DEFENDING AMERICA
REDEFINING THE CONCEPTUAL BORDERS
OF HOMELAND DEFENSE

Report on Homeland Defense
and National Missile Defenses

MAIN REPORT

FINAL REVIEW DRAFT

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Introduction

The following report is a rough initial draft section of a full report on Homeland Defense being prepared as part of the CSIS Homeland Defense project. It is a rough working draft, and reflects solely the views of the author and not of the CSIS team working on the project. It is being circulated for comment and reaction and will be substantially modified and updated before being included in the final report.
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Executive Summary

Proliferation poses a broad range of threats to the US homeland, as well as to our allies and coalition partners. The proliferation of long-range missiles armed with weapons of mass destruction is one of these threats, and it has become obvious that nations such as Iran and North Korea may be acquiring the capability to build such missiles, and the ability to arm them with nuclear or highly lethal biological weapons. While such threats are now only potential ones, these shifts in technological and manufacturing capability mean that nations like Iran and North Korea may be able to pose serious threats to the American homeland, possibly as early as during the next few years. Such threats may create a near to mid-term need for national missile defense (NMD).

There is an even greater chance that longer-term threats to the US homeland will emerge that are more serious than the near-term threats that could be posed by nations like Iran and North Korea. Advances in missile and biotechnology, and the spread of related manufacturing capabilities could give a number of nations the capability to develop missiles that can reach American territory and that are armed with warheads capable of causing massive casualties. Even if no near to mid-term missile threat is deployed by proliferating countries, the US may well need to develop a more robust and capable NMD system to deal with such longer term threats.

At the same time, the missile threats from proliferating remain potential threats. They are also are only part of the spectrum of military threats the US must deal with. The primary missile threat to the US will continue to come from the existing forces of Russia and China, not new proliferators like Iran, Iraq, and North Korea. The decision to deploy an NMD program cannot be decoupled from its potential impact in provoking changes in the very real threats the US already faces from Russia and China and in creating major problems for arms control.
Deploying a National Missile Defense System and the “Delicate Balance of Deterrence”

Other issues compound the problems for US decision-making. First, there are many other ways that an attacker can strike at the American homeland. The currently contemplated national missile defense is only effective against systems with intercontinental ranges. It provides little or no defense against shorter range, sea-launched ballistic missiles, cruise missiles, or bombers. It provides no defense against chemical, biological, radiological, or nuclear (CBRN) weapons smuggled into the US or assembled on its soil. It provides no defense against attacks using new technologies like cyberwarfare.

The primary threats that proliferation poses to the US do not originate from peer competitors or nations that oppose the US per se. They are outgrowths of theater and regional-level conflicts and tensions, primarily in the Gulf, Middle East, Koreas, and Taiwan Straits. National missile defense cannot defend America’s allies, except to the degree it helps ensure that the US cannot be threatened or blackmailed by the risk of attacks on its soil. It cannot defend allied territory, or the sources of America’s key imports and the security of a global economy. National missile defense that is decoupled from theater defense can only defend the American homeland in the narrowest physical sense. It cannot defend the homeland in terms of its economy or American strategic interests.

The currently contemplated national missile defense system also presents major problems in terms of Russia and China. It will have little intercept capability against an accidental or limited launch of the more sophisticated Russian missile systems, whose penetration aids might well defeat the US interceptors. It is not designed to deal with any substantial attack by missile forces as large as those of Russia, and could not deal with a major Chinese build-up of its new ICBMs. Current NMD options cannot provide a shield that can protect the US in ways that are a substitute for strong offensive retaliatory forces, arms control efforts to limit and reduce the Russian and Chinese threat, or efforts to negotiate a solution to regional tensions.

Deploying an NMD system could simply “squeeze the balloon” in the sense it pushes
hostile states and movements to use other forms of attack, many of which are cheaper than
missile attacks, harder to attribute and retaliate against, and at least as lethal. Unless NMD is part
of a fully balance homeland defense program, it may well do no good and might do more harm
than good. Even if it is part of such a program, it could simply increase the threat to our allies
and overseas interests, limit progress in arms control, and create new regional tensions. In this
sense, the largely bipolar “delicate balance of terror” that shape the Cold War has been replaced
by a multipolar “delicate balance of deterrence” that requires far more sophisticated US policies
and approaches to homeland defense.

Reconsidering the Programming Options for Deploying a National
Missile Defense System and the “Delicate Balance of Deterrence”

The US is now reaping the costs of politicizing its NMD program. President Clinton has
defered any decision on deploying the first part of an NMD system and left it to his successor.
This decisions reflects problems in the development and test program, in negotiating an approach
to arms control that will allow the US to deploy NMD without weakening its arms control
options, and questions about the capability of the particular systems architecture to which the US
has been committed.

In theory, the US has been legally required to deploy an NMD system providing national
coverage by 2005. In practice, the US has been rushing forward with a one-site system to provide
very limited national coverage against an attack coming from the area of North Korea. In doing
so, it has adopted an inadequate and under funded development program, and test and evaluation
methods that cannot objectively determine success even if all of the present milestones are met.
The creation of a more adequate two-site system, supported by space-based sensors could not be
deployed until well after 2010, and that system would have serious limitations and involve
significant risks if it had to be scaled up to deal with more sophisticated threats and penetration
aids.

The US must now find the proper balance between the value of deploying an NMD
system and not deploying one. At the same time, it must now address many of the issues it has
failed to address in moving ahead with a compromised and politicized system that is more a reflection of domestic political battles than valid strategic requirements. There is no simple and decisive answer to the question of whether the US needs to deploy an NMD system to meet its Homeland defense needs. An analysis of the particular missile threats the present system is designed to deal with does, however, raise serious questions in a number of vital areas. These include:

- Just how serious the threat from “rogue states” really is.
- The impact of deploying an NMD system will have on arms control, START and the ABM Treaty.
- The impact deployment will have on the future size of the Russian and Chinese nuclear threats.
- The impact on other threats to the US homeland like air breathers, cruise missiles, covert and terrorist CBRN attacks, and cyber attacks, and the cost and feasibility of creating a cohesive and integrated approach to homeland defense.
- The need, cost, and feasibility of a cohesive approach to missile and CBRN defense that includes protection of our allies and strategic interests overseas.
- The risks inherent in the present schedule, test and evaluation program, and cost estimates shaping the US NMD program, and,
- Whether the current configuration of the NMD system really meets a valid set of homeland defense needs for NMD or some alternative system is needed.

**Meeting the Strategic and Technical Requirements for Deploying a National Missile Defense System**

These questions cannot be fully resolved on the basis of the information now available, and there is no certain or single “right” set of answers to any of the major the issues and uncertainties raised in this analysis. However, the evidence that is publicly available supports the following conclusions:

- There is no evidence of an *existing* threat from nations like Iran and North Korea to justify the deployment of a full-scale US National Missile Defense system, and there is no certainty that any mix of states will deploy such a threat in the future. At the same time, there is evidence of a *potential* threat. It is also clear that the US cannot count on warning of the deployment of missile threats from these countries, or on the ability to characterize whether such missiles will have the kind of highly lethal biological or nuclear warheads that could make them a serious threat to the American homeland.
- NMD is not a substitute for strong offensive US capabilities, the ability to carry out massive retaliation

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against a state or entity that uses weapons of mass destruction using any form of delivery, and ultimately for nuclear retaliatory capabilities. Any nation willing to risk a ballistic missile attack on the US is almost certain to be willing to risk attacks of virtually any kind on both the US and its allies. Missile defenses do not punish hostile regimes or destroy hostile forces. They do not approach the kind of existential ambiguity that mere US possession of a vastly superior nuclear delivery capability creates in the mind of any regime willing to use weapons of mass destruction against the US. If there is a real risk that weapons of mass destruction will be used against the US or its allies in any form, efforts to seek a “zero option” in terms of US nuclear forces are more likely to destabilize a crisis, and lead to the use of weapons of mass destruction, than prevent it. This will be true regardless of whether the US deploys an NMD system.

- No form of NMD system can – by itself -- credibly protect the US against rogue threats. The cost to potential attackers of defeating or vitiating an NMD system by using shorter-range systems, covert attacks, and terrorist/proxy attacks is simply too low. In some ways, creating a ballistic missile threat to the American homeland is one of the least attractive ways to wage asymmetric warfare against the US. At the same time, the US may have no other choice than to both deploy NMD and improve its defensive and retaliatory capabilities to deal with all other means of asymmetric warfare.

- No form of NMD system is likely to be leak-proof, even against limited missile threats. The deployment of an NMD system will still leave many of the same needs for civil defense and response capabilities as the emerging CBRN threat posed by asymmetric attacks and terrorism.

- Effective defense of the American homeland requires the US to take a wide range of steps, of which NMD is only one. Diplomacy, regional counterproliferation capabilities, missile defenses, and coalitions to contain rogue states offer tools that are at least as important as NMD systems in dealing with rogue threats. In fact, the inherent limitations of NMD may make it one of the least cost-effective ways of dealing with such threats unless it is clearly linked to a comprehensive approach to dealing with proliferation that gives at least equal priority to other forms of defense.

- The deployment of NMD cannot be decoupled from some clear security concept of how to provide similar defenses for American forces deployed overseas and for our key allies and coalition partners. They already face direct threats in Asia, the Gulf, Middle East, and Asia. If the US deploys convincing missile defenses it may well drive attackers to strike at America’s friends and allies as a means of obtaining strategic leverage, and “theater defense” for the US is “homeland defense” for its allies.

- The study of missile threats cannot be credibly decoupled from the broader threats posed by existing nuclear powers and by other forms of proliferation in justifying an NMD program. Both the broad cost-effectiveness of any aspect of Homeland defense, and the cost of an enemy to defeating a given US capability by shifting resources to other threats, needs explicit analysis.

- There is a strong case to be made for linking the deployment of any NMD system to the successful renegotiation of START and the ABM Treaty and/or the development of suitable confidence measures to make Russia confident that the US will not develop or deploy a “break out” capability that would create the kind of NMD system that could limit Russia’s ability to strike the US. Unlike the potential threat from nations like Iran and North Korea, the nuclear and missile threat from Russia remains tangible and massive. While the risk of any such Russian attack seems minimal, so does the risk of direct attack by so-called rogue states, and the alienation of Russia poses a wide range of other threats to US security interests.

- China presents similar problems, but is a different kind of threat. There is a clear need to reevaluate the potential threat posed by China, and to consider what kind of negotiation – if any – could limit the growth of the Chinese threat so that the deployment of NMD did not result in a net increase in the Chinese threat to the US.
• At the same time, it is nations like Russia and China whose technology transfers have created the possibility of a major threat from rogue states, and the US cannot afford to be paralyzed by the terms of the ABM Treaty or the risk that Russia will maintain higher force levels than are called for under the terms of START II and START III.

**Politicizing NMD Into Failure**

These strategic issues interact with serious technical problems in the presently contemplated US NMD system. The one-site system the US could deploy between now and 2010 is far more the result of a long series of historical compromises made for partisan political reasons than a system designed to meet national needs.

Some of the strongest political advocates of the current NMD system are its worst enemies in practice. For ideological reasons, they deny the need for a complex, expensive, time-consuming, and comprehensive test program. They deny the technical and cost risks involved. They deny the need to assess possible countermeasures in far more depth, and the trade-offs that funding such a system may force in reducing other US and allied defense capabilities. They also call for a potential effort to rush into the deployment of such a system, an action which could prevent effective negotiations with our European allies and Russia, intensify relations with China, block the renegotiation efforts of present arms control agreements, and stimulate a new arms race.

The irony surrounding such an approach to national missile defense is that those who feel that ideology and policy can overcome the laws of physics, the realities of engineering, and the need for a balanced approach to national security may ultimately do as much to block the real-world deployment of an effective program as those who believe that ideology and policy call for every possible effort to deny that an effective system is possible or can be deployed in ways that reduce the threat to the US homeland.

More than that, they also are limiting consideration of alternative or supplemental programs like boost-phase defense, and sea, air, and space-based options. The US has largely ceased to debate the need for effective defense against limited and accidental launches by nations as sophisticated as Russia. It is dodging the need to come to grips with the potential threat posed by China. It is segmenting the national debate over homeland defense in ways that mean the need
for NMD is kept separate from the need for other forms of missile and airbreather defense, and defense against covert and terrorist CBRN attacks and cyber attacks.

**A Risk Prone Test and Evaluation Program**

The resulting compromises have limited the capabilities of the present NMD system, and have forced the creation of a development and deployment schedule with a high element of risk, and have politicized the test and evaluation schedule. The current US NMD program is not the proper course of action for deploying even the present NMD system. The technical risks are unacceptably high and this had been made clear by the most senior technical exports in the Department of Defense.

No result of the current limited NMD test program could produce fully credible results in terms of program effectiveness. This test and evaluation program is too limited in scope, and there are no precedents for the successful deployment of such a complex combat system without years of practical experience and modification based on the field trials of an operational system. Learning from deployment is almost certainly the only way to evolve an effective system.

Put differently, the present deployment program seems to be based on the technical myth that a test and evaluation methodology can substitute for the actual deployment of a test-bed system that puts all of the required capabilities into the field, and which involves the necessary changes and modifications needed to ensure a truly combat-capable system.

**Deferral is the Right Decision, but It is Far From an Adequate Approach**

President Clinton’s decision on September 1, 2000 to defer the award of contracts to begin building a new high-powered radar in the Aleutian Islands as an initial step towards deployment of the present NMD system is a wise one. This is true even though it means leaving deployment decisions to the project into the next presidency, and delaying initial deployment to at least 2006 or 2007, rather than 2005. It seems equally wise to postpone the next test of a national missile defense system until at least January 2001. There is no reason to force the pace.
of the test program and good reason to delay it and restructure it.

Simply delaying the present program, however, is neither effective leadership nor an answer to the strategic and technical issues that now surround the NMD program. Far more serious changes are needed to address all of the following critical problems:

- Failure to integrate theater and homeland offensive/defense issues.
- Failure to honestly examine the “balloon effect”: forcing attackers to use other methods, and strike at US allies or external vulnerabilities like oil and Asian trade.
- Rushing forward with half-defined interim single-site system with SIBRS without any clear picture of ultimate system requirements and costs.
- Deployment schedule makes effective test and evaluation impossible. Costing and effectiveness models are badly politicized.
- Freezing on current system in purely homeland context means ignoring boost-phase and theater-homeland options.
- Lack of Net Technical Assessment and realistic evaluation of cost to defeat proposed programs and solutions.
- Failure to explicitly consider offensive and retaliatory options.

**The Minimum Step: Shifting to a Success-Driven Approach**

At a minimum, the next Administration should restructure the current NMD program to focus on a success-oriented, rather than schedule-driven program. The technology proposed for the present US NMD system still involves major risks and systems integration problems. These risks tend to be understated by those advocating an NMD system, and overstated by those who oppose one. However, the methods BMDO has so far publicly proposed for risk analysis and test and evaluation simply raise too many critical questions.

Over-reliance on a limited number of tests at an accelerated schedule makes it seem very doubtful that the current number of tests can at best do more than provide technical proof of concept. An uncertain proof of concept is not adequate for an NMD system that is so complex that an accurate picture of its cost and effectiveness cannot be counted on through such methods.
This argues strongly for shifting from reliance on any kind of limited test and evaluation program, and for a shift to a full scale, “test bed” approach. It seems likely that the full-scale field trial of a working US NMD system with at least one interceptor site will prove to be the only way in which the US can evolve the level of real-world NMD capabilities it needs. A shift to such a “test bed system” that evolves according to a success-driven schedule would give the US a high probability that the result will be a successful field-proven development platform. It is also the kind of approach that will enable the US to deal with the currently contemplated threat, and to rapidly scale up its NMD capabilities if serious new threats materialize.

The Leadership and Program the Nation Needs

Creating a truly effective program, however, means going far beyond simply adjusting the present program to use a most realistic schedule and approach to testing evaluation. What is needed is action that goes far beyond simply deferring the present program. The next Administration should take the following steps to shape the kind of National Missile Defense system necessary to be an effective component of a Homeland defense program:

- Reshape the test and deployment schedule of its initial NMD system, and the budget and program, to ensure a fully successful program development over a longer period of time -- rather than attempt to rush forward in response to an exaggerated view of the threat.

- Greatly expand the test and evaluation effort of the program to ensure success.

- Require a full-scale Net Technical Assessment, including a realistic evaluation of the cost to defeat proposed NMD programs options.

- Fully examine the decoy and countermeasure issue, and adopt a more demanding and sophisticated test program.

- Maintain the research and development program necessary to ensure that the US can deploy a much more sophisticated NMD system over time if a more sophisticated threat should materialize in the period beyond 2010.

- Keep the commitment to the present NMD architecture flexible. Continuously examine credible boost phase options, and particularly the use of airborne and sea-based forward intercept systems.

- Adequately fund the development and deployment program on a less driven by actual success or kill it. Don’t “nickel and dime” it, or try to force the pace, in ways that ensure failure.

- Give the decisions affecting each stage of NMD deployment the transparency that the American people and
Congress need, and which can shape an informed and less partisan debate. Clearly define the different phases of the NMD system, their architecture, their cost, and the estimated effectiveness of each phase in dealing with potential threats. Develop an annual report on the evolution of this plan, with a supporting net assessment defining the threat and the capability of the proposed system relative to proposed countermeasures. Make it clear that national coverage does not mean true national coverage with uniform probability of intercept and show the actual differences in coverage by area.

- Tie the schedule, deployment, and architecture of the US NMD system to the changing nature of the threat. Do not assume that the US can have precise intelligence and strategic warning on the deployment of missile threats, or identify potential threat states years in advance. Evolve a program that can react to real-world uncertainties regarding strategic warning and real-world deployment lead-times. At the same time, do not demonize currently hostile states, or ignore progress in moderating the threat they pose to the US.

- Explicitly examine the trade-offs between expenditures on NMD and other aspects of US military capabilities such as offensive capabilities and conventional power projection. NMD is not a religion. It has no more inherent value than other aspects of US military strength, and any argument for NMD must be explicitly justified in terms of its advantages and disadvantages relative to other uses of the defense budget.

- Carry out a zero-based review of the trade-offs between the present NMD system and boost-phase, sea-based, and airborne laser defense systems. Provide a rolling analysis of all of the RDT&E and deployment options available to creating an effective NMD system, rather than optimize rigidly around the current architecture.

- Give equal priority to other threats against the American homeland such as shorter-range delivery systems, air breathers, and covert or terrorist attacks using weapons of mass destruction. There is no worse solution to the threat posed by asymmetric weapons and mass destruction than to focus on NMD, and one threat such as nuclear weapons, in the face of so many alternative methods of attack and advances in other areas such as biological weapons.

- Fully evaluate the overall threat that all forms of missiles, weapons of mass destruction, and asymmetric warfare pose to the allies and friends of the US. Recognize the fact that missile threats to the US are now largely theater-driven and that the US cannot deploy a national missile defense and leave its allies without such defenses, without make them the potential targets of intimidation and retaliation. Make theater missile defenses, other defenses, US offensive capabilities, and “extended deterrence” part of an integrated approach to revising US strategy and force plans.

- Link NMD to a clearly defined Theater Missile Defense system and plan that shows the interaction between the deployment of NMD and TMD, the political impacts, costs, and shifts in theater capabilities. Examine the related costs in terms of improving theater air and cruise missile defense. The isolation of NMD and TMD planning makes no sense in a world where conflicts and threats are theater-driven, tangible missile threats already exist at the theater level, and the decoupling of NMD and TMD architectures has only limited real-world war fighting capability.

- Give equal priority to the development of clearly superior offensive and retaliatory capabilities to ensure a high level of deterrence and carry out massive retaliation. Preserve a nuclear option and develop new approaches to extended deterrence.

- Re-evaluate the threat and include Russia and China, arms control risks: Examine the threat in terms of both deployment and non-deployment, and impact of deployment on pushing threats to use other forms of attack.
• Conduct a “zero-based” look at the interaction between missile defense and arms control. Examine missile defense as a partner to arms control.

• Continue to seek to modify the barriers that current arms control agreements pose to the deployment of NMD without abandoning the search for arms control and improved relations with potential threat states. NMD is not a substitute for arms control and negotiation.

• Shape deployment of the initial components of NMD as a “test bed” system in ways that minimize the impact on US arms control efforts and stimulating higher levels of threat from Russia and China than would otherwise be the case.

Some of these criteria set competing goals, and all involve a high degree of uncertainty and the need for a flexible and evolutionary US approach. It should be clear that the program that makes sense today may require major changes to respond to events over a period as short as the next two to three years, and there is little room for ideology as distinguished from pragmatism. There is an equal need to accept the full complexity of the issues and uncertainties involved.

The exact nature of any time schedule and cost estimate for a revised NMD system that grew out of such a review and reduced the risks in the present system to more acceptable levels is speculative. However -- regardless of how the system is changed -- the US must be prepared for much higher life-cycle costs. The data so far made public on the estimated costs of an NMD system indicate that a properly structured program is likely to cost at least 50% more than BMDO currently estimates. Such cost escalation is typical of the history of programs that are at the current level of sophistication of the NMD program. It could cost anywhere from two to six times the currently estimated cost over the next 10 years, with the high side of this cost escalation tied to the need to deploy a much larger and more sophisticated system than the US now contemplates.

This could delay deploying any components of the initial NMD system several years, although any assessment of the precise details of such a system must follow a major program review and would require a comprehensive redesign of the program schedule by the Ballistic Missile Defense Organization (BMDO)). Even so, it is still possible that a suitable test bed system could evolve quickly enough to deploy some elements of a combat effective system with advanced features like the Space-Based Infrared System (SBIRS) by 2010-2012.

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No Deployment Option Can Make Some Level of Strategic Competition Go Away

Regardless of the technical solution, the US decides upon, major strategic and political problems will continue to exist. The problem in dealing with Russia, China, and our allies will remain serious. Every negotiating effort will need to be made to limit the potential backlash in terms of the impact of a US deployment on Russian and Chinese behavior, arms control, and our allies to “acceptable” levels. The US should not commit itself to NMD blindly and without regard to the evolution of the threat and progress in arms control.

At the same time, the various cases for and against the near-term deployment of an NMD system have closely balanced merit. The US cannot allow a rigid adherence to the ABM Treaty to paralyze its efforts to serve its own vital national security interests. The pivotal argument for moving forward NMD may well prove to be the lack of warning and reaction time in reacting to potential threats if hostile states continue to develop new forces of intercontinental missiles. The US cannot wait to develop an NMD system until such a threat can be proven to exist and then suddenly deploy a suitable defense.

Some negative consequences may have to be accepted if the US is to make any progress in Homeland defense. There is no practical prospect that any US deployment of any form of NMD system can totally eliminate the risk that such deployment will lead to higher levels of a Russian and Chinese threat, or some political costs. The US must be equally prepared for the prospect that the successful deployment of an NMD system will lead hostile states to adapt by developing improved capabilities to use covert, short range, and proxy methods of attacking the American homeland or stepping up their capabilities to attack America’s friends and allies as a substitute for attacking the US.

Put bluntly, NMD is probably purposeless unless it is linked to a steadily strengthened global counterproliferation strategy, an integrated approach to homeland defense, and the ongoing search to balance NMD against both arms control programs and US efforts to improve its offensive and retaliatory options. Sometimes policy really does have to be complex to be
effective!
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BY LEVEL OF CAPABILITY, 1996-2015

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The US has long recognized the threat of direct attacks with ballistic missiles, aircraft, cruise missiles, and weapons of mass destruction. During the Cold War, this threat was driven by the strategic forces of the Soviet Union, and by the fact that US and Soviet competition was seen primarily in terms of mutual assured destruction and the threat each side could pose to the other’s homeland in the context of a global struggle for political influence and power. While China posed a secondary threat, China’s rivalry with the Soviet Union and ties to the US then made such a threat seem to have little immediate importance. The risk of a NATO-Warsaw Pact conflict escalating to a theater nuclear exchange and then strategic conflict was perceived as a much higher risk.

Since the end of the Cold War, however, the missile threat to the US has changed from a strategic-driven threat to a mix of current and emerging theater-driven threats. The US homeland is now most likely to be struck as the result of struggles for power in theaters that are remote from US territory, and because of the role the US plays in projecting power in these regions. While Russia and China continue to target missiles and nuclear weapons upon the US, the risk of war is not posed by a global struggle between superpowers, but rather by the risk that regional conflicts might escalate. Tensions and conflicts in regions like Eastern Europe, the Middle East, Gulf, the Taiwan Straits, or Koreas might either lead to efforts to intimidate the US with the threat of missile strikes or to a pattern of escalation that leads to actual strikes.

The proliferation of technology is an equally critical issue. Nations like Iran, Iraq, and North Korea are acquiring the technology and many of the manufacturing capabilities to deploy long-range missiles capable of striking the US with warheads armed with weapons of mass destruction. While they have not completed the development of such systems, or deployed them, there is potential threat from nations that may not show the restraint and caution of major, well-established powers like China and Russia. The new “National Security Strategy for a New Century,” that President Clinton approved in December 1999, acknowledges this threat and makes the deployment of a national missile defense (NMD) system a high priority.1
“We are committed to meeting the growing danger posed by nations developing and deploying long-range missiles that could deliver weapons of mass destruction against the United States. Informed by the Intelligence Community’s analysis of the August 1998 North Korean flight test of its Taepo Dong I missile, as well as the report of the Rumsfeld Commission and other information, the Administration has concluded that the threat posed by a rogue state developing an ICBM capable of striking the United States is growing. The Intelligence Community estimates that during the next fifteen years the United States will most likely face an ICBM threat from North Korea, probably from Iran, and possibly from Iraq.

“We intend to determine in 2000 whether to deploy a limited national missile defense against ballistic missile threats to the United States from rogue states. The Administration’s decision will be based on an assessment of the four factors that must be taken into account in deciding whether to field this system: (1) whether the threat is materializing; (2) the status of the technology based on an initial series of rigorous flight tests, and the proposed system’s operational effectiveness; (3) whether the system is affordable; and (4) the implications that going forward with NMD deployment would hold for the overall strategic environment and our arms control objectives, including efforts to achieve further reductions in strategic nuclear arms under START II and START III.

“In making our decision, we will review progress in achieving our arms control objectives, including negotiating changes to the ABM Treaty that would permit the deployment of a limited NMD system. At the Cologne G-8 Summit in June 1999, Presidents Clinton and Yeltsin agreed to begin discussions on START III and the ABM Treaty. Their reaffirmation that under the ABM Treaty the two sides are obligated to consider possible changes in the strategic situation that have a bearing on the Treaty and possible proposals for further increasing the viability of the Treaty opened the door for discussion of proposals for modifying the Treaty to accommodate a limited NMD deployment. The United States will attempt to negotiate changes to the ABM Treaty that would be necessary if we decide to deploy a limited NMD system. At the same time, the Administration has made clear that it will not give any state a veto over any missile defense deployment decision that is vital to our national security interests.”

**Issues versus Partisanship**

At the same time, many practical issues arise in examining the threat posed by direct long-range missile attacks and the value of deploying national missile defenses to deal with the emerging threats from nations like Iran, Iraq, and North Korea:

- Open-ended threat analysis tends to produce worst case threats that do not measure the value of real-world NMD capabilities. No new power has as yet firmly and clearly embarked on a program to manufacture and deploy missiles with intercontinental ranges or arm them with weapons of mass destruction.

