intelligence Agency, *North Korea: The Foundations for Military Strength Update 1995*, December 1995, p. 6. Other estimates differ: "We assess the No Dong is capable of delivering a 700 kg payload to 1,000 kilometers." Admiral Studeman, Senate Committee on Armed Services, *Worldwide Threat to the United State* , January 17, 1995, p. 39. Reportedly, Syria, Libya, and Iran are interested in purchasing the Nodong when it is operational.

[15] The Department of Defense, *Proliferation: Threat and Response*, November 1997, notes that the Taepodong-1 has a range of at least 1,500 km. Other sources including Shuey and Cerniello, "Ballistic and Cruise Missile Fo ces," and Ewig et al., "Ballistic Missiles," suggest a range of 2,000 km and a payload of 1,000 kg.

[16] One analysis suggests that Pakistan developed the Hat -2 based on French sounding rocket engines that it had obtained. See S. Chandrashekar, "An Assessment of Pakistan's Missile Capability," *Jane's Strategic Weapon Systems*, March 1990, p. 4.

[17] Several reports raised speculation about the development of the new intermediate-range Ghauri missile in Pakistan prior to its surprise test on April 6, 1998. The missile has an apparent range of 1,500-2,000 km. See Ben Sheppard, "Too close for comfort: ballistic ambition in South Asia," *Jane's Intelligence Review*, January 1998, pp. 32-35; "Pakistan: Pakistani Daily Reports Ghauri Missile Development," *Rawalpindi Jang*, January 3, 1998, p. 4, translated in FBIS-TAC-98-005, (January 5, 1998).

[18] Reported in *The Hindu*, September 27, 1999.

[19] The United States is assisting Romania in the dismantlement of its Scud missiles and launchers. Prepared Statement of Thoma McNamara, Assistant Secretary of State for Political-Military Affairs, Senate Subcommittee on International Economic Policy, Export and Trade Promotion, March 12, 1997.

[20] See the CDISS website, <http://www.cdiss.org/btablea2.htm#SAUDI>.

[21] Slovakia's posse ion of SS-23 missiles has been confirmed by Prime Minister Meciar. Nora Sliskova, "Meciar Comments on NAT Referendum, -23 Missiles," *Pravda*, November 30, 1996, in FBIS-EE -96-232 (December 4, 1996).

[22] Admiral Studeman lists a Scud Mod C transfer from North Korea to Syria. Senate Committee on Armed Services, *Worldwide Threat to the United State* , January 17, 1995, p. 39. The Nonproliferation Center, *Weapons Proliferation Threat*, March 1995, states that Syria ha both the Soviet-supplied Scud B and North Korean-supplied Scud Mod C.

[23] This program was reportedly begun in the fall of 1995 and is based on the Sky Bow II SAM. Lu Chao-lung, "Taipei to Test Surface-to-Surface Missiles," *Chung-Kuo Shih-Pao*, September 11, 1996, in FBIS-CHI-96-180 (September 17, 1996).

[24] Lennox, "Ballistic Missiles," lists Zaire as a possessor of Scud B variants. North Korea is the only known supplier of such missiles, but this transfer has not been otherwise confirmed.