- The US already faces a missile threat from Russia and China, while nations like Iran and North Korea may develop the capability to launch missiles against the US before the US can deploy missile defenses. National Missile Defense (NMD) cannot be tailored to deal with limited, and as yet undefined potential threats, and ignore the impact of the deployment of NMD on the size and growth of the Russian and Chinese missile threats, arms control, and other aspects of the threat that Russia and China can pose to the US and its allies.

- National missile defense is only one way in which to defend the American homeland. US nuclear and conventional strike forces offer a powerful deterrent and damage-limiting capability, although US use of nuclear weapons presents growing political problems, and preemption is equally politically difficult.
• Arms control also offers a potential way of defending the American homeland, and deploying NMD might provoke Russia and China to deploy larger numbers of missiles targeted on the US. At present, Russia and China strongly oppose US deployment of NMD. Russia has threatened to halt its arms control efforts and maintain higher levels of nuclear offensive forces. China has threatened to deploy larger numbers of modern ICBMs.

• Currently contemplated national ballistic missile defenses do not offer defense against cruise missiles, aircraft, or many short-range sea-launched ballistic missiles, or limited/accidental launches of missiles with sophisticated penetration aids.

• There are major uncertainties regarding the cost, effectiveness, and time of availability of national missile defenses that make it even more difficult to correlate the analysis of the threat analyses to the options for missile defense.

• The future exchange rates and cost-to-defeat rates of ballistic missiles versus missile defenses are unknown. There is a risk that hostile states can generate enough offensive missiles to saturate a US defense system in ways that present major cost and effectiveness problems.

• The stronger US NMD capabilities become against direct threats, the more likely opponents are to choose other forces of attack. Effective missile defense may lead attackers to concentrate on covert or proxy attacks.

• Terrorist and covert attackers will probably not use missiles or aircraft, and can infiltrate or attack across the coasts and borders of the US. Domestic and foreign attackers can also attack from within the US.

• There already are very real missile threats to our forces and allies in several key potential theaters of conflict. These include Northeast Asia, the Gulf, and East Mediterranean. Our NATO partners also are deeply concerned that they might be left vulnerable, and be the subject of blackmail or intimidation, if the US alone was defended. The threat of attacks on the American homeland cannot be decoupled from theater threats, and effective theater missile defenses, deterrence, and counterproliferation capabilities may help to provide defense of the US homeland as well as of US forces and our allies.

The trade-offs involved in any decision to proceed with the deployment of NMD are complex and uncertain. Even the most objective effort to choose between the various options for NMD, and between NMD and options like arms control, would produce difficult and uncertain results. Unfortunately, missile defense has become one of the most polarized and ideologically driven aspects of national security policy.

Ever since 1983, when President Reagan first proposed his Strategic Defense Initiative, missile defense has been debated along partisan lines. This debate initially focused on the feasibility of deploying a relatively leak-proof national defense against Soviet attacks. In the years that have followed, missile defense has gained broader political support by being progressively reduced to a far more limited system. The NMD system that the US is now...
contemplating is more a political compromise than the product of an architecture based on comprehensive threat analysis and national security priorities.

The evolution of the US missile defense program is shown in Table III.1. This evolution reflects more than a decade of bitter political battles over the feasibility of given types of national missile defense (NMD) systems, their costs and effectiveness, the nature of the threat, and the impact of missile defense on the stability of the nuclear arms race, and arms control negotiations. In general, Republicans and conservatives have built on the legacy of President Reagan’s Strategic Defense Initiative and have pushed for the largest and most comprehensive defense system. Liberals and Democrats have either opposed the deployment of a system or have attempted to downsize it to a system with minimal capability and cost that is compliant with both START and the ABM Treaty.

These political battles have produced millions of dollars worth of analysis design to prove the value of given missile defense systems, and millions of dollars worth of analysis designed to prove the contrary. Much of this analysis is anything but objective. It is designed to prove given points, and often ignores key risks and issues. In many cases, cost and effectiveness models are used that are tailored to support given programs and conclusions. In others, the arguments as based largely on technical speculation and ideology.

The threat analyses used to argue for and against national missile defense exhibit the same problems. Studies supporting missile defense structure the threat analysis to either downplay real risks or exaggerate the threat posed by the kind of missiles an NMD system can defend against relative to other risks. Studies designed to provide that missile defense is unnecessary either down play very real threats or ignore them. The merits of the arguments are often difficult to evaluate because they cannot present information that is classified and because they argue by assertion, rather than on the basis of evidence.

The resulting battle over NMD is continuing into the 2000 presidential campaign. George W. Bush has proposed a much more ambitious missile defense program that would cover the US
and its allies on an almost global basis. On May 24th, he set forth the following broad outline of a new approach to NMD: (citation?)

It is time to leave the Cold War behind, and defend against the new threats of the 21st century.

America must build effective missile defenses, based on the best available options, at the earliest possible date. Our missile defense must be designed to protect all 50 states – and our friends and allies and deployed forces overseas – from missile attacks by rogue nations, or accidental launches.

The Clinton administration at first denied the need for a national missile defense system. Then it delayed. Now the approach it proposes is flawed – a system initially based on a single site, when experts say that more is needed. A missile defense system should not only defend our country; it should defend our allies, with whom I will consult as we develop our plans. And any change in the ABM treaty must allow the technologies and experiments required to deploy adequate missile defenses. The administration is driving toward a hasty decision, on a political timetable. No decision would be better than a flawed agreement that ties the hands of the next President and prevents America from defending itself.

Yet there are positive, practical ways to demonstrate to Russia that we are no longer enemies. Russia, our allies and the world need to understand our intentions. America’s development of missile defenses is a search for security, not a search for advantage.

President Clinton’s decision on September 1, 1999 to defer any decision to deploy NMD until it can be made by the next president is certain to create even more partisan divisions over how to approach the issue. It also is likely to stimulate further action by the Congressional supporters of NMD to force deployment on the President while reopening many of the issues that President Clinton had appeared to resolve when he agreed to the early deployment of NMD. At the same time, Russia, Europe, China, and other nations can be expected to pursue their own political and strategic issues, heightening the debate over the nature of the threat and the linkages between NMD, theater defense, and arms control.
### Table III.1

**The Evolution of the National Missile Defense Program**

<table>
<thead>
<tr>
<th>Program Focus</th>
<th>Key Mission</th>
<th>Type of Defense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Protection Against Limited Strikes (GPALS) (1989-1992)</td>
<td>Protect against accidental or Unauthorized launch.</td>
<td>100s of interceptors, ground and space-based.</td>
</tr>
<tr>
<td>Deployment Readiness – “3+3” (1996-1999)</td>
<td>Integrate systems, prepare to Deploy three years after a Future decision.</td>
<td>10s of interceptors, ground-based only.</td>
</tr>
<tr>
<td>NMD Acquisition</td>
<td>Prepare for initial deployment In 2005</td>
<td>10s of interceptors, ground-based only.</td>
</tr>
</tbody>
</table>


### The Uncertain Heritage of the Present NMD Acquisition and Deployment Program

During fifteen years of bitter political battles, the US evolved a systems architecture for deploying NMD that has in many ways has become the lowest common denominator of what most sides could grudgingly agree upon. As a result, the US is now moving towards the deployment phase of a limited NMD system with a single site in Alaska. This single site would have 20-100 ground-based interceptors, one advanced tracking radar, and upgraded early warning radars. It would rely on the DSP satellite program for warning, and use an initial battle management and command, control, and communications system (BMC³) that would change substantially over time. It was this system that the US sought to deploy early as 2005 until President Clinton decided to defer it on September 1 2000 in ways that meant it could not be deployed until 2006-2007 at the earliest.

This systems architecture is not tailored to a clear concept of the threat or based on...
clearly defined concepts of cost-effectiveness. It is rather the minimal program that could provide some degree of national missile defense while reducing near-term program costs to a level acceptable to a largely unsupportive President and those members of Congress who do not actively support NMD. It is very unlikely that such a systems architecture would ever have evolved in this particular form if pro-NMD Republican Presidents not first faced anti-NMD Democrat majorities in the Congress, and if a Democrat President had not then faced a pro-NMD and hostile Republican-controlled Congress, and had not had to make key decisions at a time he was perceived as weak on defense and had to deal with the threat of impeachment.

It is scarcely surprising, therefore, that the present US program has an official “national architecture” that reflects a number of important compromises. It is designed to deal only with a limited ballistic missile threat from a nation capable of launching a maximum of around 10 warheads. This is the assumed maximum near to mid-term strike capability of a nation like Iran or North Korea.

The present systems architecture assumes that the US would not seek to use such an NMD system to limit damage from a Russian attack, or prevent the success of a Chinese attack, although it would have some value in defending against an accidental or limited Russian or Chinese launch of missiles without sophisticated decoys and penetration aids. The present system is assumed to have considerable capability against the kind of countermeasures or penetration aids a state like Iran or North Korea could deploy on its missiles in the near term – which would consist largely of simple decoys -- but many of the specifics have not been made public. Countermeasure capability is stated to be limited against a Russian or Chinese attack.

The NMD architecture that BMDO has made publicly available is shown in Figure III.1. This architecture is significantly less ABM Treaty compliant than the architecture the US proposed until 1998. The first plans issued by BMDO showed only one interceptor deployment site, which was located near ICBM silos in the vicinity of Grand Forks, South Dakota. The US State Department officially indicated in September 1999, however, that the first site would now be in Alaska. US officials made it clear that the US had concluded that a single site with a
limited number of interceptors should be site where the interceptors can be launched from areas nearer to the US and along the vectors where attacking missiles are most likely to come from – which is estimated to be centered in North Korea with at least some coverage of the threats emerging from Iran and Iraq.

As a result, the present US architecture cannot comply with the current terms of the ABM Treaty, even if the NMD system does not violate Article I of that treaty, which proscribes the signing parties from deploying any defense to cover its entire territory. Article III of the ABM Treaty and the 1974 Protocol to the treaty only allows the US to deploy one site within 150 kilometers of either its capital or an ICBM silo field, and require that the site must contain all of the ABM radars.

The policy debate over the value of this particular NMD architecture for Homeland defense already involves major debates over the threat, cost, timing, technical feasibility, and its impact on arms control. There are other issues that go far beyond the current architecture. An initial deployment of one system at a single site might prove adequate if the threat posed by rogue nations did not evolve to counter it and if the Russia and China continued to pose only a largely theoretical threat to the US. Such a system might remain adequate, or at least retain significant deterrent capability, if it was upgraded over time to deal with limited improvements in the threat from such rogue states.

It is equally possible, however, that the US may need more than one site and a system capable of dealing with attacking ICBMs with relatively sophisticated countermeasures and not comparatively simple decoys. This would mean additional tracking radar, upgrades in warhead discrimination capabilities, hundreds of interceptors, a greatly improved BMC\(^3\) system, and a more sophisticated space-based sensor system like the Space-Based Infrared System (SBIRS). Such a more advanced system cannot be deployed under anything like the present US NMD program until well after 2010. There is no way to adequately cost it or judge its effectiveness, although it is clear that it could cost three to ten times more than the initial NMD system the US is now contemplating.
It is also important to point out that the world is not designing its threats to be defeated by the current US NMD architecture, and Iran and Iraq are only part of the problem. The very phrase “National Missile Defense” is somewhat misleading in that it implies capabilities against a wide spectrum of threats, while it is designed to deal with only a narrow range of hostile attacks. A true NMD system must respond to changes in the threat, and to the risk that Russia and China might respond by maintaining or developing higher force levels.

There is no clear indication that a system relying solely on the current ground-based interceptor architecture could keep up with even more serious increases in the threat. The US might be forced to add space based weapons to deal with the threat of large numbers of advanced reentry vehicles (RVs), and sea based weapons to deal with attacks from shorter range missiles and different vectors. In short, if threat nations respond to NMD with significant numbers of ICBMs and short-range missiles with large numbers of sophisticated RVs, the NMD architecture would have to devolve back to the far more ambitious missile defense systems proposed at the time of “Star Wars.” As a result, the US faces an open-ended threat and may have to respond with a completely new NMD architecture with a scale, schedule, and cost that cannot be predicted.

Uncertainty is scarcely an unusual problem for US national security planning, and it certainly affects all of the threats involved in Homeland Defense, including other threats like covert programs, attacks with short-range and air breather systems, terrorism, and information warfare. It is simply a fact of life that programs have to be based on current probabilities. At the same time, it should be clear that the decisions the US makes about NMD over the next few years are at best decisions made over a highly compromised system and in the context of a very uncertain threat.

**Threat Assessment and Prioritization**

The issues of threat assessment and prioritization surrounding NMD are very complex. The present NMD system is designed to deal with a potential long-range ICBM threat from a
handful of “rogue states” (now “states of concern”) that may or may not actually complete development and deploy. At the same time, the US cannot wait for deployment and then suddenly deploy working defenses, and a sustained NMD effort may act as a powerful deterrent against such “rogue state” deployments. The rogue long-range missile threat, however, is only one way in which they can attack the US, and in many ways not the most attractive method of attack from a rogue viewpoint. It can be argued that successful deployment of an NMD system will simply push hostile states towards other forms of attack.

As has already been mentioned, NMD also interacts with the prospects for arms control, and with the threat posed by Russia and China. Their hostility towards NMD could have serious strategic consequences, and might possibly lead to a different kind of arms race involving far more sophisticated NMD systems. Such a risk seems limited, but the risk of political and strategic tension with Russia and China seems a near certainty.

Nevertheless, the base point for threat assessment lies in the fact that the proliferation of long-range strike systems that can hit the American homeland is still becoming a reality. While Iran and North Korea may be in the process of political change, they are still developing the capability to build missiles that could deliver large payloads – and substantial amounts of weapons of mass destruction -- in strikes against the US.

Secretary of Defense William Cohen made this point when he announced that the Department of Defense had concluded that the threat ballistic missiles posed to the US homeland was real enough to move forward with a National Missile Defense program on January 20, 1999,

“Today I’m announcing that we are committing additional billions of dollars and taking other steps to protect our troops and the American people from the growing threat posed by weapons of mass destruction delivered by ballistic missiles.

In addition, I’m announcing today’s decisions regarding how we’ll decide to deploy a missile defense for America, how we’ll address the Anti-Ballistic Missile Treaty, the ABM Treaty, and how we are restructuring some of our programs to enable us to deploy capable missile defenses as quickly as possible.

These decisions affect both our national missile defense program and the theater missile defense programs.
With regard to the national missile defense program to provide a limited defense for the 50 states against a long-range missile threat posed by rogue nations, we are making four critical decisions.

First, we’re budgeting funds that would be necessary to pay for an NMD deployment.

The Department has long worked to ensure that the NMD development program was properly funded, but until now the DoD has not budgeted any funds to support a possible deployment of a limited NMD system. Since we intend to make a critical decision in June 2000 regarding deployment, the budget we are going to submit in February will increase NMD by $6.6 billion including the costs associated with the NMD deployment over the Future Years Defense Plan.

This includes $800 million provided by Congress in the fiscal year ‘99 supplemental appropriations bill, and nearly triples, to $10.5 billion, the amount we’re budgeting for the national missile defense.

No deployment decision has been made at this time. That will be made in June of 2000.

Second, we are affirming that there is a threat, and the threat is growing, and that we expect it will soon pose a danger not only to our troops overseas but also to Americans here at home.

Last spring the commission that was chaired by former Secretary of Defense Donald Rumsfeld provided a sobering analysis of the nature of the threat and the limitations of our ability to predict how rapidly it will change.

Then on August 31st, North Korea launched a Taepo Dong 1 missile. That missile test demonstrated important aspects of intercontinental missile development including multiple stage separation, and unexpectedly included the use of a third stage. The Taepo Dong 1 test was another strong indicator that the United States in fact will face a rogue nation missile threat to our homeland against which we will have to defend the American people.

Our deployment readiness program has had two key criteria that has to be satisfied before we could make a decision to deploy a limited national missile defense system. There must be a threat to warrant the deployment; and our NMD development must have proceeded sufficiently so that we are technologically able to proceed.

What we are saying today is that we now expect the first criterion will soon be met, and technological readiness will be the primary remaining criterion.

The third step concerns the ABM Treaty that imposes strict limitations on national missile defense. And while our NMD program is being conducted consistent with the terms of the ABM Treaty to date, our deployment might require modifications to the treaty and the Administration is working to determine the nature and the scope of these modifications.

We will seek to amend the treaty if necessary, and we will work in good faith to do so. We have amended the treaty before and we see no reason why it cannot be amended again.

The ABM Treaty also provides, of course, for right of withdrawal with six months notice if a party concludes it’s in its supreme national interests.

The limited NMD capability we’re developing is focused primarily on countering rogue nation threats and will not be capable of countering Russia’s nuclear deterrent. We’ve already begun environmental site surveys for potential basing sites in both Alaska and North Dakota, and we have briefed Russian officials
on these activities and on our NMD program in general, and on today’s announcement.

Fourth, to maximize the probability of programmatic success and be able to deploy a technologically capable system as quickly as possible, we will phase key decisions to occur after critical integrated flight tests. As a result, instead of projecting a deployment date of 2003 with exceedingly high risk, we are now projecting a deployment date of 2005 with a much more manageable risk. But if the testing goes flawlessly, we may be able to deploy sooner.

… What we’re dealing with here is the question of those nations—rogue nations could be North Korea, it could be others, who acquire a limited capability that could in fact pose a threat to the American people. We intend to develop, are prepared to develop a system that would give us that limited type of protection against either the rogue nation or the accidental, unauthorized type of launch.

We do not intend to have an NMD that could defend against Russia, for example. That’s not something we seek to develop, but rather a limited system to provide for that kind of limited attack.”

Secretary Cohen did not, however, provide a detailed assessment of the threat or the trade-offs between NMD and other aspects of Homeland Defense. He instead mentioned the Rumsfeld Commission – The Commission to Assess the Ballistic Missile Threat to the United States -- that issued a detailed executive summary of its classified report in July 1998. This Commission is often quoted as one of the most authoritative efforts to analyze the potential threat to the US. At the same time, only a limited amount of its work has been made public, and it seems to have been concerned more with worst cases than most likely threats.

The Commission has issued an executive summary which goes into considerable detail on the threat posed by given countries but the public portions of the report – like much of the current threat analysis used to support the NMD program -- focuses largely on the potential threat from ICBM-like missiles from a handful of “rogue states” like Iran, Iraq, and North Korea.

The public portions of its report do not examine the impact of NMD on Russian and Chinese nuclear forces, and the threat from other forms of attack, in detail. There are valid analytic reasons to decouple the threat of limited missile attack from “rogue nations” like Iran and North Korea from the broader range of nuclear threats to the US from nations like Russia and China. It can be argued that Russia no longer poses any threat of a deliberate attack on the US and that China will only use its nuclear threat as a political bargaining chip and is too prudent to risk any attack. Such a decoupling does, however, ignore the greatest direct threats to the American homeland, and its selectivity greatly strengthens the argument for a limited missile.
defense system of the kind currently postulated as part of the National Missile Defense (NMD) program. It can also be used to justify a largely ideological approach to withdrawing from or renegotiating the ABM Treaty, to ignoring the impact of NMD on the START Treaties, and to ignoring the possible impact of NMD in stimulating an arms race in which China expands its nuclear and missile programs and Russia responds by not ratifying START II or START III.

There are also increasing questions as to just how hostile states like North Korea, Iran, and Libya really are, and whether they will go from testing large boosters to the actual deployment of an extensive missile force armed with effective weapons of mass destruction. The advocates of NMD often structure their threat analyses to ignore the impact of deploying an NMD program in driving rogue nations to find other ways of attacking the United States or holding it to ransom by threatening its allies. They ignore or downplay the fact that the US has relatively porous borders, few air defenses, and no defenses against cruise missiles. They ignore the vulnerability of NATO Europe (which has dismantled most of its active surface-to-air missile defenses since the end of the Cold War), the Persian Gulf region, Northeast Asia, and nations like Taiwan, or they simply postulate the deployment of effective theater missile defenses without recognizing the cost issues involved, and the current lack of effective wide-area defense systems.

At the same time, the opponents of National Missile Defense are often equally selective. They ignore ongoing level of effort in nations like Iran and North Korea, and the cumulative risk posed by accidental launch by a nation like Russia and China. They ignore the fact that there is a high probability that new missile threats will emerge against our allies, and that hard choices may have to be made between improved theater defenses and a reliance on extended deterrence and conventional and nuclear offensive programs. Neither approach provides a valid way of dealing with the issues.
Figure III.1

The National Architecture of a National Missile System Currently Used by the Ballistic Missile Defense Office (BMDO)
Uncertainty and Warning

Security classification presents a major problem for threat assessment. Key reports that warn about the potential seriousness of emerging threats are based on classified data and cannot publicly disclose all of the evidence on which their conclusions are based or provide full supporting detail. In contrast, the reports that minimize such threats tend to be reports by NGOs without access to classified information. Many are designed to oppose NMD and any threat to the ABM Treaty.

Equally important, there are many areas where there are insufficient data to make reliable predictions at any level of classification. This presents serious problems in terms of both analysis and warning. The Rumsfeld Commission is almost certainly correct in warning that, “A new strategic environment now gives emerging ballistic missile powers the capacity, through a combination of domestic development and foreign assistance, to acquire the means to strike the United States within about five years of a decision to acquire such a capability (10 years in the case of Iraq). During several of those years, the United States might not be aware that such a decision has been made. Available alternative means of delivery can shorten the warning time of deployment nearly to zero.”

Senior intelligence officials feel that the Rumsfeld Commission is equally correct in stating that the intelligence community’s ability to provide timely and accurate estimates of ballistic missile threats to the US is eroding for reasons that the intelligence community may not be able to correct, and that the warning times the US can expect for new, threatening ballistic missile deployments are being reduced. This conclusion is supported in depth in the testimony that Robert D. Walpole, the National Intelligence Officer for Strategic and Nuclear Programs gave to the Senate Foreign Relations committee on September 16, 1999.

“Projecting political and economic developments that could alter the missile threat many years into the future is virtually impossible. The threat facing the United States in the year 2015 will depend on our changing relations with foreign countries, the political situation within those countries, economic factors, and numerous other factors that we cannot predict with confidence.

- For example, 15 years ago the United States and Soviet Union were superpower adversaries in the
midst of the Cold War, with military forces facing off in central Europe and competing for global power.

• Fifteen years ago Iraq shared common interests with the United States.
• Finally, we do not know whether some of the countries of concern will exist in 15 years.

“… The new missile threats confronting the United States are far different from the Cold War threat during the last three decades. During that period, the ballistic missile threat to the United States involved relatively accurate, survivable, and reliable missiles deployed in large numbers. Soviet—and to a much lesser extent Chinese—strategic forces threatened, as they still do, the potential for catastrophic, nation-killing damage. By contrast, the new missile threats involve states with considerably fewer missiles with less accuracy, yield, survivability, reliability, and range-payload capability than the hostile strategic forces we have faced for 30 years. Even so, the new systems are threatening, but in different ways.

• First, although the majority of systems being developed and produced today are short- or medium-range ballistic missiles, North Korea’s three-stage Taepo Dong-1 SLV demonstrated Pyongyang’s potential to cross the ICBM threshold if it develops a survivable weapon for the system. Other potentially hostile nations could cross that threshold during the next 15 years.

• Second, many of the countries that are developing longer-range missiles probably assess that the threat of their use would complicate American decision-making during crises. Over the last decade, the world has observed that missiles less capable than the ICBMs the United States and others have deployed can affect another nation’s decision-making process.

• Third, the probability that a missile with a weapon of mass destruction will be used against US forces or interests is higher today than during most of the Cold War. Ballistic missiles, for example, were used against US forces during the Gulf war. More nations now have longer-range missiles and weapons of mass destruction. Missiles have been used in several conflicts over the past two decades, although not with weapons of mass destruction. Nevertheless, some of the regimes controlling these missiles have exhibited a willingness to use such weapons.

“Thus, acquiring long-range ballistic missiles armed with a weapon of mass destruction probably will enable weaker countries to do three things that they otherwise might not be able to do: deter, constrain, and harm the United States. To achieve these objectives, the missiles need not be deployed in large numbers; with even a few such weapons, these countries would judge that they had the capability to threaten at least politically significant damage to the United States or its allies. They need not be highly accurate; the ability to target a large urban area is sufficient. They need not be highly reliable, because their strategic value is derived primarily from the implicit or explicit threat of their use, not the near certain outcome of such use. Some of these systems may be intended for their political impact as potential terror weapons, while others may be built to perform more specific military missions, facing the United States with a broad spectrum of motivations, development timelines, and resulting hostile capabilities. In many ways, such weapons are not envisioned at the outset as operational weapons of war, but primarily as strategic weapons of deterrence and coercive diplomacy.

“Our ability to provide warning for a particular country is depends highly on our collection capabilities. For some countries, we have relatively large bodies of evidence on which to base our assessments; for others, our knowledge of the programs being pursued is limited…Thus, detecting or suspecting a missile development program and projecting the timing of the emerging threat, although difficult, are easier than forecasting the vehicle’s configuration or performance with accuracy. Furthermore, countries practice denial and deception to hide or mask their intentions—for example, testing an ICBM as a space launch vehicle.

“We continue to judge that we may not be able to provide much warning if a country purchased an ICBM or if a country already had an SLV capability. Nevertheless, the initiation of an SLV program is an
indicator of a potential ICBM program. We also judge that we may not be able to provide much, if any, warning of a forward-based ballistic missile or land-attack cruise missile (LACM) threat to the United States. Moreover, LACM development can draw upon dual-use technologies. We expect to see acquisition of LACMs by many countries to meet regional military requirements.... Nations with SLVs could convert them into ICBMs relatively quickly with little or no chance of detection before the first flight test. Such a conversion would include the development of a reentry vehicle (RV).”

These are not worst case warnings, but they do need to be kept in context. The inability to predict the threat works in several different directions. It is not possible to predict changes in regime or regime behavior that may moderate hostility towards the US, or lead a regime to cut back on its program. The ongoing existence of an ambitious missile development program does not mean success or that deployment will follow. Pursuing weapons of mass destruction does not mean that states will always get them, or always be able to deploy an effective missile warhead. It is important to note that North Korea and Iran continue to pursue their programs in spite of changes in their regime. At the same time, their regimes are changing. States like Libya and Syria show no signs of deploying a long-range ballistic missile threat against the US, and Iraq has no near term capability to do so.

**Existing Nuclear Threats**

The current nuclear threat to the US is summarized in Table III.2. It is important to note that only two nations listed in this Table – Russia and China – currently present a significant nuclear threat to the American homeland. Russia still maintains massive nuclear forces and long-range strike capabilities. China is developing the capability to greatly modernize its missile and nuclear forces. While they are extremely unlikely to seek to use missiles to achieve strategic dominance, they do compete with the US in several key regions. As a result, the strategic-driven threats of the Cold War may be replaced by theater-driven threats in the future.

As is the case with every aspect of the potential threat to the American Homeland, there are sharply diverse views of the present and future nature of these two threats. There are many different ways to count strategic forces and to estimate what each nation can do to modify such forces or create new ones.

There are some analysts that see Russia’s retention of massive nuclear forces threat as a
political anachronism that has come to symbolize Russia’s last remaining symbol of being a
global superpower. There are others that see Russian nationalism, Russia’s possession of vast
numbers of nuclear weapons, and Russia’s technology and military-industrial base, as evidence
that Russia may yet reemerge as a major threat. They point to the new defense doctrine that
Russia adopted in January 6, 2000 as evidence that Russia still sees itself as a nuclear power and
one willing to use nuclear forces to pressure or intimidate other states.\(^9\)

Similarly, some analysts see China as a regional power whose ICBM and SLBM forces
are at worst symbols of prestige and who view the reemergence of China as a world power as
largely benign and as oriented towards regional concerns and expanding China’s economic
power. Other analysts see China as the potential peer competitor to the US in the 21\(^{st}\) Century,
and as a nation whose regional interests and competition with the US will drive it to deploy a
significant nuclear threat to the US.

Only time can resolve these uncertainties, but some of the best estimates seem to come
from recent studies by the US intelligence community. The National Intelligence Council
produced a study entitled “Foreign Missile Developments and the Ballistic Missile Threat to the
United States Through 2015,” which was made public in September 1999.

Like the Rumsfeld Commission, its content is limited by the inability to disclose the
classified evidence on which it is based. At the same time, this study does provide considerable
detail on the considered judgment of the US intelligence community, updates much of the threat
analysis provided in the Rumsfeld Commission report, and describes a range of views rather than
a single viewpoint. It also reflects changes in the US in which the US intelligence community
views the missile threat to the American homeland that deserve careful consideration. Robert D.
Walpole, the National Intelligence Officer for Strategic and Nuclear Programs introduced this
report to Congress by stating that,\(^10\)

“\(\text{This year we examined future capabilities for several countries that have or have had ballistic missiles or space launch programs or intentions. Our approach for this year’s report differs with past efforts in three major ways.}\)

\(\text{• First, we have projected missile developments through the year 2015; previous reports projected the threat through 2010. Thus, we have added five years of further development.}\)
Second, using intelligence information and expertise inside and outside the Intelligence Community, we examined scenarios by which a country could acquire an ICBM and assessed the likelihood of various scenarios. (Earlier intelligence reports have focused on scenarios we judged as most likely; the Rumsfeld report focused only on what a country could do. We decided it was time to combine both approaches, although one agency believes that the prominence given by this approach to missile countries “could” develop gives more credence than is warranted to developments that may prove implausible.) We did not attempt to address all of the potential political, economic, and social changes that could occur. Rather, we analyzed the level of success and the pace countries have experienced in their development efforts, technology transfers, political motives, military incentives, and economic resources. From that basis, we projected possible and likely missile developments by 2015 independent of significant political and economic changes.

Third, because countries could threaten to use ballistic missiles following limited flight-testing and before a missile is deployed in the traditional sense, we use the first successful flight test to indicate an “initial threat availability.” Emerging long-range missile powers do not appear to rely on robust test programs to ensure a missile’s accuracy and reliability or to intend to deploy a large number of long-range missiles to dedicated, long-term sites. A nation may decide that the ability to threaten with one or two missiles is sufficient. 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. Using the date of the first projected flight test as the initial indicator of the threat recognizes that an adversary armed with even a single missile capable of delivering a weapon of mass destruction may consider it threatening. Using the first flight test also results in threat projections a few years earlier than those based on traditional definitions of deployment.

I should note that our projections are based largely on limited information and engineering judgment. Adding to our uncertainty is that many countries surround their ballistic missile programs with secrecy, and some employ deception. Although some key milestones are difficult to hide, we may miss others, at least until flight testing; recall that we did not know until its launch that North Korea had acquired a third stage for its Taepo Dong-1.

I should also note that we incorporated the results of several expert, academic and contractor efforts, including the recommendations of former members of the Commission to Access the Ballistic Missile Threat to the United States, assistance from politico-economic experts to help examine future environments that might foster ICBM sales, and the expertise of missile contractors to help postulate potential ICBM configurations others could pursue.”

This NIC document makes it clear that Russia and China continue to pose major potential threats to the US homeland:11

“we project that during 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.

“The Russian threat will continue to be the most robust and lethal, considerably more so than that posed by China, and orders of magnitude more than that posed by the other three.

“Initial North Korean, Iranian, and Iraqi ICBMs would probably be fewer in number—a few to tens rather than hundreds or thousands, constrained to smaller payload capabilities, and less reliable and accurate than their Russian and Chinese counterparts.

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“Countries with emerging ICBM capabilities are likely to view their relatively few ICBMs more as weapons of deterrence and coercive diplomacy than as weapons of war, recognizing that their use could bring devastating consequences. Thus, the emerging threats posed to the United States by these countries will be very different than the Cold War threat.”

These conclusions help illustrate why the analysis of the Russian and Chinese missile threat cannot be decoupled from any effort to evaluate the threats that determine the merits of a given NMD architecture. At the same time, the debate over national missile defense often ignores this reality. Only a few Americans now seriously argue for either the kind of relatively leak-proof missile defense that President Reagan once called for to deal with the Soviet strategic missile threat to the US, or for a more limited defense against the Russian threat like GPALS. No one now calls for a revitalization of US air defenses to deal with the Russian threat, or for any kind of defense against low-flying cruise missiles.

The present NMD architecture only calls for a deployment of one to two land-based anti-ballistic missile complexes which designed to deal with maximum missile threats of 10-20 near-simultaneously launched missiles, against the US. Such a limited NMD system might offer protection against an accidental Russian or Chinese launch, but could not protect the US against a medium or full-scale attack by current Russian forces or from the forces China is likely to deploy in the near to mid-term.
### Table III.2

#### The Nuclear Dimension – Part One

<table>
<thead>
<tr>
<th>Country</th>
<th>Sea-Based</th>
<th>Land Based</th>
<th>Air Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>18 SSBM/432 SLBM +1/16 Poseidon C-3 tubes in ex-SSBN</td>
<td>500 Minuteman II/III</td>
<td>178 Active.</td>
</tr>
<tr>
<td></td>
<td>10 SSBN-734 with up to 24 Trident D-5 (240 SLBM)</td>
<td>50 Peacekeeper MX</td>
<td>315 START accountable</td>
</tr>
<tr>
<td></td>
<td>8 SSBN-726 with up 24 Trident C-4 (192 SLBM)</td>
<td></td>
<td>2/17 B-2A</td>
</tr>
</tbody>
</table>

| Russia  | 21 SSBN/332 SLBM | 180 SS-18 (RS-20) | 74 START-accountable |
|         | 3 Typhoon with 20 SS-N-20 each (60) | Mostly Mod4/5 w/ 10 MIRV | 14 Test & 44 in Ukraine |
|         | 7 Delta IV with 16 SS-N-23 each (112) | 160 SS-19 (RS-18) | 68 Tu-95H6 with AS-15 ALCM |
|         | 7 Delta II with 16 SS-N-18 each (112) | 15 SS-27 Topol M2 with 20 entering service | 6 Tu-160 (8 more to come from Ukraine) |
|         | SS-N-8 each (48) | SS-24 (RS22) with 158 Tu-22M/MR (92 in storage) |

In addition, 16 SSBN and 228 missiles remain START accountable: 3 Typhoon/60 SS-N-20 6 Delta III/96 SS-N-18 2 Delta II/32 SS-N-8 6Delta I/70 SS-N-8 11 Oscar SSGN with ABMs 24 SS-N-19 3 Yankee SSGN with 20+ SS-N-21 1 Yankee SSGN/12 SS-NX-24 10 AkulaSSN/SS-N-21 3 Sierra SSN/SS-N-21 12 Victor II/SS-N-15

7 Delta IV/100 SS-N-8 16 Delta II/32 SS-N-8 10 Tu-22M/MR 64 SH-08 Gazelle 30,500 nuclear weapons* 12,075 nuclear warheads, 1,100 strategic nuclear delivery systems)**

(33,500 nuclear weapons)* (12,075 nuclear weapons)* (33,500 nuclear weapons)* (12,075 nuclear warheads, 1,174 strategic nuclear delivery systems)**

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### Table III.2

**The Nuclear Dimension – Part Two**

<table>
<thead>
<tr>
<th>Country</th>
<th>Sea-Based</th>
<th>Land Based</th>
<th>Air Force</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>France</strong></td>
<td>4 SSBN/64 SLBM</td>
<td>3/60 Mirage-2000N (AMSP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 L’Inflexible with</td>
<td>36 Super Etendard AMSP plus 16 in storage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 M-4?TN-70 or 71 each</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1,400 nuclear weapons)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(450 nuclear warheads, 109 strategic nuclear delivery systems)**</td>
<td>2 Le Triomphant with 16 M-45/TN-75 each</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>United Kingdom</strong></td>
<td>3 SSBN/48 SLBM</td>
<td>3 Vanguard SSBN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1,100 nuclear weapons)*</td>
<td>with up to 16 Trident D-5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(192 nuclear warheads, 48 strategic nuclear delivery systems)**</td>
<td>each and maximum of 48 warheads per boat.</td>
<td></td>
</tr>
<tr>
<td><strong>China</strong></td>
<td>1 Xia SSBN with 12 CSS-N-3 (J-1)</td>
<td>15-20 CC-4 (DF-5) MIRV ICBM</td>
<td>Up to 120 H-6, Some nuclear capable.</td>
</tr>
<tr>
<td></td>
<td>500-1,300 nuclear weapons)*</td>
<td>20+ CSS-3 (DF-4) ICBM</td>
<td>200+ H-5?</td>
</tr>
<tr>
<td></td>
<td>(400 nuclear warheads, 40 strategic nuclear delivery systems)**</td>
<td>38 CSS-2 (DF-3 IRBM 8 CSS-5 DF-21 IRBM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>? DF-11 CSS-7/M-11 SRBM (120-300 KM)</td>
<td>150 DF-15 CSS-6/M-9 SRBM (600 km)</td>
<td></td>
</tr>
</tbody>
</table>

Estimate by Sergei Rogov
Estimate by Carnegie Endowment and Arms Control Association
Russia, NMD, and START II/III

There are many different views of the risk that Russia would ever launch missiles against the US homeland or try to use its intercontinental missile forces to actively intimidate the US. Some see the end of the Cold War as having virtually ended the threat of Russian use. Others see a serious risk of the reemergence of a hard-line Russia and some new form of nuclear arms race.

The National Intelligence Council report summarizes the Russian ballistic missile threat to the US as follows:12

“Russia's strategic offensive forces are experiencing serious budget constraints but will remain the cornerstone of its military power. Russia expects its forces to deter both nuclear and conventional military threats and is prepared to conduct limited nuclear strikes to warn off an enemy or alter the course of a battle.

• Russia currently has about 1,000 strategic ballistic missiles with 4,500 warheads.

• Its strategic force will remain formidable through and beyond 2015, but the size of this force will decrease dramatically—well below arms control limits—primarily because of budget constraints.

• Russia will maintain as many strategic missiles and associated nuclear warheads as it believes it can afford, but well short of START I or II limitations.

• —If Russia ratifies START II, with its ban on multiple warheads on ICBMs, it would probably be able to maintain only about half of the weapons it could maintain without the ban.

• We judge that an unauthorized or accidental launch of a Russian strategic missile is highly unlikely so long as current technical and procedural safeguards are in place.”

Paradoxically, these conclusions indicate that a limited US NMD system poses little threat to Russian capabilities. The Russian forces shown in Table III.1 are so large that they scarcely indicate that US deployment of a limited NMD system will threaten Russia’s capability to achieve high levels of “assured destruction” against the US. Neither do the force ratios shown START-accountable force levels shown in Chart III.1 and Table III.3, and the more detailed threat analysis of Russian nuclear forces shown in Table III.4. The US has also never made any public statement indicating that the currently contemplated NMD system is capable of defeating Russian decoys and countermeasures.

As a result, both Russia and the US face major uncertainties regarding the interaction
between NMD, arms control efforts to limit nuclear forces, nuclear modernization, and the ABM Treaty. The present terms of the various START treaties may be summarized as follows.

- **START I:**
  - 6000 accountable warheads on 1,600 offensive strategic delivery vehicles.
  - Only 4,900 warheads on ballistic missiles
  - Limit of 1,540 warheads on heavy ICBMs.
  - Limit of 1,100 warheads on mobile ICBMs.
  - Downloading permitted
  - Verification through JCIC (Joint Compliance and Inspection Committee), unimpeded NTM (National Technical Means) and SCC, unencrypted telemetry, OSI(On-site Inspection), NRRC

- **START II:**
  - 3,000 to 3,500 accountable warheads on offensive strategic delivery vehicles..
  - Limit of 1,750 warheads on SLBMs
  - No multiple warheads on ICBMs.
  - Can download maximum of 4 warheads, except for 6 warheads in case of SS-19.
  - This means all SS-18s and Peacekeepers must be destroyed.
  - Verification through JCIC, unimpeded NTM and SCC, unencrypted telemetry, OSI, NRRC, plus OSI

- **START III:**
  - Limit of 2,000-2,500 accountable warheads on offensive strategic delivery vehicles.
  - Possible cuts to 1,500 warheads. (Russian proposal)
  - Destruction of warheads with transparency.
  - Explore limits and/or destruction of theater nuclear weapons.

Each of the prospective “build-downs” under the three current phases of START would still leave both Russia and the US with high levels of mutual assured destruction, parity in offensive capability, and with enough remaining nuclear forces so that both nations could continue to claim to be nuclear “superpowers.”

**The Russian Perspective towards a US NMD System and Nuclear Force Modernization**

The preservation of mutual assured destruction is only one of the issues shaping Russian
perceptions of NMD. From a Russian perspective, Russian strategic nuclear parity with the US is one of the few remaining indications that Russia is a superpower that is “comparable” with the US in at least some ways. Furthermore, Russia already faces major problems in maintaining its present strategic force levels and has sought to use the START negotiations to reduce both future US and Russian force levels to totals as low as 1,500 accountable warheads.

The basic problems Russia faces are force modernization and money. Russia has already cut its nuclear forces from around 10,000 deployed to less than 6,000. Its ICBMs can be modernized and rebuilt, but cumulative problems develop in terms of tolerances and fatigue that mean operational lifetimes are limited to around 20 years, and may be less than 10 years. Some experts notes that major components like rocket engines may be too difficult and costly for Russia to replace, particularly since key Ukrainian manufacturing plants have closed.13 Certainly, Russia faces major problems in trying to keep its current missile force active and “on-line.”

Most experts agree that Russia's future nuclear arsenal depends heavily on the production rate of its new missile, the SS-27 Topol-M. According to some estimates, this will be the only modern ICBM in the Russian arsenal ten years from now. At the time when START II was first discussed, Russia planned to produce 30-40 of these missiles a year. Only 20 were deployed in 1998-1999, however, and Russia will have only 130 single-warhead SS-27s by 2010 at the current production rate of roughly 10 missiles per year. If Russia reached a production rate of 20 missiles per year, it would have 230 missiles by 2010. At 50 missiles per year, it would have only 530 missiles by 2010.

Russia's ballistic missile nuclear submarine (SSBN) fleet is aging badly and suffers acutely from poor maintenance. A Carnegie Endowment estimate indicates only the relatively new Delta IV fleet will likely be operational by 2010.14 Each of the seven Delta IV SSBNs carries 16 SS-N-23 sea-launched ballistic missiles (SLBMs), for a total of 112 missiles. Each SS-N-23 has four multiple independent reentry vehicles (MIRVs), for a total of 448 sea-based warheads. The only alternative would be for Russia to renew the construction of its new Borey class SSBN. The prototype is now unfinished at the Severodvinsk Sevmash shipyard. The Borey
class will probably carry twelve SLBMs, each with four warheads. It is not clear, however, what a crash construction effort could accomplish by 2010, and it is doubtful that Russia can afford it.

Russia faces problems with the non-missile leg of its strategic triad as well. Russia's two strategic bombers -- the Tu-95 Bear H and the Tu-160 Blackjack -- are now aging aircraft which have not had the extensive rebuilding and modernization effort that has gone into the B-52 or the level of modernization in the B-1B. The Bear H has had only limited modernization since 1990, and the production of new Blackjack bombers that began to be completed in May 2000 seems to be dated in terms of electronic warfare and penetration capabilities. According to the Carnegie estimate, Russia is likely to have 480 air-launched cruise missiles, or ALCMs, carried on only 30 Bear H bombers and 10 Blackjack bombers in 2010.

Alexei Arbatov, the Deputy Chairman of the Committee on Defense in the Russian Duma expressed these Russian concerns in some detail at a briefing to the Carnegie Endowment on May 9, 2000: 15

"Let me start with the substance of this issue. START II was ratified in Russia by the Russian Parliament not because Russians think that the threat is lower, not because Russians think that nuclear weapons are less relevant, nor because the Russian Parliament and public think that the United States will be a partner for cooperation and security. START II was primarily ratified because the Russian public and political elite think that the nuclear threat is great, that the United States is keen on achieving superiority, and that nuclear weapons are still as relevant as ever for Russian security and U.S.-Russian relations.

"The principal argument in favor of START II…was that without START II, Russia’s forces—with a shortage of funding—would go down in ten years to 1,000 warheads on their own. At the same time, the United States can easily afford to maintain the present level of its strategic forces. In this way, if there is no further arms control agreement, in ten years the United States may, inadvertently, acquire nuclear forces that are five or six times over that of Russia…without spending additional money…

"If Russia were to preserve its forces at the level of START I, which is 6,000 nuclear warheads, then over ten years Russia would have to spend about $33 billion only on strategic nuclear forces and C3I systems. It would mean spending 65% of its total defense budget yearly only on strategic nuclear forces. If Russia were to keep its forces at the level of START II, which is about 3,000 weapons, then it would have to spend $26 billion during the next ten years, which would annually account for about 50% of its overall defense budget. If Russia was to maintain its forces at the level agreed in the START III agreement, which is around 2,000 weapons, then we would have to spend $14 billion in the next ten years—which would be about 27% of our present budget…

"If the United States keeps its forces at the level of START I and Russia’s [forces] decline because of a shortage of funding, then in ten years the American second strike capability, would be 15 times bigger than Russia’s second strike capability. At the level of START II the United States would have triple the superiority of Russia…Under START III there would be approximate parity between the two sides, which
implies that for Russia, ratification of START II is primarily a way to reduce the American nuclear threat.

"The fear of American nuclear superiority and the fear of the United States was the principal motive for many members of Parliament to vote for START II...Spending 65% of the budget means that nothing will be left for the conventional forces and for all other functions for Russia armed forces..."

"The second motive...is that Russia considers START II to be an additional guarantee of the viability and validity of the ABM Treaty of 1972...Putin made a very strong commitment, which is on the record, that if the United States unilaterally withdrew the ABM Treaty, Russia will withdraw from START II, and will go in for new MIRVed ICBMs. He also said...that Russia will withdraw from all regimes of arms control, including conventional arms control.

"Article IV [of the START II implementation law] clearly states that if agreement on START III is not reached by December 31, 2003, Russia will once again consider withdrawal from START II...By that time, Russia will not have completed its reduction—it will only have reached the level of 4,000 weapons...

He also made the following comments on the relationship between Russia’s ability to sustain its forces, START II, the ABM Treaty, and NMD: 16

"First of all, the U.S. Senate has to ratify the 1997 documents, then both sides have to agree on the START III Treaty, going down to 1000-1,500 warheads. And maybe we can revise the protocol to the ABM treaty, so that the United States may develop its desired ABM deployment area in Alaska. The United States also needs to ratify the CTBT, so that we can move on to a more stringent non-proliferation regime, and bring India and Pakistan into the CTBT as well...

"The ball is now in the American court; it is up to the United States to make further steps. If it is done we may achieve a real breakthrough in arms control, which will make it easier for us to come to an accommodation on European affairs, on Iran, on China, and many other issues of international security. However, if that does not happen, the new deadlock in arms control, and maybe even the disintegration of the arms control system will greatly aggravate the conflicts that we have in the world at large. That will be extremely detrimental to international security, to the security of Russia, and to the United States as well."

From a Russian perspective, reducing Russia’s current strategic forces down to the force levels called for START II presents a massive financial challenge in terms of force modernization costs. Further, Russia fears that the US deployment of a limited NMD system might only be the first step in the deployment of a much larger system that might be able to limit Russia’s capability to attack the US. At a minimum, US deployment of an NMD system threatens Russian prestige. At a maximum, it threatens Russia with American hegemony at a time Russia feels that US and Western intervention in Kosovo has shown it that it cannot trust in partnership with the West.

The START II Treaty forces Russia to dismantle its land-based MIRV’d ICBM force in
ways that mean it must pay for massive deployment of new single-warhead Topol M2 (SS-27) ICBMs to keep up with the US. Some Russians also feel that building down to the START II limits would leave the US with a major advantage in MIRV’d SLBMs while Russia gives up its advantage in land-based ICBMs. At the same time, the present terms of START II allow the US to keep half of its MIRV’d SLBMs but Russia cannot keep any of its MIRV’d ICBMs.

This is why Russia has pressed hard to move forward with START III as soon as START II is ratified by both countries. It is also why Russia pressed to cut the number of allowable START III accountable warheads from the original figure of 2,000-2,500 to only 1,500 – approximately 25% of the level now allowable under START I. The US has generally been sympathetic to these Russian arguments, although it questions Russian ability to run its forces down rapidly to only 1,500 warheads and to carry out the physical destruction of nuclear warheads proposed as a potential provision of START III.

**Russia Force Modernization versus the Current US NMD Architecture**

At the same time, the importance of the Russian force modernization issue should not be exaggerated. None of the currently contemplated NMD systems being discussed by the Clinton Administration and Congress could significantly degrade a massive Russian attack on either countervalue (city and economic) or counterforce (military) targets in the US. The impact of a US NMD system would only a have token impact on a Russian attack if both sides forces remained at the 3,500 warheads permitted in START II, or the START III levels remained at 2,000-2,500 warheads. A one-site US NMD system with 100 interceptors would be comparatively easy for Russia to saturate. Even if the number of allowable interceptors was raised to 200 interceptors in two sites, Russia could still saturate the US missile defenses. A smaller Russian force may, however, might *seem* more marginal in the face of a US NMD system, particular once warheads are cut below 2,500 warheads.

Some Russians have raised the issue that a US NMD system would preclude Russia from limited or demonstrative strikes, while leaving this option open to the US. These Russians also raise the question of whether the US can develop an NMD “break out” capability. They postulate...
various scenarios in which the US suddenly increases its number of NMD sites and interceptors and does so that the US achieves at least a damage limiting capability against Russian strategic offensive forces at a time Russia cannot afford to build back to the levels required to overcome a large US NMD system.\(^\text{18}\)

It is hard to tell how serious such Russian concerns really are, and the degree to which Russia’s opposition to NMD is based on strategic military considerations as distinguished from political ones. Russia would almost certainly be far more tolerant of a US NMD system if the Russian economic reform and growth were more successful, if Russian politics were less nationalistic, and if Kosovo, NATO expansion, the US Senate vote on the CTBT, and Chechnya had not seriously hurt US and Russian relations. At present, however, Russian politics are extremely nationalistic and relations with the US are poor. Such tensions have already helped block the Russian Duma’s ratification of START II during 1995-1999, and lead Russia to extend the life of the SS-18 and Delta III submarines in the Pacific fleet.\(^\text{19}\)

Virtually all Russians also seem to agree the present Russian strategic defense system deployed around Moscow is not comparable to any of the proposed US NMD systems. The Russian system consists of a 1970s-vintage mix of radars, battle management systems, 36 modified SH-11 (Galosh) interceptors, and 64 SH-08 Gazelle interceptors with some 1980s updates. This Russian system has only marginal capability against modern missile warheads, and is not an adequate substitute for the kind of NMD system that the US proposes to deploy.

**The Problem of the ABM Treaty**

These issues have already led Russia to adopt a much less friendly defense doctrine which no longer calls for partnership with the West, and they have led to threats to withdraw from START if the US deploys an NMD system in a form that is non-compliant with the ABM Treaty or even any NMD system at all. They are a major factor behind the Russian and Belorussian, and Chinese resolution on the preservation and implementation of the ABM Treaty that the UN General Assembly adopted in December 1999.
This resolution used virtually the words set forth in Articles I and IX of the ABM Treaty, and called for the nations who had signed the treaty to, “restrict deployment of anti-ballistic missile defense systems, refrain from deployment of anti-ballistic missile defense systems on their territories, not to create the basis for such a defense, not to hand over to other countries, and not to deploy beyond their national territories anti-ballistic missile defense systems or their components mentioned in the given treaty.”

The Constraints in the ABM Treaty

The issue of renegotiating or abrogating the ABM Treaty has become critical to both NMD and START. While the US has made attempts to argue the legal case for a more liberal interpretation of the ABM Treaty, most experts feel the ABM Treaty has key provisions that prevent the deployment of any kind of operational NMD system, and severely restrict the development and deployment of the kind of wide-area theater missile defenses that allied and friendly nations could use for NMD purposes.

- Article I says that ABM systems cannot be deployed for the defense of the entire country.
- Agreed Statement D requires that ABM systems based on other physical principles require the agreement of the parties. These include components capable of substituting for interceptors, launchers, or radars.
- Article V prohibits development and testing of space, air, or sea-based ABM system or mobile land-based system and ABM interceptors. Launchers, and radars.
- Article III initially permitted two fixed land sites, one within 150 kilometers of capital and within 150 kilometers of an ICBM silo area. A protocol in 1974 limited to one site near capital or near ICBM silos. For the US, the Common Understanding specifies the area around Grand Forks, South Dakota.
- Each site limited to a maximum of 100 ABM launchers and interceptors.
- Limits EW radars to periphery of national territory; they must look outwards.
- Cannot deploy phased array radars beyond a given capability.
- Article VI prohibits any interceptors, launchers, and radars other than those allowed under Article III from have the capability to counter strategic missiles in flight.
- Non-ABM systems may not be tested in the ABM mode.
- Agreed Statement of 1997 between US and Russia agrees on the demarcation of ABM and theater ballistic missile (TBM) defense systems. It limits TMD systems to those with a velocity of no more than 5

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kilometers per second, and the range of the target missiles used to test such a system to 3,500 kilometers. It proscribes the development, testing, and/or deployment of space-based interceptors or components based on alternative technologies that can substitute for ground based interceptors, and requires consultations if new technologies emerge which can be used for TMD systems.

**Their Impact on Near-Term US NMD Deployment Decisions**

The deployment of the currently contemplated US NMD system presents two critical near-term problems in terms of a violation of the ABM Treaty. The first is that the very phrase “national missile defense” system makes it clear that the system is intended to be national, and is not limited to the kind of area defense permitted under the treaty.

The second is that the US is currently planning to deploy the first site in Alaska to maximum coverage against North Korea and Iran, and this would mean deployment in a prohibited area. As a subset of this debate, some of the Department of Defense’s legal experts have argued that simply starting the construction work in Alaska would not be a violation of the treaty while many other US government legal experts believe that any move to physically start the construction of an NMD system is forbidden by the treaty. This debate seems to have been one of the factors leading President Clinton to defer any work on construction in Alaska in September 2000, and to leave the decision to his successor.

There are also questions about the need to place US radars outside the US, and US plans to go on to create a new space-based surveillance system that are discussed later in this report. The US argues that deploying new ground-based radars outside the US would not threaten Russian retaliatory capabilities, and that its new Space-Based Infra-Red Sensors (SBIRS) will only provide space-based infra-red warning of a missile launch, trajectory, and approximate aim point – improvements over capabilities the US and Russia have had for many years. At least some Russians feel that such efforts are either a sign that the US intends to go far beyond the limited system it is now talking about or that it will give the US the capability to rapidly deploy such a larger system.

**Their Impact on Near-Term US TMD Deployment Decisions**

As has been touched upon earlier, there is a further interaction between NMD,
theater missile defense, the ABM Treaty, and START. In March 1997, both nations also agreed to ban space-based theater missile defense (TMD) systems, and that theater systems can only be tested at speeds greater than 3 kilometers per second if target has speed of less than 5 kilometers per second and range of less than 3,500 kilometers. This allows systems to be tested at speeds of more than 3 kilometers per second at targets with closing speeds of less than 5 kilometers per second and ranges less than 3,500 kilometers.

These speeds are adequate for the deployment of the Patriot PAC 3 and may be adequate to allow the deployment of the wide area version of THAAD. According to some experts, however, these speeds are not fast enough to allow the development of effective wide area theater missile defenses, particularly effective defenses against high apogee, long-range theater missile systems which have high closing speeds. They may be adequate for defense against systems like the extend-range Scud, but it is doubtful that they provide adequate range against newer systems like the Iranian Shahab 3.

This is a potentially critical issue in terms of US cooperation in missile defense with allied and friendly states. States in Europe, the Middle East, and Asia do not require either the area coverage or range of intercept needed in a US NMD system. On the other hand, they do need the equivalent of TMD systems that are capable of NMD-like intercepts of advanced ballistic missiles. As such, the ABM Treaty is a major potential barrier to the transfer of US TMD technology and the integration of Homeland defense into a cohesive counterproliferation strategy.

**Linking NMD to Changes in the ABM Treaty**

As a result, the US may ultimately have to consider just how valuable the ABM Treaty really is if it is to create an effective Homeland defense and counterproliferation capability. Present US policy still seeks to preserve both the ABM Treaty and START II as essential aspects of US policy. Undersecretary Walter Slocombe provided the following summary of the resulting mix of US and Russian attitudes towards NMD, START, and the ABM Treaty in his speech to
“Our NMD development program has been and will continue to be carried out in compliance with the ABM Treaty. That compliance in the development phase has not slowed or curtailed the effort. The technical experts who have directed this program have concluded that this architecture that I have described is the best suited to the quickest possible deployment of an effective national missile defense.

It is, however, clear that deployment – as distinct from development – of the NMD, will require Treaty modifications, and we have made clear to Russia that we will seek to negotiate such modifications, proceeding in good faith.

The goal of both preserving the Treaty and having the option to deploy an effective limited defense is a wholly reasonable one. There is no substantive reason we should find ourselves in the position of having to choose between having the capability to defend our people against rogue state ballistic missile attack, on the one hand, and jeopardizing our interest in strategic stability, a sound relationship with Russia, and further reductions in American and Russian strategic offensive arms on the other.

There are several reasons why we should not have to face that choice.

First, and most important, the system we would deploy would not in any way threaten Russia's deterrent. Whatever the merits of the prior SDI plans for a massive defense against a deliberate Soviet attack, the fact is that the system we would deploy is completely different from a large-scale territorial defense against each other that greatly concerned the United States and the Soviet Union during the Cold War.

Second, the ABM Treaty already allows a limited ballistic missile defense system, though to be sure, not a nationwide one. Indeed, the ABM Treaty from its inception in 1972 has permitted such deployment, and Russia has long maintained such an ABM system around Moscow. Russia continues to test the elements of that system.

Third, the ABM Treaty, even when modified to permit deployment of a limited defense system, will remain fully viable and a key element in our broad strategy to reduce further the nuclear threat. This is so because the limited defense system we have in mind is fully compatible with the fundamental purpose of the ABM Treaty. That purpose is not to ban defenses altogether -- since it does not do that -- but to ensure that each party's strategic deterrent is not threatened by the missile defenses of the other party. We believe that the Treaty can be modified to permit deployment of the limited national missile defense while preserving that fundamental purpose.

Indeed, the real threat to the viability of the Treaty in contemporary conditions comes not from efforts to modify it to reflect current reality -- namely the threat from rogue missiles, or, in the Treaty’s own terms, the "strategic situation" -- but from a fixed refusal to modify it to permit the United States -- and for that matter, Russia, which potentially faces the same problem -- to build effective defenses against those threats. Neither the ABM Treaty nor any other international treaty can remain viable if it fails to reflect contemporary reality -- in this case, the problem of rogue state ballistic missile proliferation.

Over the past years, we have kept Russia fully informed of our NMD policy, and of our progress on work toward an NMD system, such as our initiation earlier this year of the analysis of the environmental impact of an interceptor deployment in Alaska. More recently we have begun detailed discussion with the Russians about our deployment architecture and the necessity of adapting the ABM Treaty to permit it.

Specifically in June, Presidents Clinton and Yeltsin agreed to begin discussions that will address both updating the ABM Treaty in light of U.S. NMD plans, and further reductions in strategic offensive arms.
Since late August we have been talking in detail with Russia at senior levels about the system we have in mind and its implications for the Treaty. And over the past several months, we have closely consulted with allies regarding both our policy and our approach to Russia.

We are now seeking Russia's agreement to those changes to the ABM Treaty required to permit us to meet our initial goal. We have judged it right to leave to President Clinton's successor and to the successor of President Yeltsin the longer-term issue of follow-on negotiations on further changes to the Treaty required to permit deployment to meet larger, more complex threats. But we have made clear that we expect such negotiations would need to begin in 2001, in order to ensure that the United States could begin the necessary construction of additional components, possibly including foreign-based ABM radars, so those components would be ready to provide a defense against a more sophisticated threat, which may emerge later in the next decade.

Central to this issue is that both the United States and Russia face the potential of rogue state ballistic missile threats. The President has told President Yeltsin, and Secretary of Defense Cohen has told Russian Minister of Defense Sergeyev on his recent visit to Moscow that we want to work cooperatively with Russia on these matters. In this regard we have recently proposed a number of specific projects for cooperation to the Russian government. These measures, which could include cooperative operation of satellite systems and cooperative modernization of troubled Russian missile attack warning radars, would be designed to serve two goals. They would both help Russia and the United States move together to meet a common rogue state threat, and also provide tangible assurance that the U.S. system is not aimed at Russian deterrence. Naturally, such cooperation would need to have Congressional support if U.S. funds were involved and would have to address difficult issues of security, command and control, and basic policy. However, if these difficulties could be resolved, through such cooperative programs, both the United States and Russia would be able to require tangible benefits to their security that would help both nations demonstrate that a cooperative approach on ballistic missile defense is in our common interest.

As has been clear so far from Russian public statements, the Russian government reaction has so far been negative. That said, however, the Russians agree that it is important to discuss this matter. As to the prospects of eventual Russian agreement to the necessary modifications to the treaty, Secretary Cohen has said: "We will negotiate with the Russians and try to persuade them it is in our interest and their interest to remain within the framework of modifying the treaty.... I believe that we can persuade them that we are serious about holding on to the structure of the ABM Treaty, but that it needs to be modified to give us this protection for our own country."

If in the end we are unsuccessful in these negotiations, the President would have to decide whether to withdraw from the ABM Treaty under the supreme national interest clause. That right of withdrawal is expressly provided for in the Treaty, and it always remains an option. We will, however, make every effort to secure what we think to be the right outcome in our national interest and that of Russia and the rest of the world, which is modification of the ABM Treaty so that our planned NMD system can go forward, while preserving the treaty as a key component of strategic stability for the future.

In summary, our planning and our development, our technological work for an NMD system is well advanced. It seeks to anticipate future rogue state threats and to develop systems that can defend against such threats, which I have to say appear very close on the horizon. Our NMD program remains on a highly accelerated track to ensure that we are positioned to respond in a timely fashion. And we continue to work with Russia to pursue negotiated changes to the ABM Treaty so that the Treaty can be preserved while we maintain our option to deploy a national missile defense system."

Michael Krepon of the Stimson Center, provided the following arguments in
favoring of linking the deployment of NMD to revising the ABM Treaty in his testimony to the House Armed Services Committee on November 10, 1999:

Why not proceed with unlimited defenses? Because unconstrained defenses will prompt the demise of most co-operative threat reduction efforts with both Russia and China. Unlimited defenses will also mean the demise of treaties governing nuclear offenses that, in turn, will turn the Non-Proliferation Treaty into a hollow document.

Can the benefits of unconstrained defenses outweigh the attendant costs?

An entirely different calculus applies to limited national defenses. Limited defenses, if proven under rigorous testing, can offer political as well as military benefits, and can be pursued within the context of co-operative threat reduction efforts. Will limited defenses work perfectly if needed? If perfection is the required standard, then government spending of all kinds would be greatly reduced. Does it make sense to seek to intercept missiles when there are other, simpler means of wreaking havoc with weapons of mass destruction? Yes B as long as counters to other means of delivery are also pursued.

Under troubling post-Cold War circumstances, a modest insurance policy against missile threats is worth buying. Buying too much insurance is not a wise use of taxpayer dollars. Abrogating treaties to deploy heavy defenses against light threats is profoundly unwise, in my view.

The launch of extended-range missiles carrying weapons of mass destruction B and the resulting breakdown of deterrence—would be a seminal event. National and theater missile defenses can help lessen the likelihood of this tragic circumstance by demonstrating US resolve to defend forces and friends, as well as by countering states that seek to use missiles to extend their coercive influence in troubled regions. The political utility of missile defenses could be as important as their military effectiveness B if missile defenses are pursued in the context of collaborative approaches rather than by trashing treaties.

The approach suggested here involves bilateral US-Russian negotiations as well as extensive consultations between the executive and legislative branches in both countries. While amended treaty constraints are envisaged, less formal arrangements could well play a larger role. Co-operative threat reduction efforts would need to extend beyond current Nunn-Lugar and lab-to-lab programs. The next frontiers for co-operative threat reduction are reduced launch readiness for nuclear forces and the verifiable, irreversible dismantlement of nuclear warheads—tasks best tackled outside of treaties.

The debate over deep cuts vs. defenses made sense during the Cold War, but it has now been overtaken by events. Both arms control advocates and strategic defense enthusiasts want to reduce nuclear dangers, but they are too wedded to old arguments to join in common cause. These tired debates no longer make sense to most Americans, who support deep cuts as well as defenses. Both objectives can be compatible and stabilizing as long as they are pursued co-operatively. The next administration and members of Congress face the challenge of turning common sense into national policy.

At the same time, there are those who argue that the ABM Treaty is now dated and serves little purpose. Jim Wolsey, the former Director of Central Intelligence (DCI), provided the following arguments against linking NMD to the ABM Treaty in his testimony to the House Armed Services Committee on November 10, 1999:

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My point with respect to the ABM Treaty in today’s world is really twofold.

- First, there is common ground possible, today, between those who have been on different sides of the ABM Treaty debate in the past. Both those who have opposed the treaty for many years (often in company with early support of the more ambitious forms of SDI) and those, such as myself, who supported the treaty during the same period and were skeptical of ambitious SDI, need to realize that what matter, today, are the decisions that now need to be made, not ancient jousts between SDI supporters and ABM Treaty supporters during the era before the fall of the Berlin wall. We may have both been somewhat right and somewhat wrong. It doesn’t matter. Together we won the cold war. It’s time, indeed past time, to go on to the next set of problems.

- Second, if one focuses on the strategic realities of today, I would submit that there is no strategic rationale for the ABM Treaty. The old rationale for our wanting to limit Soviet defenses, as spelled out above, does not apply to today’s Russia or the Russia of the foreseeable future, even if that nation turns more hostile to the U.S. than it is today. Russia is no longer capable of threatening Europe with many divisions of conventional forces so it would have no advantage in a crisis on that continent. Consequently we do not need to rely in any day-to-day sense on our strategic offensive nuclear forces to protect our NATO allies from Russian conventional attack. Moreover, Russian strategic nuclear forces do not threaten a substantial share of our nuclear deterrent: the deterrent that we do maintain is no longer heavily reliant on fixed land-based ICBM’s that might be vulnerable to Russian attack, and hence we have no reason to want to limit Russian defenses to ensure that our retaliatory forces would be able to penetrate Russian defenses.

The only rationale for the ABM Treaty today is one rooted in current foreign relations concerns: the Russians do not want us to withdraw from it, so doing so would, presumably, upset them and perhaps lead them to do other things that we don’t want. For example, for the umpteenth time they may threaten to refuse to ratify the START II Treaty. But it seems to me there is a limit to the degree to which we should let this sort of thing influence us. The Russians were willing in 1992, following President Yeltsin’s remarkable speech in January of that year, to consider substantial revisions to the ABM Treaty and to discuss mutual work on ballistic missile defenses with us. Perhaps this or the next Russian government will prove similarly reasonable in the future. That doesn’t look likely today, but it is still worth offering, in my view, to work with the Russians in the way that we began in 1992 and abandoned in 1993. If that proves fruitless there are ample legal and strategic grounds for no longer considering ourselves bound by the Treaty. We cannot perpetually let our security vis-a-vis the likes of North Korea, Iran, and Iraq be held hostage to Russia’s not wanting us to have defenses.

In the meantime, in my judgment, the Senate should not approve the delineation agreement that the Administration has already reached with the Russians, which limits unnecessarily the effectiveness of our theater defenses, nor the accompanying expansion of the treaty to encompass Belarus, Ukraine, and Kazakhstan—a step for which there is not even the most remote strategic rationale. We don’t have any reason to want to limit these countries’ ballistic missile defenses. Why should we let them have a hand in limiting ours?

In my view only a shift to a fundamentally different kind of treaty dealing with ballistic missile defenses or a withdrawal from the 1972 treaty would meet our strategic needs. Even if one believes that a full defense against an all-out Russian attack is not attainable, the 1972 treaty clearly hinders our ability to defend ourselves against a number of lesser and plausible threats during this post-cold war era: blackmail by rogue states, an accidental launch from a more chaotic Russia, or a threat from China in the midst of, e.g., a crisis over Taiwan. As interpreted by, particularly, this Administration, the treaty is even undermining the effectiveness of our theater ballistic missile defenses, systems that are not supposed to be covered by the treaty. A very limited one- or two-site defense of the U.S., of the sort that might be compatible with a treaty that has been only modestly amended, would be essentially worthless against some perfectly plausible
threats, such as ship-launched ballistic missiles, that we identified during the deliberations of the Rumsfeld Commission. Indeed against some very plausible threats, such as ballistic missiles carrying clusters of biological weapons that may be released early in the trajectory, only boost-phase intercept from space offers a likely response.

The Initial US-Russian Negotiations on NMD

The US was slow to react to Russia’s growing perception of the seriousness of the “threat” US deployment of NMD might present to its offensive nuclear parity, and to understand just how serious the coupling between START, NMD, theater missile defense, and the revision of the ABM Treaty was becoming in Russian eyes. The US only began to seriously negotiate with Russia on NMD in 1996, and the Clinton Administration only began to offer serious incentives to Russia to accept NMD and changes to the ABM Treaty in 1999. Even then, press reports indicated that the initial incentives consisted largely of US aid in improving Russian early warning systems.

The chronology of the Clinton Administration’s initial efforts is summarized below:

- April 21, 1999: Senate approves American Missile Protection Act of 1998, calling for deployment as soon as system is ready. Fails in September vote, 59:41.
- January 1999: Clinton announces will seek renegotiation of ABM Treaty under Article XIII, which says can do so in response to changes “in the strategic situation.” Yeltsin agrees renegotiation is possible. Some Russians do not.
- June 1999 Summit: Agree to negotiation in late summer.
- When meet during August 17-19, 1999 Russians say cannot renegotiate. (Kosovo may be a key factor as is Russian fear of loss of nuclear status and parity. Some Russians begin to raise the idea of MIRVing the SS-27/Topol M to three warheads to compensate for US NMD.
- Fall 1999: US offers aid on Russian EW radar sites in Siberia. Russia refuses.
- December 1999: Russia again defers Duma debate on START III, takes stand that the ABM Treaty cannot
be renegotiated.

- February 2000, US negotiations with Russia again fail to produce positive result on NMD and changes to the ABM Treaty.

- June 2000 Summit: Leaders sign agreements to dispose of 68 tons of weapons-grade plutonium and share early warning capabilities to detect missile launches in order to avoid mistaken counter attacks. No deal on ABM.

At the same time, Russia has continued to play its own political games with START II and CTBT, and attempted to portray the US as anti-arms control rather than as anti-proliferation. During April 2000, the Duma voted to ratify both START II and the CTBT with the qualification that this ratification was dependent on US adherence to the ABM Treaty – a de facto effort to block the US NMD program.

On the day of the Duma’s vote in support of START II, Russian Foreign Minister Igor Ivanov said, "The ball is now in the court of the United States," and that "Russia would not be bound by its strategic arms reduction obligations" if the United States withdrew from the Anti-Ballistic Missile Treaty. Col. Gen. Valery Manilov, a deputy chief of the general staff of the Russian military, warned that Russia was prepared to respond to a breakdown in the ABM Treaty with "asymmetrical" systems that could undermine American advances in missile defense. "Our scientific, technological and military potentials are capable of offsetting the harm resulting from the disintegration of the system of disarmament agreements."\(^{21}\)

Ivanov stated a similar position in a speech to the UN on April 25, a day after Secretary Albright had defended the US record on arms control and proliferation. He stated to representatives of more than 150 nations on the second day of four-week international conference on the NPT that Russia was prepared to make deep cuts in its nuclear warheads, but not if the United States plans to construct a missile defense system that would “destroy” the 1972 pact, the Antiballistic Missile Treaty. “The prevailing system of arms control agreements is a complex and quite fragile structure…Once one of its key elements has been weakened, the entire system is destabilized. The collapse of the ABM treaty would, therefore, undermine the entirety of disarmament agreements concluded over the last 30 years. (This prospect) affects national
security interests of every state and of the international community as a whole.”

**New US Views on a Possible Deal with Russia**

What Ivanov did not address was the fact that the US and Russia had begun much more serious negotiations on these issues in January 2000. US and Russian delegations met in Geneva on January 19-21, 2000. John Holum, senior adviser for arms control and international security affairs at the State Department, headed the U.S. delegation. Yuri Kapralov, head of the Russian Foreign Ministry's arms control department, led the Russian delegation.

The US presented a series of documents relating to NMD to the Russian delegations, which were translated by Ministry of Foreign Affairs and then leaked to the *Bulletin* of Atomic Scientists in the US. The documents included an “NMD Protocol: Topics for Discussion; an “Annex on Verification: Topics for Discussion;” “Russia’s Concerns,” “Response to the Russian Proposal,” “Unilateral Statement,” “Protocol to the Treaty,” and an “Annex to the Protocol.”

**The US Argument that NMD Would Not Degrade the Russian Threat**

The US documents attempted to assure Russia that even if the US and Russia agreed to reduce their warheads to between 1,500 and 2,000, as proposed in Start III, the Russian nuclear force would be able to penetrate the American defensive shield. The documents also provide a unique insight into the Administration’s calculation of what a near to mid-term NMD system could and could not do against the Russian threat.

“Russia now keeps its strategic arsenal on constant alert and apparently will do so even at START-III levels. Russian forces under START-III could make an annihilating counterattack even under conditions of a surprise disarming first strike by the USA in combination with a limited US NMD system.

As a result of this Russian response initiated from nuclear-powered ballistic missile submarines at sea, land-based mobile missiles, silo-based ICBM and bombers that would survive the first strike, a minimum of a few hundred warheads could be delivered. Moreover, Russian forces have sophisticated decoy systems and other defense penetration aids, and this means that it would not have to count on simply exhausting defensive resources to overcome them. Furthermore, the surviving Russian forces would be so large and sophisticated that they could carry out an assault to enhance the offensive, which no rogue state would be capable of.

Furthermore, it is highly unlikely that any enemy would ever contemplate a first strike, since it would have to assume that Russian ICBM’s and submarine-launched ballistic missiles/nuclear-powered ballistic missile submarines in port would be launched after tactical warning, which would neutralize the effectiveness of...
the assault. In this case Russia’s response to an assault would obviously be to send about a thousand warheads, together with two to three times more decoys, accompanied by other advanced defense penetration aids.

If an attempt at a disarming strike were made after a period of increased international tension or conflict using conventional weapons, Russia’s counterattack would be considerable after the US repulsed the first strike as a result of explicit steps that the Russian armed forces would have taken to increase combat readiness by dispatching an additional number of nuclear-powered ballistic missile submarines out to sea, by field deployment of a large number of mobile missiles and by putting bombers on takeoff alert.

The planned American strategic nuclear forces deployed under the START-III ceilings would also be able to be on constant alert or on crisis alert to deliver many hundreds of warheads in response to any assailant.

Both the United States and the Russian Federation therefore have solid capabilities to respond to a strike from any assailant with a large number of retaliatory weapons.

Furthermore, the tremendous risks associated with initiating a nuclear war under any circumstances make these theoretical calculations largely irrelevant. Obviously, neither side could ever contemplate such an assault.

...The first phase of deployment will be limited to 100 interceptor missiles. Ultimately, when a second deployment position is added, there will be 200 or so interceptor missiles. This will be enough to knock out several dozen warheads accompanied by advanced defense penetration aids, but inadequate to counter a larger Russian counterstrike.

Deployment of a significant number of additional interceptor missiles and their silos would require major construction, which would take several years to complete, and this could easily be detected by national technical means of verification. In fact, our experience to date indicates that the speed with which the US could build interceptor missiles, not radars, is a key factor preventing rapid expansion. In any case, in view of the openness of budgetary processes in the US, this hypothetical increase in the number of interceptor missiles would be known several years before the expanded forces would first be deployed.

... In the long term, even a US NMD system with two deployment regions, as we are planning, would not permit the establishment of multi-layer defense. Moreover, a two-region system would enable us to maintain an effective single layer with exoatmospheric capability to intercept several dozen single-warhead missiles accompanied by sophisticated defense penetration aids launched from North Korea or the Near East/Persian Gulf regions.

The US national missile defense system, which will be limited and intended to defend against several dozen long-range missiles launched by rogue states, will be incapable of threatening Russia’s strategic deterrence at the level of START-II or START-III (or later).

For more than 30 years the classic argument in favor of strategic stability and against the deployment of a large-scale strategic missile defense system has been based on concerns that one side might have the ability to make a surprise disarming first strike against the enemy and then deploy a broad strategic missile defense system to knock out the enemy’s combat resources which had survived the first strike and were being launched against the assailant. We have clearly stated that the US missile defense system to be developed by the US Government is a very limited strategic missile defense system intended to protect against a threat from some rogue state, which may, at most, use a few dozen warheads accompanied by advanced defense penetration aids. We also proposed steps to ensure Russia’s confidence that the US system is in fact limited and deployed within the bounds of the agreed-upon terms of the amended ABM treaty. This classic argument is, therefore, simply inapplicable to defense, where capabilities are just as
limited as they would have been in connection with proposals on the US NMD system. Nor could the system be upgraded to alter this reality, except over the long term, which would create conditions for considerable advance warning.

Both the United States of America and the Russian Federation now possess and, as before, will possess under the terms of any possible future arms reduction agreements, large, diversified, viable arsenals of strategic offensive weapons consisting of various types of ICBM’s, submarine-launched ballistic missiles and heavy bombers. Specifically, Russia’s proposal for START-III would make it possible to have 1,500-2,000 warheads and even according to highly conservative hypotheses, Russia and the United States could deploy more than 1,000 ICBM’s and submarine-launched ballistic missiles with nuclear warheads over the next decade and thereafter.

These strategic offensive forces give each side the certain ability to carry out an annihilating counterattack on the other side regardless of the conditions under which the war began.

Forces of this size can easily penetrate a limited NMD system of the type that the United States is now developing.

Russia now keeps its strategic arsenal on constant alert and apparently will do so even at START-III levels. Russian forces under START-III could make an annihilating counterattack even under conditions of a surprise disarming first strike by the USA in combination with a limited US NMD system.

As a result of this Russian response initiated from nuclear-powered ballistic missile submarines at sea, land-based mobile missiles, silo-based ICBM and bombers that would survive the first strike, a minimum of a few hundred warheads could be delivered. Moreover, Russian forces have sophisticated decoy systems and other defense penetration aids, and this means that it would not have to count on simply exhausting defensive resources to overcome them. Furthermore, the surviving Russian forces would be so large and sophisticated that they could carry out an assault to enhance the offensive, which no rogue state would be capable of.

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The planned American strategic nuclear forces deployed under the START-III ceilings would also be able to be on constant alert or on crisis alert to deliver many hundreds of warheads in response to any assailant. Both the United States and the Russian Federation therefore have solid capabilities to respond to a strike from any assailant with a large number of retaliatory weapons. Furthermore, the tremendous risks associated with initiating a nuclear war under any circumstances make these theoretical calculations largely irrelevant. Obviously, neither side could ever contemplate such an assault.

….The Clinton administration is now considering a US limited NMD system to counter missile threats by rogue states. It is intended to intercept long-range missiles launched from North Korea or from the Near
East/Persian Gulf region midway toward the United States.

Consequently, advanced early warning radars, as well as ABM tracking radars associated with the proposed system should detect approaching warheads and track them in flight in space above the upper levels of the Northern Hemisphere, as shown on the attached diagrams.

As a result, the architecture of our US NMD requires that the existing early warning system radars around Clear, Alaska; Thule, Greenland; Fylingdales, UK; Beale AFB in California; and Otis AFB in Massachusetts be upgraded to provide the necessary warning and tracking of missiles from rogue states.

These same radars could, of course, detect and track any long-range missiles headed toward the United States that might have been launched from any country in the Northern Hemisphere. It is the case that the system has to track the approach route for minimum-energy attack trajectories of ballistic missiles launched from North Korea and the Persian Gulf/Near East. This is not a sign of our intent to focus the US limited NMD system on possible attacks by Russia and China.

The existing five early warning radars, which we intend to upgrade, were developed and deployed for early warning purposes, and by design they are less capable than radars built specially to support missile defense system tasks.

In view of their technical characteristics (their operating frequency in particular), even after these radars are upgraded, they will not be able to provide sufficiently accurate information on tracking (distinguishing between warheads and defense penetration aids) to achieve effective defense against attack by more than a dozen warheads accompanied by the simplest defense penetration aids.

The initial level of defense we are striving for would have only one SHF ABM radar deployed in Alaska. Even a US national missile defense system with a large number of SHF radars, which we would like to deploy in the long term, would not be able to deal with an arsenal of the size and sophistication that Russia would likely deploy under START-III.

…The number and level of sophistication of Russian warheads and defense penetration aids will ensure that the US NMD will not have significant capabilities against Russia’s nuclear deterrence.

In accordance with START-3 levels proposed for the USA and Russia, Russian ICBM’s and submarine-launched ballistic missiles clearly would carry more than 1,000 warheads accompanied by twice that many decoys and defense penetration aids. Authoritative written Russian sources claim that the Russian Government understands that the capabilities of its defense penetration aids are extremely high. These same written sources, supplemented by the statements of senior Russian military personnel and defense industry representatives, clearly present the idea that the Russian Government anticipates that its defense penetration aids could easily overcome the US NMD system. The limited NMD system that the USA is developing relies on hit-to-kill technology, in which the interceptor missile destroys the warhead on impact with it.

This approach clearly differs from the use of the interceptor missiles with nuclear warheads in the Russian system deployed around Moscow, which could destroy several warheads with one interceptor missile.

In the American hit-to-kill system at least one interceptor missile has to be launched against each warhead and “authentic object.” By this we mean a decoy or its likeness, which are frequently accompanied by aids to overcome defense (active and passive jamming, etc.) which cannot be distinguished from warheads. To achieve high certainty that no warhead is overcoming the defense system, one has to launch a multitude of interceptor missiles against each warhead or authentic decoy combined with additional defense penetration aids.
In view of the operational realities of the defense of a large area, a limited strategic missile defense system consisting of 100 non-nuclear interceptor missiles will be able in the best case to destroy 20-25 warheads on impact with comparatively primitive defense penetration aids. Two hundred interceptor missiles could destroy 40-50 warheads. We do not think that reducing Russia’s ability to counterattack by 20-50 warheads would substantially affect Russia’s strategic deterrence, even at START-III levels.

In an encounter with a retaliatory attack from Russia, which would include sophisticated defense penetration aids, a limited North American missile defense system could destroy far fewer warheads. Furthermore, the system as developed is not equipped to defend against submarine-launched ballistic missiles, which might be launched from a large number of deployment sites. Quite to the contrary, it was developed to defend against an ICBM attack from a comparatively narrow direction from specific rogue states.

The bottom line is clear: the strategic missile defense system for the limited US NMD system which we are calling for could protect only against a few dozen ICBM warheads accompanied by sophisticated defense penetration aids.

According to press reports, the US followed the presentation of this document by briefing the Russian foreign minister and other Russian officials in depth at the Pentagon during their visit to Washington in April 2000.  

**Suggested US Protocols to Revise the ABM Treaty**

The US also presented a new set of draft protocols to revise the ABM Treaty in ways that would permit both the US and Russia to deploy a limited NMD system of 100 launch points and interceptors over a 150 kilometer radius at any place on their territory. It also permitted both nations to enable strategic ballistic missile attack warning radars in existence on December 1, 1999 to perform ABM radar functions to support the limited territorial missile defense system and to deploy one additional ABM radar each at any site within their national territory.

The administration’s proposals did not directly amend the text of the treaty, but rather suggested revising it by adding two “protocols” to allow the first phase of a missile defense and provide extensive measures for verification of the system’s missiles and radars. It was felt that this was easier than trying to revise the wording of the treaty line by line and allowed the Russians to declare that the treaty itself remained unchanged.  

The protocol also only covered the first phase of the American missile defense system intended to counter an attack from North Korea. The administration stopped short of asking the
Russians to approve immediately the second phase of the system, which would be based at a still undecided location to counter threats from the Middle East and Persian Gulf. However, an article in the protocol explicitly allows either side to reopen negotiations as soon as March 1, 2001 “to take into account further changes in the strategic situation.”

The full text of the protocol on the ABM Treaty read as follows: 28

PROTOCOL TO THE TREATY BETWEEN THE UNION OF SOVIET SOCIALIST REPUBLICS AND THE UNITED STATES OF AMERICA ON THE LIMITATION OF ANTI-BALLISTIC MISSILE SYSTEMS[1]

---------, the Parties to the Treaty between the Union of Soviet Socialist Republics and the United States of America on the Limitation of Anti-ballistic Missile Systems, signed May 26, 1972, with amendments introduced by the Protocol of July 3, 1974, hereinafter referred to as the Treaty,

Recognizing the importance of the Treaty for strategic stability,

Noting the commitment of the Parties to the Treaty to consider proposals to increase the viability of the Treaty as necessary,

Considering changes in the strategic situation that have occurred as a result of the proliferation among states of weapons of mass destruction and long-range ballistic missiles which threaten international peace and security,

Recognizing the necessity of protecting their citizens and, consequently, their territories from the threat that these states will use long-range ballistic missiles and recognizing that this threat is increasing and that the defensive capabilities necessary to protect against this threat must also increase, from which it follows that the Treaty must be updated as necessary to permit the creation of the necessary defense,

Intending to adapt the Treaty to these changes in the strategic situation,

Proceeding from the understanding that the deployment of ABM systems for limited defense of their respective national territories will neither threaten nor allow a threat to the strategic deterrent forces of either Party,

Undertaking to carry out this deployment on the basis of cooperation and transparency, and

Reaffirming their commitment to continue consultations aimed at strengthening and improving the efficacy of the Treaty,

Have agreed as follows:

Article I

The United States of America and the Russian Federation shall be permitted to deploy a missile defense system for purposes of limited defense of their national territory against limited long-range ballistic missile strikes as an alternative to deploying the ABM systems permitted by Articles I and III of the Treaty.
Article II

The limited territorial missile defense system permitted by Article I hereof shall be subject to the following provisions:

a) With regard to the provisions of Article I of the Treaty, the United States and the Russian Federation may each deploy no more than 100 ABM launchers and no more than 100 antimissile missiles at launching positions within one deployment region within their national territory. The radius of this limited territorial defense deployment region may not exceed 150 km;

b) With regard to the provisions of Article VI, subparagraph a and Article IX of the Treaty, the United States and the Russian Federation shall be permitted to enable strategic ballistic missile attack warning radars in existence on December 1, 1999 to perform ABM radar functions to support the limited territorial missile defense system deployed in accordance herewith;

c) The United States and the Russian Federation may deploy one additional ABM radar each at any site within their national territory.

Article III

If the United States or the Russian Federation decides to deploy a limited territorial missile defense system pursuant to the provisions hereof as an alternative to deploying the missile defense permitted by Articles I and III of the Treaty,

a) ABM launchers deployed in accordance with Article III of the Treaty that are not operational, under construction or undergoing testing, overhaul, repair, or refurbishment on December 1, 1999 will not have to be dismantled or destroyed. These launchers shall not be counted in the number provided for by Article II, subparagraph a hereof;

b) ABM launchers deployed pursuant to Article III of the Treaty that are operational, under construction or undergoing testing, major overhaul, repair, or refurbishment as of December 1, 1999 shall be dismantled or destroyed so that there shall be no more than 100 ABM launchers deployed at any time;

c) ABM radars deployed pursuant to Article III of the Treaty on December 1, 1999 will not have to be dismantled or destroyed.

Article IV

To increase confidence in compliance and ensure compliance with the Treaty and with this Protocol, the Parties shall carry out the provisions of the Annex, which shall be an integral part hereof.

Article V

Except for changes specified hereby, all existing rights and duties of the Parties to the Treaty shall remain in force and shall be applicable to the limited national defense system.

Article VI

At the request of one of the Parties, but no sooner than March 1, 2001, the Parties shall commence good
faith negotiations to review this Protocol to take into account further changes in the strategic situation caused by the proliferation of weapons of mass destruction and long-range ballistic missiles which therefore might require deployment of more effective limited national territorial defense systems necessary to counter these long-range missiles.

Article VII

This Protocol shall be subject to ratification in accordance with the constitutional procedures of each Party and shall enter into force on the day of exchange of the Protocol ratification instruments.

ANNEX TO THE PROTOCOL TO THE TREATY BETWEEN THE UNION OF SOVIET SOCIALIST REPUBLICS AND THE UNITED STATES OF AMERICA ON THE LIMITATION OF ANTI-BALLISTIC MISSILE SYSTEMS

In accordance with the provisions of the Protocol to the Treaty between the Union of Soviet Socialist Republics and the United States of America on the Limitation of Anti-ballistic Missile Systems signed ----- -------------- , 2000, hereinafter Protocol, the Parties hereby agree on the following steps to build confidence in compliance and ensure compliance with the provisions of the Treaty between the Union of Soviet Socialist Republics and the United States of America on the Limitation of Anti-ballistic Missile Systems, hereinafter Treaty, and of the Protocol.

Section I

1. In accordance herewith, the Parties shall carry out an initial exchange of information and notifications no later than 90 days after the Protocol enters into force. This exchange shall reflect data on the effective date of the Protocol. Unless otherwise agreed, this information shall be updated annually on January 1 of each year and shall be provided no later than April 1of that year. The annual update of information shall not be required to report data that remained unchanged since the previous information exchange. This information exchange shall not be required until the first installation by the United States of an anti-missile missile on an ABM launcher within an ABM system deployment region.

2. Each Party shall submit the following information on its missile defense system:

a) anti-missile missiles:

i) designation/name; type of warhead (nuclear; high-explosive fragmentation, neutron); the number of stages; the length and maximum diameter of the anti-missile missile, which by its configuration is intended both for installation on an ABM launcher and for storage; the type of fuel (solid or liquid); the length and maximum diameter of the anti-missile missile outside its launch container;

ii) the number and location, with regard to each facility, of the deployed anti-missile missiles (i.e., anti-missile missiles installed on ABM launchers within an ABM system deployment region) and non-deployed anti-missile missiles;

iii) photographs of each type of anti-missile missile that, by its configuration, is intended both for installation on an ABM launcher and for storage; each type of anti-missile missile outside its launch container; a silo loader indicated in paragraph 2, subparagraph d of this section;

b) ABM launchers:

i) designation/name; diameter;

ii) number and geographic coordinates of deployed ABM launchers;
c) ABM radars:

i) designation/name; frequency range (using designations accepted by the International Electrical Communications Union);

ii) the number and geographic coordinates of each ABM radar;

d) the number of silo loaders in the ABM deployment region and intended for installing anti-missile missiles in ABM launchers;

e) the general concept of the operation of the Party’s missile defense system (in a form of the Party’s choice);

f) the status of the Party’s plans and programs with respect to its missile defense system (in a form of the Party’s choice).

3. Each Party shall provide the following information with respect to ABM Test Ranges for testing its missile defense system;

a) the name and geographic coordinates of all such ABM test ranges;

b) the number and geographic coordinates of ABM launchers, ABM radars, anti-missile missile maintenance facilities and anti-missile missile storage facilities in the ABM test range.

4. Each Party shall report the name and geographic coordinates of each strategic ballistic missile attack warning radar.

5. Each Party shall provide the following information on the following facilities located outside its ABM system deployment area:

a) the name and geographic coordinates of all final assembly sites for anti-missile missiles, anti-missile missile maintenance facilities, and anti-missile missile storage facilities;

b) with respect to each facility subject to inspection in accordance with Section III herein, a diagram of the facility shall be provided to the other Parties in accordance with paragraph 1 herein or no later than 30 days after initial notification of a facility at which non-deployed anti-missile missiles are located in accordance with Section II, paragraph 7 hereof.

6. Each Party shall provide the following information on the region where its own ABM will be located:

a) a diagram of the entire deployment region showing the location of each ABM launcher, each anti-missile missile maintenance facility, and each anti-missile missile storage facility;

b) with respect to an ABM deployment region established after the Protocol enters into force, the Party shall provide a diagram of that region no later than 30 days prior to the installation of the first anti-missile missile on an ABM launcher within the ABM system deployment region. This diagram shall show the actual or planned location of each ABM launcher, each anti-missile missile maintenance facility, and each anti-missile missile storage facility.

Section II
In accordance with Section I, paragraph 1 of this Annex, each Party shall provide the following notifications of its ABM system. These notifications shall be provided within the bounds of the initial exchange of information and notifications. In the future these notifications will be provided in accordance with the provisions of this Section II.

The provision of these notifications is not required before the United States has installed an anti-missile missile on an ABM launcher within the ABM system deployment region.

1. Notifications provided under the initial information exchange as specified in Section I, paragraph 1 or no later than within 90 days of the date of commencement of:

a) any construction or assembly work which is not earthmoving (soil excavation) associated with the construction of anti-missile missiles; or

b) any construction or assembly work associated with the construction of antennae (arrays), structures associated with an ABM radar antenna or antenna pedestal supports that are not parts of buildings pertaining to ABM radars.

2. Notifications to be provided within no less than 90 days of the first installation of an anti-missile missile on an ABM launcher within the ABM system deployment region.

3. Notifications to be provided within no less than 10 days of the launch of an anti-missile missile. These notifications shall indicate the designation/name of the anti-missile missile and the geographic coordinates of the anti-missile missile launch site.

4. Notifications to be provided within no less than ----- days, of the maiden launch of each new type (to be defined by the Party providing the notification) of anti-missile missile.

5. Notifications to be provided no later than 48 hours after completion thereof, of the transit of an anti-missile missile between the ABM system deployment region, anti-missile missile maintenance facilities which are not within the ABM system deployment region, anti-missile missile storage facilities which are not within the ABM system deployment region, and anti-missile missile final assembly facilities.

6. Notifications to be provided no later than 5 days after completion thereof, of the dismantling or elimination of an anti-missile missile (including elimination as the result of an accident or elimination by launch).

7. Notifications of a facility not previously indicated in accordance with Section I, paragraph 5, subparagraph a and paragraph 6, subparagraph a to be provided no less than 30 days before the first arrival of an anti-missile missile at that facility.

Section III

1. Each Party shall have the right to perform the following inspection activity in accordance with procedures subject to the approval of the Parties. This inspection activity shall not be performed prior to the initial installation by the United States of an anti-missile missile on an ABM launcher within the ABM system deployment region:

a) commencing 30 days after the date of the initial installation of an anti-missile missile on an ABM launcher within the ABM system deployment region, but no less than 90 days after an agreement is reached on the specific procedures for performing this inspection, each Party shall have the right to perform
inspections with respect to raw data to confirm the accuracy of the information submitted on the number and location of non-deployed anti-missile missiles and ABM launchers. These inspections shall be performed in the ABM system deployment region, including at anti-missile missile maintenance facilities and at anti-missile missile storage facilities within this ABM system deployment region;

b) commencing 60 days after the date of the initial installation of an anti-missile missile on an ABM launcher within the ABM system deployment region, but no less than 90 days after an agreement is reached on the specific procedures for performing this inspection, each Party shall have the right to perform a total of ----- short-notice site inspections in each treaty year to confirm the accuracy of the information provided on the numbers and locations of non-deployed anti-missile missiles and ABM launchers. These inspections shall be performed in the ABM system deployment region, including at anti-missile missile maintenance facilities and anti-missile missile storage facilities at the same locations.

2. If either Party has a concern with respect to compliance with the provisions of this Protocol, that Party may express this concern under the framework of the Standing Consultative Commission and request that specific measures be taken to alleviate this concern. These measures may include, but not be limited to, a visit with special right of access to a facility or place where, in the opinion of the requesting Party, the activity that raised the concern occurred. The receiving Party shall provide a response no later than 7 days after receipt of such request. The receiving Party’s response shall include:

a) consent or refusal to take the proposed specific measure to alleviate the concern, including, if a visit with special access right is proposed, the date, place, and procedure for such visit; or

b) a proposal on a specific alternative measure to alleviate the concern, including, if a visit with special access right is proposed, the date, place, and procedures for such visit.

3. Each Party shall, in accordance with procedures subject to an agreement between the Parties, give demonstrations of each type (as defined by the Party giving the demonstration) of anti-missile missile and ABM launcher to be used in its ABM system. The goal of these demonstrations is to provide the opportunity to confirm the accuracy of dimensional information contained in the notifications to be provided in accordance with the provisions of Section 1, paragraph 2, subparagraph a and of paragraph 2, subparagraph b of this Annex:

a) with regard to anti-missile missiles and ABM launchers included in the initial exchange of information and notifications in accordance with Section I, paragraph 1 of this Annex, the time of these demonstrations shall be subject to agreement by the Parties;

b) with regard to anti-missile missiles and ABM launchers not included in the initial exchange of information and notifications in accordance with Section I, paragraph 1 of this Annex, these demonstrations shall be given within a 30-day period commencing:

i) with respect to anti-missile missiles, at a time and place subject to agreement by the Parties;

ii) with respect to ABM launchers, on the date of the initial installation of an anti-missile missile in such ABM launcher; [sic]

5. [sic] For the efficient performance of their functions in fulfillment of the provisions of this Annex, but not in their personal interest, inspectors shall be granted the same privileges and immunities enjoyed by diplomatic agents in accordance with the Vienna Conventions on Diplomatic Relations of April 18, 1961.

Section IV
1. Either Party may, on a voluntary basis, organize for the other Party a demonstration of its system or the components thereof or other activities pertaining to missile defense; an observation of the launchings of its anti-missile missiles; or a visit to facilities related to missile defense and the area where its missile defense system is located. In each specific case, the participating Parties shall agree in advance on the goal of these demonstrations, observations and visits and on the steps to accomplish them.

2. Each Party may, on a voluntary basis, provide any other information or any other notifications not mentioned in the other provisions of this Annex. In addition, either Party may, on a voluntary basis, provide information in accordance with Sections I and II hereof before this information is required to be provided. This information and these notifications shall be provided on the matters, to the extent, and within the timeframes that each Party itself shall determine.

Section V

1. Each Party shall use the channels of the Nuclear Risk Reduction Centers or equivalent intergovernmental communications channels to provide and receive notifications and to exchange information in accordance with the provisions of this Annex.

2. Each Party undertakes not to disclose information provided in accordance herewith except with the express consent of the Party that provided that information.

Section VI

Upon the entry into force of the Protocol, the Parties undertake to propose and agree upon, within the framework of the Standing Consultative Commission, additional administrative and technical procedures that may be necessary to carry out the provisions of this Annex. These administrative and technical procedures shall be devised as quickly as possible.

It is also important to note that even if Russian had approved these agreements, such approval would be only part of the story. Even if the Russians approved the protocols, the US Senate would still have to approve them before they took effect. More than 25 Republican senators have already said they would not accept Mr. Clinton’s proposed changes, on the grounds that they would limit a NMD system too much.

**US Proposals for Transparency and Inspection**

The draft protocols gave Russia the right to inspect virtually every aspect of a US NMD deployment, as well as required the US to give Russia warning of virtually any deployment activity. 30

The US proposed an approach based on the following four fundamental elements:

- Information exchange with annual updating sufficient to give a comprehensive picture of key elements in
the system (among other things, the number and location of ABM interceptor missiles, both deployed and non-deployed);

- Notification of key events, in preparation and past, pertaining to the ABM system to assist in observation of compliance with the provisions of the Protocol;

- Inspections to verify raw data and short-notice inspections to ensure safeguards of the accuracy attained within the bounds of the exchange of information and notifications to be provided by each Party;

- A mechanism for resolving matters of concern related to compliance, such as visits with special access rights within the bounds of the START. Using this mechanism, for example, one Party can request a visit to facilities inaccessible under other circumstances to verify the presence or absence of ABM interceptor missiles.

The protocol discussing the inspection regime called for an exceptional degree of transparency and read as follows:

“These measures are aimed at increasing the transparency and predictability of our respective actions related to the ABM Treaty, as well as confidence that any system intended to provide limited national defense will not jeopardize the strategic deterrence of the other Party. By mutual agreement, the information exchanges, notifications and inspections specified in the Annex will not be required until the United States’ first installation of an ABM interceptor at an ABM launcher within the ABM system deployment region. As a result, the Russian Federation will not unilaterally bear the burden of providing the proposed notifications and verification measures.

Naturally, either Party may on a voluntary basis provide any information or notifications according to the provisions of Sections I and II of the Annex before the provision of such information or notification becomes mandatory.

The United States, for example, is prepared to consider the matter of providing certain information and notifications on a voluntary basis, if necessary, even before its first installation of an ABM interceptor in an ABM launcher within the ABM system deployment region.

…The key provision on reporting in the Protocol we propose remains, of course, a quantitative maximum number of ABM launchers (just as in Articles III and IV of the 1972 ABM Treaty). The US approach requires declaring the total number of ABM interceptor missiles transported from their respective final assembly facilities. With respect to ABM deployment regions and other facilities subject to inspection, launch position diagrams are to be provided. Demonstrations and information exchanges will be carried out with respect to all “types” of ABM interceptor missiles and ABM launchers.

…The US approach to developing the control regime for the revised ABM Treaty calls for several notifications of measures in progress and completed. Notifications will, for example, be provided on flight tests within the bounds of national missile defense, on the first installation of an ABM interceptor missile on an ABM launcher in the ABM system deployment region, on movement between facilities, dismantling or elimination, and construction of new ABM-related facilities.

The US approach includes certain types of onsite inspections, both to verify raw data and a quota for short-notice inspections to be performed to confirm the accuracy of the information provided on ABM interceptor and ABM launcher numbers and locations within the ABM system deployment region. The US approach assumes that after the first US ABM interceptor missile is installed on an ABM launcher in the
ABM system deployment region, there will be demonstrations of each type of ABM launcher and ABM interceptor missile.

Other steps to increase transparency will include voluntary demonstrations, observation, and visits using approved procedures. If there arises a sufficiently serious, ambiguous situation or matter related to compliance with the Protocol, either side may decide within the bounds of the Annex to request that the mechanism that we took from the control regime under the START-I Treaty be used, i.e., visits with special access rights. Using this mechanism, one side can, for example, request a visit of the other side’s facilities where in other cases it would be impossible to perform short-notice inspections, to verify whether non-deployed ABM interceptor missiles have been unlawfully deployed at those facilities.

Creating a Global Monitoring System (GMS)

The same press reports indicated that the US responded to Russia proposals to create a Global Monitoring System (GMS) and a coordinated Russian-American approach to countering the worldwide proliferation of missiles and missile technology. The US responded to the Russian proposals to create a Global Monitoring System (GMS) as follows:

The GMS proposal apparently has four basic elements:

The first is global monitoring of missile launches, which encompasses notification, exchange of early warning information, and the establishment of an international center, is a continuation of our joint effort on the initiative on missile launch information exchange put forth by our Presidents in September 1998.

Wide access to information contained in launch notifications and universal launch monitoring would be an important tool in building trust.

We agree that the principle of broad international participation is important to the success of launch notifications, and we can support the voluntary participation of any state provided that this participation does not legitimize the missile programs of rogue states.

Broad international participation in early warning or early detection information exchange or the establishment of an international monitoring center for this purpose will go beyond the framework of our concept in this area, but we are ready to study this idea in the future.

It is important that we gradually move toward bilateral agreements and understandings before we expand our efforts to involve others.

We are completely convinced that the first step in establishing any international system should be the signing of the agreements on exchanging missile launch information and notification of planned launches which we have been working on together. We hope that these discussions can be renewed in early February.

As soon as we reach an understanding on the agreement on notification of scheduled launches, we will be ready to discuss a diplomatic strategy to achieve broad international participation in this effort.

Previously we also informed you that we are ready to discuss the possibility of including, where necessary and reasonable, individual members of the “Big Eight” in the Joint Warning Center as a first step in
carrying out President Yeltsin’s initiative set forth at the Big Eight meeting in Cologne.

We have many questions about the second proposed element of the GMS, namely guarantees of the security of any state participating in the GMS.

Safeguarding the security of states that halt their missile programs is unfeasible.

We must, however, better understand what Russia thinks about this before further continuing discussion of this element.

The third element of the GMS pertains to incentives, including aid to national space programs for states that turn away from possessing missile systems.

We agree that in certain cases incentives can play an important role as part of an overall approach to a specific country in countering missile technology proliferation.

In our approaches to North Korea with regard to both issues of the proliferation of nuclear and missile technologies, we have found that positive incentives can be effective, at least in deterring proliferation activities.

One-size-fits-all approaches to incentives would, however, be counterproductive in countering missile technology proliferation, and it is not clear that this can be done on a multilateral basis (in contrast to a bilateral basis)--we would welcome your assessments.

We are especially concerned about offering aid within the framework of national space programs. It is difficult to “aid” space efforts, especially a space launch, without promoting the proliferation of missile technologies. These technologies overlap much more than do technologies for the development of nuclear reactors for peaceful civilian use and those for a nuclear weapons development program.

While we are not ready to provide aid to national programs for the development of booster rockets, other space-related incentives might be considered, such as providing rocket-launching services at favorable prices for key countries. This might be an appropriate topic for discussion at a Big Eight meeting.

And finally, as regards the consultation mechanism, we are in favor of holding regular consultations among countries involved in this matter.

We do not believe that broad multilateral discussions will be productive at this time. These issues should be discussed within the framework of the MTCR [Missile Technology Control Regime] (and groups of MTCR partners) before they are moved outside this framework.

Discussions within the framework of MTCR partners, the Big Eight, and Russian-American bilateral discussions are possible ways to study these ideas in depth. We would not want GMS proposals to diminish the effectiveness of existing forums.

**Other Proposals for US and Russian Cooperation**

The US responded to other Russian proposals to create a coordinated Russian-American approach to countering the worldwide proliferation of missiles and missile technology as follows:

...
Your additional proposals on cooperation were based on ideas that the USA put forth at our discussions of the ABM Treaty, for example, exchanging information on missile system proliferation, joint actions toward computer modeling and renewing and continuing our TMD [theater missile defense] testing programs.

We welcome your interest in these areas of possible cooperation that we proposed during our discussion of the ABM Treaty. We will be ready to study your ideas in detail in future meetings.

It is not clear from Russia’s statement whether you are proposing that additional aspects of cooperation will be effected on a bilateral basis or with multilateral involvement.

From our side, we would like to study whether multilateral participation is logical in each individual case. We previously stated our desire to discuss with Russia the possibility of including individual Big Eight countries in the TMD testing program as a first step in implementing the initiative put forth by President Yeltsin in Cologne.

There is one Russian proposal pertaining to additional cooperation that raises some concern, namely the proposal to carry out confidence-building measures agreed to in the context of demarcation agreements on ABM’s and theater ABM’s on a bilateral basis. We do not believe that this will be proper.

Approach to Cooperation

We fully concur with point 5 of your draft statement that cooperation in countering missile and missile technology proliferation “should be long term and established in phases.”

In general we believe that we should build a firm foundation for cooperation, first on a bilateral basis and later by involving Big Eight states and other states participating in the MTCR as necessary.

We are convinced that steps toward starting negotiations on an international agreement on GMS at a meeting in Moscow at the beginning of this year, as you suggest, will be premature.

This meeting is not only premature because of the many bilateral issues requiring our analysis, but also because both our sides agreed at the plenary meeting on the MTCR in Noordwijk in October of last year to continue discussion of approaches to the global threat of missile technology proliferation at a special meeting of MTCR partners in Paris in March.

To be honest, we were disappointed by the fact that Russia has moved away from the understanding on MTCR and invited non-partners to the conference it has proposed.

The Russian Reaction to the New US Proposals

Nevertheless, the US did not succeed in obtaining a favorable response from Russia. At a news conference after three days of talks that centered on national missile defense, the Russian foreign minister, Igor S. Ivanov, and Secretary of State Madeleine K. Albright did nothing more that say that discussions would continue when Mr. Clinton and Mr. Putin were to meet in Moscow in June. Mr. Ivanov said that “considerable differences” remained, and repeated that Russia believed the ABM treaty should “remain a cornerstone of strategic stability.” Dr. Albright
responded by saying that the administration, too, wanted to preserve the treaty but also wanted to adapt it to “21st-century needs,” a reference to the missile threats that intelligence experts have warned are fast approaching.

Foreign Minister Igor Ivanov also stated that Russia continued to strongly object to the proposed treaty changes and that it was prepared to counter any expansion of an anti-missile defense system in the United States, “No doubt, this is a very bad scenario, but we are ready for it. Russia has the money and capability for that, and the Americans know it.” 31 Ivanov did not spell out exactly how Moscow would respond to the deployment of an expanded U.S. missile defense, but said it would be “not by political, but other means,” implying the deployment of either additional missile or improved countermeasures.

It was clear that these differences could have a significant impact on arms control because the US Congress and Russian Duma have passed resolutions that link NMD to START II, and to reductions that would reduce each side's strategic arsenal from 6,000 warheads to between 3,000 and 3,500 warheads by 2007. In 1996 when the Duma was delaying ratification, the US Congress adopted a law forbidding the United States to reduce its arsenal below the 6,000 warheads permitted under START I until the START II Treaty entered into force. The Duma’s ratification of START II might normally lead Congress to reconsider this legislation, but the Duma’s ratification of START II is conditional upon a satisfactory resolution of the ABM issue. As a result, START II cannot enter into force, and the problem is made worse by Russia’s focus on using the CTBT as a means of embarrassing the US, and Senator Helms view that no major decisions should take place on arms control until a new Administration comes to office.

The Clinton-Putin June 2000 Summit and Russian ABM Proposals

These negotiating issues grew steadily more complex as Russia presented its own view of missile defense. In early June 2000, President Clinton and Putin met for their first summit in Moscow. In the days leading up to the summit Putin made a slight shift in Russian policy and did more to acknowledge the potential threat from missile proliferation. He also expressed Russia’s willingness to cooperate with the US and Europe, although he made it clear that Russia

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still did not agree with changes to the ABM treaty.

In an interview with Tom Brokaw on June 1, 2000 Putin remarked:

There is a system of agreement that has been created in the area of anti-ballistic missiles. It works and it works effectively. And we believe that it shouldn’t be destroyed. But we are in agreement that there are new threats arising. And we think we must react to that. We have a proposal to do it together. The point is that the defense of all territory means the defense of only the triad that only Russia has today, the nuclear triad. Outer space, the world’s oceans, and the territory of our country. But if you are talking about threats that are directed at Russia or at the United States, specific territory today, there are countries that have that capability today that can only do that from their own land. They don’t have nuclear submarines or that don’t have planes with atomic weapons on board so we put up these umbrellas above potential areas of threat. We could jointly with this umbrella protect all of Europe. We have these possibilities both technically and politically. We would like to propose them and we would like to discuss that issue with President Clinton.32

Some progress was made during the summit. Agreements were signed on the joint disposal of 68 tons of weapons grade plutonium and the sharing of early warning systems, and both sides recognized the seriousness of the threat posed by proliferation, and the need to move forward in resolving their differences regarding the ABM Treaty.33 However, no deal was reached on ABM and Putin continued to oppose any deployment of the US NMD system.34

The Russian “Boost Phase Defense” Proposal

Russia also became active in promoting its own “boost phase defense” approach to missile defense which would rely on the interception of a missile in the period after launch. It has used this concept to oppose NMD, to try to preserve the present terms of the ABM Treaty, and to seek European and other support for the Russian position. The Russian program called for the use of undefined new approaches to boost phase intercepts. The plan had two key elements. The first was to create a system to defend US and Russian territory by shooting down missiles as they are launched. In the case of North Korea, this meant deploying anti-missile interceptors near the Korean border. The second element was to use theater missile systems of the kind permitted under the ABM Treaty to protect Europe, and presumably other regions in the Middle East and Asia which Russia did not want to address as part of a US-Russian agreement.35

The intensity of Russia’s advocacy of such a system to the US and European community
is illustrated by the following brief chronology:

- June 5, 2000: Putin advocates collaborative “boost phase defense” system which would shoot down missiles soon after launch. Proposal opposite to NMD proposed by the US.

- June 9, 2000: Secretary Cohen and NATO officials meet with Russian Defense Minister Igor Sergeyev in Brussels and are briefed on the Russian proposed joint “European nonstrategic defense” project. Cohen responds, “If that in fact is what Russia has in mind, then there's a serious problem.” Cohen adds that Russian proposal does not “appear feasible or desirable for protecting up against the kind of threats that are emerging.”

- June 12-13. Secretary Cohen visits Moscow to meet with Putin and Ivanov. Russian Defense Minister Igor Sergeyev states that the US NMD proposal would trigger a new arms race, and calls for a different approach based on diplomacy: “We propose the creation of a political umbrella by joint efforts on the political front among the US, Russia, and other nations to fend off missile threats (through) mutual agreements and mutual obligations under tight control.”

- June 15: Putin speaks to business leaders in Berlin. He portrays Russia as the emerging ally of Germany and the new Europe and the US as failing to respond to European concerns: “Our cooperation could take the form of building a nonstrategic missile defense system reliably covering all of Europe from the Atlantic to the Urals. We think this is all possible technologically and politically. All we need is the political will.” Putin appears to be referring to theater defense missiles like some form of the SA-10 or SA-13. He says that, “there is no risk of all-out war in Europe.” He says the US is leading the way to a “very dangerous arms race” and the NMD system would be a blow, especially in Europe.” He states the NMD system is “directed against Europe,” and that Russia, “would respond in an appropriate way.”

### The US Reaction to the Russian Proposal

The Clinton Administration regarded Russia’s proposal as unacceptable. Like similar proposals by a number of strong US opponents to NMD, they meant rejecting any form of US-based NMD, and relying on the forward intercept of all launches in the boost phase. They also presented technical problems. The Russian system has little credibility in intercepting accidental or unauthorized launches in Russia or China. It also relies on technologies that are far less proven than the elements of the US NMD system, and requires either extensive strategic warning or the constant deployment of boost phase defense assets over a large portion of the globe.

The availability, cost, and effectiveness of the Russian system is unknown. There are real questions about the ability to target advanced missiles because of uncertainties regarding their speed and the inability to distinguish the cold body of the missile from the surrounding plume, and no one has yet advanced the outline of a credible proposal for actual deployment. As such, “boost phase defense” seems more of a political tool to kill NMD than a credible defense
proposal. In addition, the Russian proposal holds that it will be in compliance with the current ABM Treaty, meaning defensive missiles would be limited to a range of 2,200 miles, a distance too limited to provide defensive capabilities for the American homeland and much of Europe.  

Secretary of Defense William Cohen described the Russian proposal, and the state of US and Russian negotiations, as follows in an interview on National Public Radio on July 7, 2000,

Q: If the U.S. were to go ahead with a national missile defense system, why shouldn’t the Russians and other nuclear powers develop at least countermeasures to defeat such a system, if not their own national missile defense systems?

Secretary Cohen: First of all, the Russians have the only anti-ballistic missile system in the world today—one that’s centered around Moscow. It is limited in area and scope, but nonetheless it’s the only one in existence.

Secondly, I met with President Putin during my recent visit to Moscow and also during the course of my visit in Moscow the same Strategic Rocket Forces commander put a statement out in the Moscow news indicating there are at least five to eight nations that were presenting an emerging threat to use intercontinental ballistic missiles.

The third point I’d point out is this system, limited as it is, and we have taken pains to point this out in great detail to the Russians and others, would not in any way undercut the Russian strategic systems. They have many thousands of nuclear weapons now. Those will be reduced under the START agreements, but even so under the reductions, be they to 2,000 or 2,500 or indeed 1,500 which the Russians have proposed, they would still have more than enough to overwhelm any limited system that we would construct.

So there is no threat to the Russian system, and I think the argument being made now is not with merit. But that’s something I think they clearly are trying to divide the Europeans and to divide the American people in the suggestions they’re making.

Q: But if such a system would actually make the U.S. safer, why wouldn’t a Chinese missile defense system make China safer, or a French missile defense system make France safer? Why is it only the United States?

Secretary Cohen: Well it’s not only the United States. As a matter of fact during my visit to Moscow and during President Clinton’s visit to Moscow the issue was discussed or at least raised that perhaps they could work with NATO to have a theater missile defense system, and we have said we are eager to do that. We have at least five programs underway now as far as research and development to construct a theater missile defense system to protect our soldiers and our forces out in the field, so to speak.

We have agreed with the Russians that let’s work together. If you have a system that we can share and work with, we’re prepared to do that.

Secondly, they also suggested—not during the Summit, but prior to the Summit in a news broadcast—that they had a system that would help protect the Europeans and presumably the United States with a so-called boost phase intercept system. We have tried to get clarification on that, but I represented to President Putin and to my counterpart Marshal Sergeyev and others, that we are eager to explore that with the Russians as well. But so far it has been simply a “concept” without any substance that we can determine that they
would be forthcoming with. But we are eager to see what kind of technology they are suggesting, that we could have a boost phase intercept that we could work on together. It would not be a substitute for our system, but certainly something we could work together on. But so far it has been mostly rhetoric and nothing behind it.

**Russian Opposition to the US NMD System Continues to Accelerate and Russian Efforts in China and Europe**

The Russian effort to block NMD did not, however, diminish. General Leonid Ivashov, the head of a department within the Ministry of Defense stated on June 29, 2000 that, “When estimating the threat of missile strikes, the Americans give priority to…technological capability of this state or another to build missiles…meanwhile there is a complete absence of evaluation of the motivation…”

President Putin met with Chinese President Jiang Zemin on July 5, 2000 and stated that any US deployment of NMD, “will signify the undermining of the global balance.” The two heads of state then issued a statement in which they agreed that the ABM Treaty should not be altered. Putin said at a news conference following the meeting that Russia would consider it highly significant if Washington proceeds with the project despite the Russian legislature’s recent ratification of the START II arms reduction treaty and his own suggestion that Russia and the United States create a joint missile defense system. If despite “decisive support by China and other states… decisions are taken nevertheless aimed at disruption of the 1972 treaty, this will signify the undermining of the world balance.” The same day, Gen. Vladimir Yakovlev, head of Russia’s strategic rocket forces, said that Russia might respond by increasing the number of warheads on its Topol-M missile, or by building mid-range ballistic missiles – an obvious attempt to put pressure on Europe.

On July 7, 2000, the day after the failure of a key US missile test, Russian generals stated that the failure of a missile interceptor test proved that the national missile defense proposed by the United States is unworkable. General Vladimir Yakovlev, commander of Russia’s Strategic Rocket Forces, stated that, “In its present technical design, the tested national missile defense will not be able to secure protection of US territory, and attempts to deploy such a system will be an empty waste of money.” Colonel General Leonid Ivashov, chief of the Defense Ministry’s
department of international cooperation, also stated that the failure showed that such defenses were unworkable. “Both Russian and American professionals in the anti-ballistic missile sphere are perfectly aware that it is impossible to create a system of absolute protection...Russia will always be able to defeat any US missile-defense system...The only question is whether it is worth investing such significant amounts of money in this scheme when it could be resolved by political means.” General Valery Manilov, deputy head of the army general staff, stated that the US NMD program is “politically dangerous and strategically wrong. There will always be the possibility of creating more perfect offensive systems and this can pose a new threat.”

On July 17 and 18, 2000, Chinese President Jiang Zemin and Russian President Vladimir Putin held closed-door talks and then issued a joint attack on US plans to build an anti-missile system.

The 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems (hereinafter referred to as the ABM Treaty) remains the cornerstone of global strategic stability and international security, and constitutes the basis for a framework of the key international agreements designed to reduce and limit offensive strategic weapons and to prevent the proliferation of weapons of mass destruction. The maintenance of and strict compliance with the ABM Treaty is thus of paramount importance.

With the above view, the US program to establish national missile defense, a system prohibited under the ABM Treaty, has aroused grave concern. China and Russia hold that this program is, in essence, aimed at seeking unilateral military and security superiority. Such a program, if implemented, will give rise to most serious negative consequences on the security of not only Russia, China and other countries, but the United States itself and global strategic stability as well. In this context, China and Russia have registered their unequivocal opposition to the above program.

To undermine the ABM Treaty will trigger off another round of arms race and subsequently reverse the positive trend emerged in world politics after the end of the Cold War. This will undoubtedly not be in the fundamental interest of any country in the world. The country which press for amending this fundamental treaty on the disarmament front will have to bear the full responsibility for undermining international stability and security, and for all the consequences that may arise therefrom.

The assessment of the current international reality has demonstrated that it is totally untenable to press for amending the ABM Treaty on the pretext of so-called missile threats from some countries. The so-called "amendment" proposal by the relevant country is, in effect, aimed at covering its attempt to violate the provisions of the ABM treaty. To amend the text of the ABM Treaty is tantamount to an act of undermining the ABM Treaty and will inevitably bring about a series of negative consequences. Under the current strategic situation, it is of great practical significance to preserve the integrity and effectiveness of the ABM Treaty.

In meeting the new challenges of international security, maintaining world peace and protecting the legitimate security interests of all countries, the correct approach is, instead of scrapping the ABM Treaty, to promote the establishment of a new, just and equitable international political order, do away with the
practice of power politics and the abuse of force in international affairs and further strengthen regional and international security. In the meantime, it is essential that Russia and the United States continue and deepen their process of reducing offensive strategic weapons on the basis of strict compliance with the ABM Treaty, and engage other nuclear weapon states in such a process in due course in the future. It is imperative that international efforts be intensified to prevent the proliferation of weapons of mass destruction and their delivery vehicles through political, legal and diplomatic means, to explore the possibility of gradually working out a global control system in prevention of the proliferation of missiles and related technologies, and to conduct extensive and non-discriminatory dialogue and cooperation in this field.

One of the five documents they signed stated that, "The nature of the [American missile defense] plan is to seek unilateral military and security advantages…Implementing this plan will have the most grave adverse consequences not only for the security of Russia, China and other countries, but also for the security of the United States and global strategic stability…Therefore China and Russia are firmly opposed to such a system." The Russian and Chinese leader called upon the US to continue to adhere to Anti-Ballistic Missile Treaty and warned that altering the treaty "will trigger an arms race and lead to an about-face in the positive trend that appeared in world politics after the end of the Cold War." They also stated that, "the pretext of a missile threat is totally unjustified."  

The Russo-Chinese statement contained the following key points:

- The nature of this plan is to seek unilateral military and security advantages. Implementing this plan will have the most grave adverse consequences not only for the security of Russia, China and other countries, but also for the security of the United States and global strategic stability.
- Therefore China and Russia are firmly opposed to such a system.
- The 1972 ABM treaty remains the cornerstone of global strategic stability and international security.
- Any damage to the ABM will trigger a new arms race.
- A non-strategic missile defense system which is not banned by the ABM and international cooperation in this area should not undermine security interests of other countries.
- Incorporating Taiwan in any foreign missile defense system in any way is unacceptable and will seriously undermine regional stability.
- China and Russia will continue their close cooperation on these issues.
- China and Russia will strengthen ties in related areas to ensure their own national security as well as that of the region and the world, in line with the international obligations undertaken by the two countries.
Impact on President Clinton’s Decision to Delay Deployment

It was hardly a coincidence that Putin timed this statement to be issued only days before he attended the G8 meeting in Okinawa, Japan. Putin continued with the theme that NMD posed an unacceptable threat to arms control throughout the summer of 2000. Russia’s resistance to the deployment of NMD, and the fears it would present major problems for arms control were certainly a factor in President Clinton’s decision to delay a deployment decision on September 1, 2000.

The White House statement making the announcement stated that,46

The development of our NMD is part of the Administration’s comprehensive national security strategy to prevent potential adversaries from threatening the United States with such weapons and acquiring the weapons in the first place.

Arms control agreements with Russia are an important part of this strategy because they ensure stability and predictability between the United States and Russia, promote the dismantling of nuclear weapons, and help complete the transition from confrontation to cooperation with Russia. The Anti-Ballistic Missile (ABM) Treaty of 1972 limits anti-missile defenses according to a simple principle: neither side should deploy defenses that would undermine the other’s nuclear deterrent, and thus tempt the other to strike first in a crisis or take countermeasures that would make both our countries less secure.

This announcement will provide additional time to pursue with Russia the goal of adapting the ABM treaty to permit the deployment of a limited NMD that would not undermine strategic stability. The United States will also continue to consult with Allies and continue the dialogue with China and other states.

The President provided further details on this aspect of his decision during his speech on the subject at Georgetown University the same day, and clearly tied his decision to broaden concerns regarding arms control and strategic stability,47

None of these elements of our national security strategy can be pursued in isolation. Each is important and we have made progress in each area. For example, Russia and the United States already have destroyed about 25,000 nuclear weapons in the last decade. And we have agreed that in a Start III treaty we will go 80 percent below the levels of a decade ago.

In 1994, we persuaded Ukraine, Kazakhstan and Belarus, three of the former Soviet republics, to give up their nuclear weapons entirely. We have worked with Russia and its neighbors to dispose of hundreds of tons of dangerous nuclear materials, to strengthen controls on illicit exports and to keep weapons scientists from selling their services to the highest bidder.

We extended the nuclear nonproliferation treaty indefinitely. We were the very first nation to sign the comprehensive test ban treaty, an idea first embraced by President Kennedy and Eisenhower. Sixty nations now have ratified the test ban treaty. I believe the United States Senate made a serious error in failing to ratify it last

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year and I hope it will do so next year.

We also negotiated and ratified the international convention to ban chemical weapons and strengthened the convention against biological weapons. We’ve used our export controls to deny terrorists and potential adversaries access to the materials and equipment needed to build these kinds of weapons.

… I want you to know that I have reached this decision about not deploying the N.M.D. after careful deliberation. My decision will not have a significant impact on the date the overall system could be deployed in the next administration, if the next president decides to go forward. . . .

In the meantime, we will continue to work with our allies and with Russia to strengthen their understanding and support for our efforts to meet the emerging ballistic missile threat, and to explore creative ways that we can cooperate to enhance their security against this threat, as well.

An effective N.M.D. could play an important part of our national security strategy. But it could not be the sum total of that strategy. It can never be the sum total of that strategy for dealing with nuclear and missile threats. Moreover, ballistic missiles armed with nuclear weapons, as I said earlier, do not represent the sum total of the threats we face. Those include chemical and biological weapons, and a range of deadly technologies for deploying them.

So it would be folly to base the defense of our nation solely on a strategy of waiting until missiles are in the air and then trying to shoot them down. We must work with our allies and with Russia to prevent potential adversaries from ever threatening us with nuclear, chemical and biological weapons of mass destruction in the first place, and to make sure they know the devastating consequences of doing so. . . .

Over the past 30 years, Republican and Democratic presidents alike have negotiated an array of arms control treaties with Russia. We and our allies have relied on these treaties to insure strategic stability and predictability with Russia, to get on with the job of dismantling the legacy of the cold war and to further the transition from confrontation to cooperation with our former adversary in the most important arena: nuclear weapons.

A key part of the international security structure we have built with Russia, and therefore a key part of our national security, is the Anti-Ballistic Missile Treaty, signed by President Nixon in 1972. The A.B.M. treaty limits antimissile defenses according to a simple principle: neither side should deploy defenses that would undermine the other side’s nuclear deterrent and thus tempt the other side to strike first in a crisis or to take countermeasures that would make both our countries less secure.

Strategic stability based on mutual deterrence is still important despite the end of the cold war. Why? Because the United States and Russia still have nuclear arsenals that can devastate each other. And this is still a period of transition in our relationships.

We have worked together in many ways: signed an agreement of cooperation between Russia and NATO, served with Russian troops in Bosnia and Kosovo. But while we are no longer adversaries, we are not yet real allies. Therefore, for them as well as for us, maintaining strategic stability increases trust and confidence on both sides. It reduces the risk of confrontation. It makes it possible to build an even better partnership and an even safer world.

Now, here’s the issue: N.M.D., if deployed, would require us either to adjust the treaty or to withdraw from it, not because N.M.D. poses a challenge to the strategic stability I just discussed, but because by its very words, N.M.D. prohibits any national missile defense.

What we should want is to both explore the most effective defenses possible, not only for ourselves, but for all
other law-abiding states. And to maintain our strategic stability with Russia.

Thus far, Russia has been reluctant to agree, fearing, I think, frankly, that in some sense this system or its future—some future incarnation of it—could threaten the reliability of its deterrent, and therefore strategic, stability.

Nevertheless, at our summit in Moscow in June, President Putin and I did agree that the world has changed since the A.B.M. treaty was signed 28 years ago and that the proliferation of missile technology has resulted in new threats that may require amending that treaty.

And again I say these threats are not threats to the United States alone. Russia agrees that there is an emerging missile threat. In fact, given its place on the map, it is particularly vulnerable to this emerging threat.

In time, I hope the United States can narrow our differences with Russia on this issue. The course I have chosen today gives the United States more time to pursue that, and we will use it.

President Putin and I have agreed to intensify our work on strategic defense while pursuing in parallel deeper arms reductions in Start III. He and I have instructed our experts to develop further cooperative initiatives in areas such as theater missile defense, early warning and missile threat discussions for our meeting just next week in New York.

Apart from the Russians, another critical diplomatic consideration in the N.M.D. decision is the view of our NATO allies. They have all made clear that they hope the United States will pursue strategic defense in a way that preserves, not abrogates, the ABM Treaty. If we decide to proceed with N.M.D. deployment, we must have their support because key components of N.M.D. would be based on their territories.

The decision I have made also gives the United States time to answer our allies’ questions and consult further on the path ahead.

Finally, we must consider the impact of a decision to deploy on security in Asia. As the next president makes a deployment decision, he will need to avoid stimulating an already dangerous regional nuclear capability from China to South Asia.

Now let me be clear: no nation can ever have a veto over American security, even if the United States and Russia cannot reach agreement; even if we cannot secure the support of our allies at first; even if we conclude that the Chinese will respond to N.M.D. by increasing their arsenal of nuclear weapons substantially with a corollary inevitable impact in India and then in Pakistan.

The next president may nevertheless decide that our interest in security in the 21st century dictates that we go forward with deployment of N.M.D. But we can never afford to overlook the fact that the actions and reactions of others in this increasingly interdependent world do bear on our security.

Clearly, therefore, it would be far better to move forward in the context of the A.B.M. treaty and allied support. Our efforts to make that possible have not been completed. For me, the bottom line on this decision is this: because the emerging missile threat is real, we have an obligation to pursue a missile defense system that could enhance our security.

Vice President Gore, the Democratic presidential nominee, supported Mr. Clinton’s decision, and stated that, “As president, I would oppose the kinds of missile defense systems that
would unnecessarily upset strategic stability and threaten to open the gates for a renewed arms race with Russia and a new arms race with China.”. His aides said that he had discussed the decision with the president, and implicitly criticized Mr. Bush’s plan, which would require the United States to withdraw from the ABM Treaty. The accord bars Washington and Moscow from building national missile defenses, unless Moscow agrees to changes, which it has refused.48

As for Russian President Vladimir Putin, he immediately praised Clinton’s decision as a “well-considered and responsible step.” On September 3rd, he congratulated Clinton for putting off deployment of a national missile defense system. Putin said he had no doubt that Clinton's decision was taken strictly in the interests of the United States… I believe that this considered decision was taken after Clinton consulted his allies and hope that Russia's position was taken into account.” He also stated that Clinton’s decision was “important for international safety and raises the authority of the United States,” and “will enable us to count on constructive dialogue with our American partners in the future.”49

**Russian Capability to Increase the Nuclear Threat to the US**

It is difficult to know how seriously the US should take Russian threats to withdraw from START if the next President does decide to deploy an NMD system. Senior Russian officials have warned that Russia might do this, however, and that Russia might cooperate with China in creating an NMD system.

Russia did adopt a much stronger policy on the role of nuclear arms in its strategy in late 1999, which shifted from a stated reliance on nuclear weapons only if Russia’s national strategy was threatened to one that states nuclear weapons can be used, “in case of a need to repulse an armed aggression, if all other means of resolving the crisis are exhausted or have been ineffective.” This statement was hardly a return to the Cold War, but the same document did condemn the role of NATO and the US in threatening Russian interests. It attacks the US for “unilateral” action and “evading the basic founding norms of international law.” It attacks NATO for acting in Kosovo without the support of the UN and says such action is, “fraught with the
threat of destabilizing the entire strategic situation in the world.”

It seems doubtful, however, that Russia could afford to quickly deploy additional nuclear forces even if it did withdrew from START I. A recent analysis of the trends in Russian strategic forces by Alexander A. Pikayev for the Carnegie Endowment provides an assessment of the limits in Russian capabilities to react to US deployment of an NMD system that a number of US intelligence experts largely support.

...During the 1990s, Moscow did not face serious difficulties in maintaining the force levels required by START I. The exception lies in the strategic nuclear submarine (SSBN) fleet which, due to lack of financing, has been decommissioned ahead of the START I schedule. Since 1990, the number of operational SSBNs has been reduced 250 percent, affecting even relatively modern Delta III and Typhoon subs.

More importantly, nuclear-related procurement has been drastically curtailed. During the height of the Cold War, the Soviet Union produced more than one hundred nuclear missiles annually. In modern Russia, the production rate has never exceeded ten ICBMs per year, and not one new strategic nuclear submarine has been completed. (Construction of a new SSBN started in 1996, with initial plans for completion in 2002, but is now delayed until 2007.) Production of SLBMs and heavy bombers was halted (with many difficulties and delays in completing the assembly of the Tu-160 aircraft started before 1992).

In the 1990s, Russia set its strategic nuclear modernization programs according to START II provisions. It successfully completed development and testing of the new Topol M (SS-27) single-warhead ICBM, which can be deployed in both silo and road-mobile versions. The system was first deployed in late 1997, but only 10 missiles had been deployed by the end of 1998. Ideally, Moscow hopes to increase the production of Topol Ms to 30 to 40 ICBMs per year, but financial constraints will make achieving even this relatively modest task quite problematic. In July 1998, the Russian Security Council decided to develop a new SLBM based on Topol M technology. If the program is successful, the future sea leg of Russia’s strategic triad will be based on light SLBMs carrying a small number of MIRVs per missile.

The combination of these three factors—early decommissioning of some strategic systems, very low procurement rates, and transition to light ballistic missiles with single or a few warheads—will most certainly lead to a radical decline in Russian strategic force levels around 2010, when Russia will start withdrawing its MIRV’d ICBMs from service. Unless new programs to develop MIRV’d ICBMs and to accelerate production of new SSBNs are adopted in the next few years, Russia’s strategic nuclear deterrent force could fall below 1,000 deployed warheads sometime in the next two decades. Some Russian officials are predicting an even lower number of perhaps several hundred deployed strategic warheads.

While CIA and DIA officials are not willing to go on record with similar statements, a number clearly had similar views during a debate over an NIE on the subject in the summer of 2000. In what seems to be a reliable report in the Washington Post, the US intelligence community was also reported to be deeply divided over how seriously to take Russian threats that if the United States deployed an NMD system, Russia would build new intermediate-range
SS-20 missiles to threaten Europe. Some officials argued that Russia’s finances and construction capacity were so limited that it could either make more SS-20 IRBMs or more longer-range SS-27 ICBMs, but could not make both.

Later reports on the NIE, in both the *New York Times* and *Washington Post*, indicated that the NIE did not predict how Russia and other countries would respond, but laid out a range of responses including worst-case scenarios. The report said, for example, that the Russians could withdraw from "an array of arms control treaties," especially if the US went ahead without negotiating changes in the Antiballistic Missile Treaty of 1972, which prohibits national missile defenses.

The NIE indicated that Russia's economy was not able to support a large buildup of its strategic missile forces, but that it could again deploy shorter-range missiles along its borders and resume adding multiple warheads to its ballistic missiles -- something Russia had agreed to stop as part of START II. It indicated that deploying an American national missile defense could cause Russia to place multiple warheads on ballistic missiles that now carry only on warhead. The report indicated that Russia had an interest in negotiating reductions in both countries' nuclear arsenals because it could scarcely afford to maintain the 5,000 or so warheads it now deploys. The NIE suggested that Russia might accept a trade-off that would strictly limit the American defensive system to 100 interceptor missiles based in Alaska, as the administration has proposed building by 2007, but that Russia could respond by increasing the warheads on each missile without such an agreement.

Russia might well, however, provide the funds to retain large numbers of its present forces that it would otherwise retire under START II and START III, and alter its alert and targeting procedures in ways that could make them more threatening. This could increase the risk of accidents, reliability, and accidental launch. More broadly, Russian and US rivalry might lead Russia to make additional transfers of dual-use and arms technology that would exacerbate the problem of proliferation. There is no way to predict just how much US and Russian relations and the strategic nuclear balance will deteriorate as a result of NMD, or the outcome for TMD. It is
clear, however, that a unilateral US deployment of NMD in any form could create problems with Russia that partly offset the value of NMD, and any US NMD or TMD system that required US withdrawal from the ABM Treaty would make things worse.

Russia could also react by increasing other kinds of threats to the US and its allies. Russia’s long internal crisis has already discredited much of the pressure for democratic and economic reform. The expansion of NATO, the growing US role in Central Asia, the inclusion of a number of former client states into the EC, and events in Bosnia and Kosovo have helped make the US and the West a target for much of the reaction to Russia’s failure to quickly achieve acceptance and prosperity. This has resulted in the rise of Russian nationalism. Competition of any kind over nuclear forces will make this situation worse, perhaps pushing Russia towards China or hostile regional alliances. Much more is involved than somewhat game theoretic calculations about nuclear warfighting. Furthermore, Russia still retains massive theater nuclear assets, and it is at least possible that Russia could react to reduced US vulnerability by increasing its threat to Europe.

Russia might also take a more subtle path to objecting to the US deployment of an NMD system and retaliate by increasing the flow of expertise, technology, and equipment to hostile states. Russia has long tolerated – or at least not rigorously enforced controls on such transfers to North Korea, Iran, and Iraq. A January 2000 report by the Director of Central Intelligence makes this clear,\textsuperscript{54}

Russian entities … continued to supply a variety of ballistic missile-related goods and technical know-how to Iran and were expanding missile-related assistance to Syria and India. For example, Iran’s earlier success in gaining technology and materials from Russian companies accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the first six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to build new indigenous ballistic missile systems.

During the first half of 1999, Russia also remained a key supplier for civilian nuclear programs in Iran. With respect to Iran’s nuclear infrastructure, Russian assistance enhances Iran’s ability to support a nuclear weapons development effort. By its very nature, even the transfer of civilian technology may be of use in Iran’s nuclear weapons program. In addition, Russia supplied India with material for its civilian nuclear program during this reporting period.

Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians.
seeking technical information and training on BW and CW agent production processes.

Russia also was an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

Following intense and continuing engagement with the US, Russian officials took some positive steps to enhance oversight of Russian entities and their interaction with countries of concern. Russia has reiterated previous commitments to observe certain limits on its nuclear cooperation with Iran, such as not providing militarily useful nuclear technology, although—as indicated above—Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. President Yeltsin in July 1999 signed a federal export control law, which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators.

Despite these decrees, the government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.

…For the first half of 1999, entities in Russia and China continued to supply a considerable amount and a wide variety of ballistic missile-related goods and technology to Iran. Tehran is using these goods and technologies to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998 and probably has achieved “emergency operational capability”—i.e., Tehran could deploy a limited number of the Shahab-3 prototype missiles in an operational mode during a perceived crisis situation. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.”

Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the first half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and developmental program.

…Russia has committed to observe certain limits on its nuclear cooperation with Iran. For example, President Yeltsin has stated publicly that Russia will not provide militarily useful nuclear technology to Iran. Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were identified in 1998) remain in effect.

…During the first half of 1999, Damascus continued work on establishing a solid-propellant rocket motor.
development and production capability with help from outside countries such as Iran. Foreign equipment and assistance to its liquid-propellant missile program, primarily from Russian entities, but also from firms in China and North Korea, also have been and will continue to be essential for Syria’s effort. Damascus also continued its efforts to assemble—probably with considerable North Korean assistance—liquid-fueled Scud C missiles.

…In addition, sales of ACW to Syria continued, albeit at a lesser pace, during this reporting period. The vast majority of it’s arsenal consists of weapons from the FSU. Russia in particular wants to keep its predominant position as the key supplier of arms to Damascus.

Making a Russian Compromise Work: The Problem of Russian Goals and Perceptions

It is also impossible to rule out an eventual US-Russian compromise. Russian officials as senior as Putin must know that NMD does not pose a serious threat to Russian strategic offensive capabilities in a war fighting sense, and Russia could potentially benefit as much from NMD and TMD as the US. There are also a number of ways of compensating Russia for the US deployment of NMD by modifying the terms of the START agreements or sharing NMD technology and capabilities. At the same time, it is hard to deny the fact that Russia is on the one hand seeking to block a US NMD program that does not threaten it, and acting on the other hand as a major contributor to the very threat the current US NMD program is designed to defend against.

As a result, it is still possible that the US and Russia may come to an accommodation over these issues. A number of senior Russians feel that a US decision to deploy NMD may now be inevitable, and that the real question is what advantages Russia can gain from an eventual and grudging acceptance of this fact. They state privately that they believe it could be possible to negotiate a US-Russian agreement on NMD, the ABM Treaty, and START II and III, if US and Russian relations improve. They have raised a number of negotiating points they feel might give Russia the compensation it needs:

- US technical transparency on NMD that would assure Russia of the capabilities of the US system, that its ability to degrade a Russian attack was predictable, and that the US did not possess any break out capability to suddenly deploy a much larger system.

- Shifts in the START II/III numbers of allowable warheads to compensate Russia for the capabilities of the US NMD system by giving Russia a larger number of warheads.
- Allowing limited MIRVing of the Topol M2, perhaps to three warheads, to allow Russia to deploy a suitable number of warheads under the START III limit at an acceptable cost.

- Moving ahead with the idea of shared early warning, and a joint presence at each nation’s early warning command center, to reduce fears of accidental launches and any confusion over launch activity and the other side’s reaction.

The practical problem is that the present climate of US and Russian relations, and the increasingly hard-line character of Russian nationalism, make such negotiations difficult. Russia also has shown relatively little concern with the potential “rogue state” threat to their own homeland. A number of Russians do acknowledge that Russia is potentially more vulnerable to proliferation than the US because potential attackers are closer and argue that Russia could benefit from its own NMD system. At the same time, few Russians openly share the US concern over accidental launches and nuclear “accidents” and feel an NMD system would enhance US and Russian nuclear stability.

Few, if any, Russians seem to believe that Russia has any near to mid-term capability to afford the development and deployment of its own NMD system or that Russia would accept or could trust any direct transfer of NMD technology from the US. As a result, few Russians see dual US and Russian deployment of NMD as a practical negotiating option, no matter how desirable it might be in theory.

In short, the tensions between the US and Russia may make any Russian agreement to revise the ABM Treaty and accept US deployment of NMD nonnegotiable. It could block progress in the START Treaty and lead to a revival of some form of the US-Russian nuclear arms race – although probably on new terms more oriented towards enhancing national prestige and influence than towards serious war fighting capability. At best, the next President faces a major challenge in dealing with Russia politically and strategically, and particularly in terms of arms control, strategic nuclear modernization, and the competition for global influence.
Chart III.1

The US, Russian, and Ukrainian Strategic Nuclear Triad Declared for Start I
(Declarations as of April 4, 2000)

<table>
<thead>
<tr>
<th></th>
<th>US Launchers &amp; Bombers</th>
<th>Russian Launchers and Bombers</th>
<th>Ukrainian Launchers and Bombers</th>
<th>US Warheads</th>
<th>Russian Warheads</th>
<th>Ukrainian Warheads</th>
<th>US Throw Weight</th>
<th>Russian Throw weight</th>
<th>Ukrainian Throw Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bombers</td>
<td>300</td>
<td>78</td>
<td>32</td>
<td>1578</td>
<td>596</td>
<td>256</td>
<td>1024</td>
<td>1033.2</td>
<td>109.35</td>
</tr>
<tr>
<td>SLBMs</td>
<td>464</td>
<td>504</td>
<td>3776</td>
<td>2336</td>
<td>1024</td>
<td>1033.2</td>
<td>2806.8</td>
<td>109.35</td>
<td></td>
</tr>
<tr>
<td>ICBMs</td>
<td>687</td>
<td>756</td>
<td>2409</td>
<td>3540</td>
<td>270</td>
<td>979.7</td>
<td>2806.8</td>
<td>1033.2</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted by Anthony H. Cordesman from data provided by the Bureau of Arms Control, US State Department, on April 4, 2000. Belarus and Kazakhstan report zero in every category.
### Table III. 3

**Russian and US Strategic Nuclear Forces and Force Modernization: Part One**

**Aggregate Numbers of START I Accountable Strategic Offensive Arms in April 2000**

<table>
<thead>
<tr>
<th>Category of Date</th>
<th>Belarus</th>
<th>Kazakhstan</th>
<th>Russia</th>
<th>Ukraine</th>
<th>FSU</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployed ICBMs and their Associated launchers, Deployed SLBMs and Their Associated Launchers and Deployed Heavy Bombers</td>
<td>0</td>
<td>0</td>
<td>1,338</td>
<td>59</td>
<td>1,397</td>
<td>1,451</td>
</tr>
<tr>
<td>Warheads Attributed to Deployed ICBMs, SLBMs, and Heavy Bombers</td>
<td>0</td>
<td>0</td>
<td>6,427</td>
<td>526</td>
<td>6,998</td>
<td>7,763</td>
</tr>
<tr>
<td>Warheads Attributed to Deployed ICBMs, SLBMs</td>
<td>0</td>
<td>0</td>
<td>5,876</td>
<td>270</td>
<td>6,146</td>
<td>6,185</td>
</tr>
<tr>
<td>Throw-weight of Deployed ICBMs And SLBMs in megatons</td>
<td>0</td>
<td>0</td>
<td>3,840</td>
<td>109.35</td>
<td>3,949.35</td>
<td>1,953.7</td>
</tr>
</tbody>
</table>

Source: US State Department, Bureau of Arms Control, as of April, 2000
### Table III. 3

**Russian and US Strategic Nuclear Forces and Force Modernization: Part Two**

Strategic Nuclear Forces of the Former Soviet Union: Past, Present and Projected

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-11</td>
<td>326</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RS-12M</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Road mobile</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Silo</td>
<td>-</td>
<td>(20)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS-13</td>
<td>40</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-17</td>
<td>188</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-18</td>
<td>3,080</td>
<td>1,800</td>
<td>1,800</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-19</td>
<td>1,800</td>
<td>1,062</td>
<td>900</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>SS-24</td>
<td>890</td>
<td>920</td>
<td>460</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Silo</td>
<td>-</td>
<td>-</td>
<td>(100)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rail mobile</td>
<td>-</td>
<td>-</td>
<td>(360)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SS-25</td>
<td>288</td>
<td>360</td>
<td>360</td>
<td>250</td>
<td>100</td>
</tr>
<tr>
<td>SS-27</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Subtotal</td>
<td>6,612</td>
<td>4,144</td>
<td>3,540</td>
<td>535</td>
<td>385</td>
</tr>
<tr>
<td>SS-N-6</td>
<td>192</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-N-8</td>
<td>280</td>
<td>192</td>
<td>64</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-N-17</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-N-18</td>
<td>672</td>
<td>624</td>
<td>624</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS-N-20</td>
<td>1,200</td>
<td>1,200</td>
<td>1,200</td>
<td>1,000</td>
<td>600</td>
</tr>
<tr>
<td>SS-N-23</td>
<td>448</td>
<td>448</td>
<td>448</td>
<td>448</td>
<td>320</td>
</tr>
<tr>
<td>SS-NX-28</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>Subtotal</td>
<td>2,804</td>
<td>2,480</td>
<td>2,336</td>
<td>1,544</td>
<td>1,016</td>
</tr>
<tr>
<td>Bear</td>
<td>735</td>
<td>716</td>
<td>532</td>
<td>532</td>
<td>532</td>
</tr>
<tr>
<td>ALCM</td>
<td>-</td>
<td>-</td>
<td>(528)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non-ALCM</td>
<td>-</td>
<td>-</td>
<td>(4)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Blackjack ALCM</td>
<td>120</td>
<td>200</td>
<td>64</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>Subtotal</td>
<td>855</td>
<td>916</td>
<td>592</td>
<td>800</td>
<td>568</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10,271</td>
<td>7,540</td>
<td>~3,000</td>
<td>~2,000</td>
<td></td>
</tr>
</tbody>
</table>


Notes:

1. Warhead numbers are based on START I counting rules. Figures include weapons in Belarus, Kazakhstan, Russia and Ukraine. From 2000 on, warheads are only held in Russia.
2. Warhead numbers are based on START I counting rules. Figures include weapons in Russia and Ukraine only. Although Ukraine returned the last of its strategic nuclear warheads to Russia in 1996, they remain START-accountable until the delivery systems have been destroyed. The July 1998 START I MOU lists Ukraine as possessing 54 warheads on SS-19s, 460 warheads on SS-24s, 200 warheads on Bear bombers and 152 warheads on Blackjack bombers. Belarus and Kazakhstan have returned all of their nuclear warheads to Russia and have completed the destruction of their delivery vehicles, thereby removing them from START accountability.
3. Assumes that START II enters into force, but that START III is not successfully negotiated. Figures include weapons in Russia only and are based on START II counting rules. This means that the number of weapons counted for heavy bombers will be the number they are actually equipped to carry.
4. Assumes that START III is successfully negotiated. Under this treaty, the United States and Russia will be permitted to deploy 2,000-2,500 strategic warheads each.
5. START II permits Russia to download 105 SS-19s from six warheads each to one.
6. Assumes that Russia keeps these forces under START III.
7. Assumes that Russia will achieve and is able to sustain a production rate of about 20 SS-27s per year.
8. *ibid*.
9. Russia laid the keel for a new class of ballistic missile submarines (known as the Borey) in November 1996. According to the Office of Naval Intelligence, the submarines will be fitted with a new SLBM, possibly the SS-NX-28. Borey-class submarines are expected to carry at least 12 SLBMs. It is assumed that each SS-NX-28 will carry four warheads. The first of the Borey-class submarines may be operational around 2005, depending on financial circumstances.
10. *ibid*.
11. This outcome largely depends on Russia’s economic situation. Under some scenarios, Russia would deploy significantly fewer warheads.
12. *ibid*.

### Table III. 3

**Russian and US Strategic Nuclear Forces and Force Modernization: Part Three**

**U.S. Strategic Nuclear Warheads: Past, Present and Projected**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MX</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Minuteman III</td>
<td>1,500</td>
<td>1,950</td>
<td>1,908</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Minuteman II</td>
<td>450</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal</td>
<td>2,450</td>
<td>2,451</td>
<td>2,409</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Poseidon (C-3)</td>
<td>1,920</td>
<td>320</td>
<td>320</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trident I (C-4)</td>
<td>3,072</td>
<td>1,536</td>
<td>1,536</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trident II (D-5)</td>
<td>768</td>
<td>1,920</td>
<td>1,920</td>
<td>1,680</td>
<td>1,008</td>
</tr>
<tr>
<td>Subtotal</td>
<td>5,760</td>
<td>3,776</td>
<td>3,776</td>
<td>1,680</td>
<td>1,008</td>
</tr>
<tr>
<td>B-52</td>
<td>2,258</td>
<td>1,644</td>
<td>1,467</td>
<td>980</td>
<td>364</td>
</tr>
<tr>
<td>B-1</td>
<td>95</td>
<td>91</td>
<td>91</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B-2</td>
<td>0</td>
<td>20</td>
<td>29</td>
<td>336</td>
<td>336</td>
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<tr>
<td>Subtotal</td>
<td>2,353</td>
<td>1,755</td>
<td>1,578</td>
<td>1,316</td>
<td>700</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>10,563</strong></td>
<td><strong>7,982</strong></td>
<td><strong>7,763</strong></td>
<td>~3,500</td>
<td>~2,000</td>
</tr>
</tbody>
</table>


Notes:

1. Warhead numbers are based on START I counting rules. This results in bombers having fewer warheads attributed to them than they actually carry. On the other hand, even though all Poseidon submarines have been decommissioned, their C-3 SLBMs and associated warheads remain START-accountable until the delivery systems have been destroyed.

2. Same as above.

3. Assumes that START II enters into force, but that START III is not successfully negotiated. Figures are based on START II counting rules. This means that the number of weapons counted for heavy bombers will be the number they are actually equipped to carry.

4. Assumes that START III is successfully negotiated. Under this treaty, the United States and Russia will be permitted to deploy 2,000-2,500 strategic warheads each.

5. Assumes 500 Minuteman IIIIs, with each missile carrying one warhead.

6. Assumes 300 Minuteman IIIIs, with each missile carrying one warhead.

7. Assumes 14 Ohio-class submarines carrying 24 Trident II (D-5) missiles each, with all D-5s carrying five warheads.

8. Assumes 14 Ohio-class submarines carrying 24 Trident II (D-5) missiles each, with all D-5s carrying three warheads.

9. Assumes that the United States maintains its entire fleet of 71 B-52 bombers, but reduces their cruise-missile carrying capacity.

10. Assumes that the United States maintains its entire fleet of 71 B-52 bombers, but reduces their cruise-missile carrying capacity.

Sources: US State Department, Bureau of Arms Control, ACA, DOD, START I Memoranda of
Table III.4

Estimate of Russian Nuclear Forces, April 2000

<table>
<thead>
<tr>
<th>Type/Name</th>
<th>Launcher/Year Deployed</th>
<th>Warheads x yield (kt)</th>
<th>Total warheads</th>
<th>Throwweight in Megatons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICBMs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS-18 Satan (RS-20)</td>
<td>180/1979</td>
<td>10 x 550/750</td>
<td>1,800</td>
<td>1,584.8</td>
</tr>
<tr>
<td>SS-19 Stiletto (RS-18)</td>
<td>150/1979</td>
<td>6 x 550</td>
<td>900</td>
<td>652.5</td>
</tr>
<tr>
<td>SS-24 Scalpel (RS-22)</td>
<td>10/1987</td>
<td>10 x 550</td>
<td>100</td>
<td>40.5</td>
</tr>
<tr>
<td>SiLo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail Mobile</td>
<td>36</td>
<td></td>
<td>360</td>
<td>145.8</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td></td>
<td>460</td>
<td>186.3</td>
</tr>
<tr>
<td>SS-25 Sickle (RS-12M)</td>
<td>360/1985</td>
<td>1 x 550</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>(SS-27 (Topol-M)</td>
<td>15/1997</td>
<td>1 x 550</td>
<td>10*</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>756(180 Heavy)</td>
<td></td>
<td>3,540</td>
<td>2806.8</td>
</tr>
<tr>
<td><strong>SLBMs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSN-8 Sawfly</td>
<td>64</td>
<td></td>
<td>64</td>
<td>70.4</td>
</tr>
<tr>
<td>SS-N-18 Stingray (RSM-50)</td>
<td>208/1978</td>
<td>3 x 500</td>
<td>624</td>
<td>343.20</td>
</tr>
<tr>
<td>SS-N-20 Sturgeon (RSM-52)</td>
<td>120/1983</td>
<td>10 x 200</td>
<td>200</td>
<td>306.0</td>
</tr>
<tr>
<td>SS-N-23 Skiff (RSM-54)</td>
<td>112/1986</td>
<td>4 x 100</td>
<td>448</td>
<td>313.60</td>
</tr>
<tr>
<td>Total</td>
<td>504</td>
<td></td>
<td>2,236</td>
<td>1,033.2</td>
</tr>
<tr>
<td><strong>BOMBERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tu-95/Bear-ALCM</td>
<td>66/1984</td>
<td>6 AS-15A ALCMs</td>
<td>174</td>
<td></td>
</tr>
<tr>
<td>Tu-95/Bear-Non-ALCM</td>
<td>4/1984</td>
<td>16 AS-15A ALCMs or bombs</td>
<td>560</td>
<td></td>
</tr>
<tr>
<td>Tu-160/Blackjack</td>
<td>8 (+8)/1987</td>
<td>AS-15B ALCMs or AS-16 SRAMSs or bombs</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>202</td>
<td>806</td>
<td></td>
</tr>
<tr>
<td><strong>NON-STRATEGIC WEAPONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic Defense</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABM</td>
<td>64 SH-08 Gazelle, 36 SH-11 Gorgon</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>SAM</td>
<td>SA-5B Gammon, SA-10 Grumble</td>
<td>1100</td>
<td>1100</td>
<td></td>
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<tr>
<td>Land-based Non-strategic Bombers and Fighters</td>
<td>Backfire (158), Fencer (350)</td>
<td>508</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td>Naval Non-strategic Attack aircraft</td>
<td>Backfire (71), Fencer (75)</td>
<td>146</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>SLCMs</td>
<td>SS-N-9, SS-N-12, SS-N-19, SS-N-21, SS-N-22</td>
<td>500</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>ASW Weapons</td>
<td>SS-N-15, SS-N-16, torpedoes</td>
<td>300</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>~4,000</td>
<td></td>
</tr>
<tr>
<td><strong>OTHER WEAPONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserve/Awaiting Dismantlement</td>
<td></td>
<td>~12,000</td>
<td>~12,000</td>
<td></td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td></td>
<td>~2,700 MT (strategic weapons)</td>
<td>~22,250</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES**

* Shown in some Western sources but not in State Department estimate.
1. Figures in this table represent total operational forces, not just forces accountable under START I.
Chinese Strategic Force Deployments

The case of China is very different from the case of Russia. As Chart III.2 and Table III.5 show, China now has relatively limited nuclear forces. From China’s perspective, even a relatively limited US NMD program would seriously degrade current China missile attack capabilities if China launched anything but its entire ICBM force in a single volley. China is, however, developing the new generation of missiles summarized in Table III.6, and is already deploying many of the theater-range missiles listed in this table. These developments raise the prospect that China will increase its strategic and theater range missile forces in proportion to any US NMD system, although there are no clear unclassified indications of how China presently intends to size its future threat against the US – with or without US deployment of NMD.

The National Intelligence Council report summarizes the Chinese ballistic missile threat to the US as follows:\(^5^6\)

“Chinese strategic nuclear doctrine calls for a survivable long-range missile force that can hold a significant portion of the US population at risk in a retaliatory strike.

• China's current force of about 20 CSS-4 ICBMs can reach targets in all of the United States.

• Beijing also is developing two new road-mobile, solid propellant ICBMs.

• —It conducted the first flight test of the mobile DF-31 ICBM in August 1999; we judge it will have a range of about 8,000 km and will be targeted primarily against Russia and Asia.

• —We expect a test of a longer range mobile ICBM within the next several years; it will be targeted primarily against the United States.

• China is developing the JL-2 SLBM, which we expect to be tested within the next decade. The JL-2 probably will be able to target the United States from launch areas near China.

• By 2015, China will likely have tens of missiles targeted against the United States, having added a few tens of more survivable land- and sea-based mobile missiles with smaller nuclear warheads—in part influenced by US technology gained through espionage.

• China has had the technical capability to develop multiple RV payloads for 20 years. If China needed a multiple-RV (MRV) capability in the near term, Beijing could use a DF-31-type RV to develop and deploy a simple MRV or multiple independently target able reentry vehicle (MIRV) 1 for the CSS-4 in a few years. MIRVing a future mobile missile would be many years off.

• China is also significantly improving its theater missile capabilities and is increasing the size of its
SRBM force deployed opposite Taiwan.

- We assess that an unauthorized launch of a Chinese strategic missile is highly unlikely.”

It is important to note, however, that much depends on Chinese perceptions of the US and the seriousness of a potential clash over Taiwan. Furthermore, China too might also take a more subtle path to objecting to the US deployment of an NMD system and retaliate by increasing the flow of expertise, technology, and equipment to hostile states. The January 2000 report by the Director of Central Intelligence referred to earlier makes this clear, as well as the fact that Chinese firms have not halted the sales of relevant technology to potential threat states,57

China joined the Zangger Committee—which clarifies certain export obligations under the NPT-in October 1997 and participated in the Zangger Conversion Technology Holders meeting in February 1999. This was China’s first opportunity to participate in a discussion of this type.

China pledged in late 1997 not to engage in any new nuclear cooperation with Iran but said it would complete work associated with two remaining nuclear projects-a small research reactor and a zirconium production facility—in a relatively short period of time. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

During the reporting period, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern-such as Iran. China also was a supplier of ACW to Iran through the first half of 1999.

Prior to the reporting period, Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

China has provided extensive support in the past to Pakistan’s WMD and ballistic missile programs, and some ballistic missile assistance continues. In May 1996, Beijing promised to stop assistance to unsafeguarded nuclear facilities, but we cannot preclude ongoing contacts. China’s involvement with Pakistan will continue to be monitored closely.

…Pakistan acquired a considerable amount of nuclear-related and dual-use equipment and materials from various sources—principally in the FSU and Western Europe—during the first half of 1999. Islamabad has a well-developed nuclear weapons program, as evidenced by its first nuclear weapons tests in late May 1998. (The US imposed sanctions against Pakistan as a result of these tests.) Acquisition of nuclear-related goods from foreign sources will be important if Pakistan chooses to develop more advanced nuclear weapons. China, which has provided extensive support in the past to Islamabad’s WMD programs, in May 1996 promised to stop assistance to unsafeguarded nuclear facilities—but we cannot rule out ongoing contacts.

Chinese and North Korean entities continued to provide assistance to Pakistan’s ballistic missile program during the first half of 1999. Such assistance is critical for Islamabad’s efforts to produce ballistic missiles. In April 1998, Pakistan flight-tested the Ghauri MRBM, which is based on North Korea’s No Dong missile. Also in April 1998, the US imposed sanctions against Pakistani and North Korean entities for their role in
transferring Missile Technology Control Regime Category I ballistic missile-related technology. In April 1999, Islamabad flight-tested another Ghauri MRBM and the Shaheen-1 SRBM.

… For the first half of 1999, entities in Russia and China continued to supply a considerable amount and a wide variety of ballistic missile-related goods and technology to Iran. Tehran is using these goods and technologies to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998 and probably has achieved “emergency operational capability—i.e., Tehran could deploy a limited number of the Shahab-3 prototype missiles in an operational mode during a perceived crisis situation. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.”

Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the first half of 1999, Tehran continued to seek production technology, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure.

China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

Potential Sources of Chinese and US Confrontation

As is the case with Russia, it is possible that the US may be able to negotiate some kind of ceilings on Chinese strategic forces in response for clear limits to a US NMD system. Unlike Russia, however, China sees a serious prospect for military confrontation with the US over issues like the Taiwan Straits. A Department of Defense report on the Taiwan Straits issue makes the following comments about Chinese attitudes and force developments:  

“Although the PLA is still decades from possessing a comprehensive capability to engage and defeat a modern adversary beyond China's boundaries, Beijing believes that the PLA can develop asymmetric abilities in certain niches—such as advanced cruise missiles and conventional short-range ballistic missiles (SRBMs). Asymmetric warfare generally is defined as attacks by a weaker or more technologically backward opponent on a stronger foe's vulnerabilities using unexpected or innovative means, while avoiding the adversary's strengths. China's effort to "leapfrog" generations of technology in weapons programs is often times perceived as an effort to develop new and surprising capabilities, but most of the actual programs are derivative of efforts already well underway in more developed countries. Rather than technological breakthroughs, Beijing's military modernization effort could more accurately be described as a focus on asymmetric engagement capabilities. China is seeking to identify innovative tactics and employment parameters for systems and technologies which the PLA has successfully employed or can be
reasonably expected to employ in the next two decades.

“… Beijing’s military modernization program, underway for the past two decades, is designed to prepare the PLA to conduct regional active defensive warfare in support of Chinese economic interests and sovereignty claims—a doctrinal shift away from a focus on the large-scale, land-based guerrilla warfare of Mao's classic "People's War." Chinese doctrine and tactics, however, still bear the indelible mark of Mao's teachings, particularly as they apply to concentration of power by a technologically inferior force at select times and places on the battlefield to overcome a foe armed with superior weapons.

“Rather than shifting priority resources from civil infrastructure and economic reform programs to an across-the-board modernization of the PLA, Beijing is focusing on those programs and assets which will give China the most effective means for exploiting critical vulnerabilities in an adversary's military capabilities. This approach potentially will give Beijing the "credible intimidation" needed to accomplish political and military goals without having to rely on overwhelming force-on-force superiority. China's modernization programs thus seek to realize short-term improvements in anti-surface warfare (ASuW) and precision strike and longer term advances in missile defense, counter-space, and information warfare (IW). Concurrently, the PLA is acquiring weapons that would be useful in countering potential adversaries operating on naval platforms or from bases in the East and South China Seas, particularly stand-off weapons such as anti-ship cruise missiles (ASCMs) and long-range land-attack cruise missiles (LACMs), as well as SRBMs. Beijing also is working to address problems associated with integrating advanced weapons systems into their inventory; and weaknesses in command, control, communication, computers, and intelligence (C4I); training; and logistics, so as to improve the PLA's overall warfighting capability.

“As demonstrated in military exercises in the Taiwan Strait in 1995 and 1996, China views its growing conventionally armed ballistic missile force as a potent military and political weapon to influence Taiwan's populace and their leaders. New LACM designs, when operational, will increase China's capability to strike regional targets accurately with conventional warheads. These kinds of weapons systems will play an increasingly important role in modern combat. By 2005, the PLA likely will have deployed two types of SRBMs and a first generation LACM. An expanded arsenal of accurate, conventional SRBMs and LACMs targeted against critical facilities, such as key airfields and C4I nodes, will complicate Taiwan’s ability to conduct military operations.

“Short-Range Ballistic Missiles (SRBMs). Within the next several years, the size of China’s SRBM force is expected to grow substantially. The PLA currently has one regimental-sized CSS-6 (DF-15/M-9) SRBM unit deployed in southeastern China. The CSS-6 is a solid propellant, road mobile missile which can deliver a 500-kilogram conventional payload to a maximum range of 600 km. The CSS-X-7 SRBM—better known by its export designator, the M-11—also is a solid propellant, road-mobile SRBM with an estimated range of 300 km. This missile, however, has not yet entered the PLA's inventory; and an improved, longer range version may be under development. Moreover, both the CSS-6 and the CSS-X-7 are expected to incorporate satellite-assisted navigation technology to improve their accuracy. In an armed conflict with Taiwan, China's SRBMs likely would target air defense installations, airfields, naval bases, C4I nodes, and logistics facilities.

“Land-Attack Cruise Missiles (LACMs). China also is developing LACMs. These missiles appear to have a relatively high development priority. Chinese research and development of LACMs is being aided by an aggressive effort to acquire foreign cruise missile technology and subsystems, particularly from Russia. The first LACM to enter production probably would be air-launched and could be operational early in the next century.

“Antiship Cruise Missiles (ASCMs). Technological improvements to the C-801/SARDINE and the C-802/ SACCJADE are providing a gradual upgrade to China's current force of antiquated, first generation, CSS-N-1/SCRUBBRUSH ASCMs. Despite the obsolescence of many of its ships, its lack of operational
experience and its inability to resupply ASCMs at sea, the PLA Navy could assemble a sizeable ASuW force against Taiwan and, most likely, saturate the Taiwan Navy with barrages of ASCMs. In addition, B-6D bombers subordinate to the PLA Naval Air Force (PLANAF) are capable of firing the C-601/KRAKEN ASCM. The Navy's new FB-7 bomber likely will carry C-801/C-802 ASCMs. China's ASCM capability is expected to improve further with the planned acquisition of two Russian-built SOVREMENNYY-class destroyers armed with the SS-N-22/SUNBURN ASCM.

“... Within the next several years, the size of China's SRBM force is expected to grow substantially. An expanded arsenal of conventional SRBMs and LACMs targeted against critical facilities, such as key airfields and C4I nodes, will complicate Taiwan's ability to conduct military operations. By 2005, China will have deployed both the CSS-6 and CSS-7 SRBM. In addition, the PLA could have a first generation, air-launched LACM in its inventory. Should Beijing choose escalation, a rapid transition from relatively low-intensity blockade operations to massive missile strikes would be a likely step, particularly as a pretext to an invasion. These missile attacks most likely would be high-volume, precision strikes against priority military and political targets, including air defense facilities, airfields, Taiwan's C2 infrastructure, and naval facilities. China, however, could encounter problems coordinating missile firings with other concurrent military operations, such as air and maritime engagements. Exclusive Taiwan reliance on active missile defenses and associated BM/C3I, however, will not sufficiently offset the overwhelming advantage in offensive missiles which Beijing is projected to possess in 2005.

“... Despite anticipated improvements to Taiwan's missile and air defense systems, by 2005, the PLA will possess the capability to attack Taiwan with air and missile strikes which would degrade key military facilities and damage the island's economic infrastructure. China will continue to give priority to long-range precision-strike programs. Similarly, despite improvements in Taiwan's ability to conduct ASW operations, China will retain the capability to interdict Taiwan's SLOCs and blockade the island's principal maritime ports. Should China invade Taiwan, such an operation would require a major commitment of civilian air and maritime transport assets, would be prolonged in duration, and would not be automatically guaranteed to succeed. In the end, any of these options would prove to be costly to Beijing—politically, economically, diplomatically, and militarily.

“Beyond 2005, development of a modern military force capable of exerting military influence within the region, achieving deterrence against potential enemies, preserving independence of action in domestic and foreign affairs, protecting the nation's economic resources and maritime areas, and defending the sovereignty of the nation's territory will remain one of China's national priorities. Beijing will strive to create a smaller, more modern, better trained, more professional, and better logistically supported force, with an emphasis on air, naval and missile forces. China will continue to improve its regional force projection capabilities, but will not possess the conventional military capabilities to exert global influence.

“The PLA will field large numbers of increasingly accurate SRBMs and introduce LACMs into its inventory. China's naval forces will continue their transition from a large coastal defense force to a smaller, more modern force able to conduct limited sea control operations against regional opponents in the East and South China Seas. China's air force will continue to assimilate greater numbers of fourth generation aircraft into its inventory, upgrade its regional IADS, and expand its airborne refueling and AEW capabilities. China will retain a numerical advantage over Taiwan in terms of both personnel and weapons.”

While the report conspicuously fails to touch upon any aspect of the military balance between the US and China – including Chinese missile threats to the US – it is clear that the regional asymmetric strategy that China is pursuing towards Taiwan could just as easily become
the Chinese nuclear and ballistic missile strategy for dealing with the US:\footnote{59}

China has repeatedly warned that any US sale of theater missile defense to Taiwan will be seen as a violation of the 1979 US-Chinese pact in which the US agreed to recognize Beijing, end its defense pact with Taiwan, and withdraw US forces from the island. Lt. General Xiong Guangkai, director of intelligence and deputy chief of the general staff of the PLA, reinforced this view during a visit to Washington in January 2000. He also stated that any US transfer of TMD capability “would damage US and Chinese relations.”\footnote{60}

**Chinese versus Russian Attitudes Towards a US NMD System**

China and Russian have steadily increased their cooperation in opposing a US NMD system, but they have different reasons for doing so. China differs from Russia in that its opposition to NMD is not a matter of relatively esoteric issues like political status and maintaining parity in offensive systems. From China’s perspective, it already is a distinctly marginal nuclear power relative to the US with relatively limited credibility to deter, threaten, or pressure the US. China is also an emerging power with the wealth and resources to deploy significant nuclear forces, but which lacks the near to mid-term ability to compete with the US in conventional warfare capabilities. Therefore, there is a reasonable probability that China will not negotiate some form of nuclear forces agreement with the US, and will react to US development of an NMD system by systematically upgrading its strategic nuclear forces to ensure that it can saturate and defeat any NMD system the US deploys.

**Chinese Strategic Force Modernization**

It is hard to determine whether the net threat China ultimately poses to the US will be significantly higher as a result of NMD. Once again, there is no way to estimate either the size of current Chinese modernization and force expansion plans or the future Chinese definition of strategic sufficiency. Furthermore, a number of experts question how quickly China can modernize its strategic nuclear forces and implement an asymmetric strategy or react to the US deployment of an NMD system.
For example, Robert Norris -- Senior Analyst at the Natural Resources Defense Council, discussed the likely shape and pace of China's nuclear modernization program comments that,\textsuperscript{61}

In a 1993 book, I wrote: "Two mobile missile programs are in development, the DF-31 and DF-41." I described what we knew about them (they actually date back to the '70s) and noted that they would be deployed sometime in the future.

Today, six years later, in the \textit{Nuclear Notebook} that I do with William Arkin, we write, "Two future ballistic missiles are often mentioned in newspaper accounts but very little is known about them, the DF-31 and DF-41. More than likely these missiles would have improved accuracy and guidance, mobile launch platforms, solid fuel technology and possibly multiple warheads. Neither the DF-31 nor DF-41 has begun flight-testing. It could take many years before either missile is deployed. If they are fielded it is not known how many missiles might be deployed or how many warheads they might carry."

The submarine program is in sad shape. There were endless predictions that China was producing a \textit{Xia} class nuclear ballistic missile submarine, and that it was being tested. Finally, there was one submarine. Can you imagine our military deciding to spend billions of dollars for a submarine program that produces one submarine? This is a massive failure. We know that the Chinese have not mastered nuclear reactor technology or underwater ballistic missile firing technology. There are rumors that a new submarine class is in development. When Joseph Cirincione holds this seminar again 3 years from now and invites me back, I will probably repeat the quote that I just stated this morning: it continues in development.

Chinese weapons programs take an enormous length of time to be researched, developed, tested, produced, deployed and fully fielded. This is the case when we look at the whole range of weapons beginning back in the 1950's, and it continues to be the case today. There is an excellent paragraph that I've borrowed from David Shambaugh: "It is important not to confuse ambition with capability. The PLA's doctrinal desires at present stand in sharp contrast to its severely limited capabilities. The PLA's current weapons inventory remains 10 to 20 years behind the state-of-the-art in almost all categories, although some gaps are being closed."

While CIA and DIA officials are not willing to go on record with similar statements, a number clearly had similar views during a debate over an NIE on the subject in the summer of 2000.\textsuperscript{62} In what seems to be a reliable report in the Washington Post, one was quoted as saying, "The question is whether NMD will really make China beef up, or whether they planned to ramp up anyway," Another official was stated to have said that many felt Beijing was less concerned with NMD, and more with the possibility that the US might someday provide a theater missile defense system to protect Taiwan.

If the NIC estimate is correct, however, it is possible that China will see the US deployment of NMD -- coupled to any Japanese, South Korean, and Taiwanese deployment of a theater missile system -- as an "encircling" threat and react accordingly by increasing its nuclear threat to the US. Certainly, the Chinese leadership has long seen missile defenses as a threat to...
both its regional military posture in dealing with Taiwan and its ability to exercise strategic leverage over the US.\footnote{63}

“At the beginning of this year, one country breached the existing arms control treaty by announcing its decision to accelerate the research and development of missile defense systems. At the same time, that country also has ambitious programs to extend its weaponry system to the outer space. The aim of such program is to seek absolute military dominance. These programs will certainly have negative impact on bilateral and multilateral nuclear disarmament process and on the global strategic security and stability as well. All these developments make the [Conference on Disarmament’s] deliberation on [prevention of an arms race in outer space] ever more relevant and pressing.” -- Ambassador Li Changhe, Chinese representative to the Conference on Disarmament, (May 27, 1999, Conference of Disarmament, Geneva).\footnote{64}

“The research, development, deployment, and proliferation of sophisticated anti-missile systems, and revision of, or even withdrawal from, the existing disarmament treaties, on which global strategic equilibrium hinges will inevitably exert an extensive negative impact on international security and stability and trigger a new round of arms races in new areas, thereby seriously obstructing or neutralizing international efforts of nuclear disarmament and nuclear non-proliferation.” -- President Jiang Zemin, (March 26, 1999, Conference of Disarmament, Geneva).\footnote{65}

“We are against TMD. We are especially firm in our opposition to including Taiwan under TMD. TMD would constitute a violation against international agreements on missiles as well as an encroachment on China’s sovereignty, territorial integrity and an interference in China's internal affairs.” --Premier Zhu Rhongji, (News conference).\footnote{66}

“The development and research of TMD does not go with the trend of the times, nor is it conducive to international disarmament efforts. It will also exert a negative impact on the global and regional strategic balance and stability into the next century.” --Foreign Minister Tang Jiaxuan, (News conference).\footnote{67}

“[The U.S. studying the TMD system with] one of its allies would be damaging to peace and security in the Asia-Pacific. [This research] will go far beyond the legitimate defense needs which the relevant country has repeatedly indicated.” --Foreign Minister Tang Jiaxuan.\footnote{68}

“A U.S. national missile defense, which would consist of missile interceptors, ground radar and satellite sensors that could be deployed by 2005, would have a ‘comprehensive and far-reaching impact on world security.” -- Foreign Ministry Spokesman Sun Yuxi, (Beijing).\footnote{69}

“China also considers that joint development of advanced missile systems by the United States and other concerned countries will have serious impact on the security and stability of the regions concerned. Any country’s supply of any weapons system, including TMD, to China’s Taiwan Province will be considered a move that seriously infringes on China’s sovereignty and territorial integrity, such action will certainly meet with ‘strong opposition from the Chinese people’.” --Foreign Ministry Spokesman Sun Yuxi, (Beijing news briefing).

“China maintains that the international community, the big powers with the capacity to utilize outer space in particular, should take the following realistic steps to prevent a weaponized outer space: A complete ban on weapons of any kind in outer space, including anti-missile and anti-satellite weapons, so as to keep outer space free of weapons; a ban on the use of force or conduct of hostilities in, from or to outer space; and all countries should undertake neither to experiment with, produce or deploy outer space weapons nor to utilize outer space to seek strategic advantages on the ground, for example, using disposition of the important parts of ground anti-missile systems in outer space for the purpose of developing strategic
defensive weapons. In addition, negotiations should be held as soon as possible for the conclusion of a legally-binding international agreement with the above-mentioned contents.” -- Information Office of the State Council of the PRC, China’s National Defense, July 1998.

**Chinese and Russian Cooperation in Opposing NMD**

Under these conditions, it is scarcely surprising that Russia and China have cooperated in opposing US deployment of NMD. President Jiang Zemin and Russian President Vladimir Putin both condemned the US NMD program during their first meeting as heads of state on July 5, 2000. The US also failed to make any significant progress in easing Chinese concerns during arms control talks in Beijing, which were the first US-Chinese arms control talks in over a year, and which took place at the same time the US conducted a failed test of its interceptor. If anything, the talks almost certainly raised Chinese concerns. The senior US arms control adviser, John Holum, stated that “We don’t rule out the possibility that some time in the future Taiwan may have TMD capabilities.” Holum also made it clear that the PRC remained strongly opposed to NMD, “They were clear, as they have been publicly, on their position on National Missile Defense.”

On July 14, 2000, Sha Zukang, the director general of the Chinese Foreign Ministry's department of arms control and disarmament, attacked both NMD and any sale of US technology to Taiwan for a smaller-scope theater missile defense system during Defense Secretary William S. Cohen’s first trip to China in nearly three years. Sha said that such a sale would "lead to serious confrontation…This is of supreme national interest…It will be defended at any cost." China had stated earlier that it might expand its nuclear forces to compensate for the proposed US defense system, but Sha broadened China’s threats to include a possible Chinese renunciation of undertakings barring nuclear or chemical weapons proliferation and nuclear testing. "I have spent the most valuable and important part of my life, 16 years, on these issues…Now all of these achievements are at risk."

Sha predicted that if President Clinton or his successor went ahead with NMD, the decision would actually hurt US security, "Instead of enhancing your security, your security policy will be further compromised," he said. "The United States will play the role of a fire
brigade. Rushing from one place to another to extinguish fires." He rejected US claims that an NMD system would not aimed at China but at unpredictable and hostile "states of concern," such as North Korea, Iran and Iraq. "That doesn't matter, the consequences are still terrible for us," he said. Asked if China would reconsider its commitment to nuclear disarmament and a halt to sensitive weapons sales, he responded: "To say the least, our enthusiasm and our participation in all of those regimes, particularly in cooperating with the United States, our mood, let me say, would be severely dampened. To say the least, it would seriously dampen our interest... We have not reached a stage to say we will forget our commitments, yet... It is too early to say what we will do," he said. "All I can say is that China will do everything possible to ensure its security, and the measures it will take will be in proportion to the success."

Sha said that any NMD system would risk negating China's limited arsenal and the "strategic stability" that ensures deterrence around the world. He also said that exporting theater missile defense technology to Taiwan would constitute a belligerent act on the part of the United States and would mark the first step in resumption of a U.S. military alliance with Taipei. That "Wear our cap for a moment...Imagine we are pumping arms to one of your states and supporting their independence. How would America feel about it?"72

On July 17, 2000, Chinese President Jiang Zemin and Russian President Vladimir Putin issued a joint statement opposing NMD that went much further. Zemin and Putin held closed-door talks, and then gave held a public signing ceremony in which they issued a joint attack on U.S. plans to build an anti-missile system.

One of the five documents they signed accused the US of using the system "to seek unilateral military and security advantages that will pose the most grave, adverse consequences" to China, Russia and the United States. The Russian and Chinese leader called upon the US to continue to adhere to Anti-Ballistic Missile Treaty and warned that altering the treaty "will trigger an arms race and lead to an about-face in the positive trend that appeared in world politics after the end of the Cold War." They also stated that, "the pretext of a missile threat is totally unjustified."73
The Russo-Chinese statement contained eight points, one of which explicitly linked opposition to NMD and opposition to the deployment of any TMD system in Taiwan. The “Beijing Declaration” stated that, “Any sort of talk of channeling foreign missile defense systems into Taiwan is unacceptable, and both (sides) stressed that it would destroy the region's stability.” China and Russia also pledged to "defy hegemonism, power politics and group politics."75

- The nature of this plan is to seek unilateral military and security advantages. Implementing this plan will have the most grave adverse consequences not only for the security of Russia, China and other countries, but also for the security of the United States and global strategic stability.
- Therefore China and Russia are firmly opposed to such a system.
- The 1972 ABM treaty remains the cornerstone of global strategic stability and international security.
- Any damage to the ABM will trigger a new arms race.
- A non-strategic missile defense system which is not banned by the ABM and international cooperation in this area should not undermine security interests of other countries.
- Incorporating Taiwan in any foreign missile defense system in any way is unacceptable and will seriously undermine regional stability.
- China and Russia will continue their close cooperation on these issues.
- China and Russia will strengthen ties in related areas to ensure their own national security as well as that of the region and the world, in line with the international obligations undertaken by the two countries.

**The Impact of Chinese Nuclear Modernization**

China has been cautious about threatening to improve its offensive capabilities in response to NMD. Senior Chinese officials like Sha Zukang, the director general of the Foreign Ministry's department of arms control and disarmament, have, however, reiterated the theme that NMD would lead to a new arms race, and that the sale of US technology to Taiwan for a smaller-scope theater missile defense system would "lead to serious confrontation." When Sha spoke at the end of Defense Secretary William S. Cohen’s trip to China in July 2000, Sha stated that China would link its attitude toward nonproliferation and modernization of its nuclear forces to the success of the national missile defense program,76
“It is too early to say what we will do,” he said. “All I can say is that China will do everything possible to ensure its security, and the measures it will take will be in proportion to the success” of national missile defense.

There already is evidence that China is stepping up cruise missile programs that could be used to both counter any US NMD deployment and put pressure on the US in any regional confrontation. China is believed to have obtained access to some of the surviving portions of Tomahawk cruise missiles that the US has fired against rogue states, and had the opportunity to reverse engineer them.

China is believed to have started its own long-range cruise missile program, called the X-600 as early as 1977, to have begun testing turbofan engines in 1985, and to have deployed cruise missiles with a range of 600 kilometers as early as 1992 (possibly the Hong Niao-1 or HN-1). It has made major progress in developing advanced air-launched cruise missiles similar to the Russian Kh-55/AS-15 Kent missile as early as 1995, and to be developing advanced versions of the Hai Ying 3 and Hair Ying 4 sea-launched cruise missiles. There are reports that the HN-2 entered service in 1996 with a range of 1,500-2,000 kilometers, and that the HN-3 will have a range of 2,500 kilometers. There are unconfirmed reports that such missiles will be fitted for use in the torpedo tubes of the new Chinese Type 093-class of submarines.77

While CIA and DIA officials are not willing to go on record press reports on an NIE called "Foreign Responses to U.S. National Missile Defense Deployment" in the summer of 2000 indicated that they saw Chinese force modernization as a serious threat.78 The NIE had been delayed by disagreements among the various intelligence agencies that contributed to the report, but the majority of analysts believed that construction of a U.S. missile defense system would cause China to significantly accelerate its production of nuclear weapons beyond current plans. It concluded that China was already is working to modernize and modestly expand its strategic force of some 20 fixed-silo, single-warhead intercontinental missiles, and that China probably would try to develop both mobile and multiple-warhead weapons in response to the deployment of NMD, expanding its force to as many as 200 warheads by 2015 to be able to overwhelm American defenses, causing India and Pakistan to respond with their own buildups.79
If China becomes committed to a major nuclear force expansion plan, it is likely to be able to sustain it and to develop forces which have substantially larger capability to target the US than China now possess. Furthermore, if China does deploy the additional systems necessary to offset a US NMD, it will probably increase the rate of production of its ICBM and SLBM forces to levels that make large-scale deployments much cheaper.

Assessing the Chinese Reaction to NMD

While such a conclusion is speculative, the net threat China poses to the American homeland probably will be larger if the US deploys an NMD system than if the US did not. At the same time, China seems likely to increase its ICBM, SLBM, and cruise missile threat against the US in any case. Some experts feel, for example, that China will be able to test launch its new Julang JL-2 SLBM early in 2000. In addition, China is reportedly about to begin construction of a new nuclear-powered ballistic missile submarines (SSBNs) Type 094. The new sub is expected to carry the three-stage Julan-2 SLBM, a variant of the DF-31. The deployment of this system, however, is many years away. Coupled to the existing test program for the DF-31, this could give the PRC significantly greater capabilities to deploy ICBMs and SLBMs against the US long before 2010. It might be able to deploy a submarine-launched cruise missile threat much earlier.

The same is true of Chinese efforts to strength China’s theater delivery capabilities. The Taiwan Straits issue, Chinese fear of Japan and US ties to Japan, and India proliferation are all major forces that are likely to increase China’s present theater missile forces. The US deployment of NMD and TMD may accelerate this process, but it is scarcely the only catalyst. While Clinton only mentioned China in terms of its support to Iran during his September 1st delay speech, China’s reaction to NMD was considered as a serious issue during the discussions in the NSC before Clinton’s announcement.

As is the case with Russia, there is little prospect that the next President can easily change China’s position or resolve the issues that could lead China to increase the nuclear
missile forces it targets on the US and targets in Asia. This does, however, raise a number of major issues that the US has not yet addressed. The US would have to decide whether or not to react to China’s actions by deploying a more robust NMD system and theater missile defenses. There are US experts who feel that the threat from China may ultimately be more serious than any threat from nations like Iran, Iraq, and North Korea, and that the US has made a major mistake in not designing its NMD system to defend against the Chinese threat. At the same time, this would mean engaging in a new arms race with China, create major new problems for the US in dealing with Russia and arms control, and require a much more sophisticated and costly NMD system than the one the US now contemplates.
Chart III.1

Chinese Deployed Nuclear-Capable Delivery Systems


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### Table III.5

**Estimate of Chinese Nuclear Forces, 2000**

<table>
<thead>
<tr>
<th>Type/Designation</th>
<th>Launchers Deployed</th>
<th>First Deployed</th>
<th>Range (km)</th>
<th>Warheads x yield</th>
<th>Warheads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LAND - BASED MISSILES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DF-3 (3A)</td>
<td>38-50</td>
<td>1971</td>
<td>2,650 (2,800)</td>
<td>1 x 3.3 MT</td>
<td>50</td>
</tr>
<tr>
<td>DF-4</td>
<td>20+</td>
<td>1980</td>
<td>4,750</td>
<td>1 x 3.3 MT</td>
<td>20</td>
</tr>
<tr>
<td>DF-5 (5A)</td>
<td>15-20</td>
<td>1981</td>
<td>12,000</td>
<td>1 x 4.5 MT;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIRV tested</td>
<td>~20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DF-21 (21A)</td>
<td>8-40</td>
<td>1985-6</td>
<td>1,700 (1,800)</td>
<td>1 x 200-300 kt</td>
<td>36</td>
</tr>
<tr>
<td>DF-25</td>
<td>0</td>
<td>development</td>
<td>1,700</td>
<td>n/a</td>
<td>0</td>
</tr>
<tr>
<td>DF-31</td>
<td>0</td>
<td>Tested in 1999</td>
<td>8,000</td>
<td>1 x 200-300 kt;</td>
<td>10-20 to be built</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50-90 kt; MIRV?</td>
<td></td>
</tr>
<tr>
<td>DF-41</td>
<td>0</td>
<td>development</td>
<td>12,000</td>
<td>250 kt; MIRV?</td>
<td>12 to be built</td>
</tr>
<tr>
<td><strong>SEA LAUNCHED BALLISTIC MISSILES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Julang-1</td>
<td>12</td>
<td>1986</td>
<td>1,700 (2150)</td>
<td>1 x 200-300 kt</td>
<td>12</td>
</tr>
<tr>
<td>Julang-2</td>
<td>0</td>
<td>development</td>
<td>8,000-9,000</td>
<td>1 x 100-200 kt</td>
<td>16 to be built?</td>
</tr>
<tr>
<td><strong>AIRCRAFT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-6</td>
<td>120</td>
<td>1965</td>
<td>3,100</td>
<td>1-3 bomb (10kt-3MT)</td>
<td>120</td>
</tr>
<tr>
<td>Q-5</td>
<td>30</td>
<td>1970</td>
<td>400</td>
<td>1 bomb (10kt-3MT)</td>
<td>30</td>
</tr>
<tr>
<td><strong>TACTICAL WEAPONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artillery/SRMs</td>
<td>low kt</td>
<td></td>
<td></td>
<td></td>
<td>120</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>~410 MT</td>
<td>400</td>
</tr>
</tbody>
</table>


2. Recent reports have claimed that China is increasing its ballistic missile force aimed at Taiwan. (see Bill Gertz, "Chinese Missiles Menace Taiwan," *Washington Times*, February 11, 1999. The report claimed that China had produced 150 M-9 and M-11 (short-range ballistic missiles) and was facing the majority of the force toward Taiwan. It should be noted that these are non-nuclear systems, and are not represented in this chart.

3. 310 MT is a good estimate for the yield of China's ballistic missile forces. The bombs, however, with a range of 10kt to 3MT pose a slight problem. We estimate the bomb force to have a yield of approximately 100 megatons.


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Table III.6
Chinese Missile Programs and Developments\textsuperscript{82}

<table>
<thead>
<tr>
<th>Type</th>
<th>Chinese Name</th>
<th>US Name</th>
<th>No. Deployed</th>
<th>Range (Km)</th>
<th>Warhead (Kg)</th>
<th>CEP (M)</th>
<th>Launch Platform</th>
<th>Fuel</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBM</td>
<td>DF-4\textsuperscript{83}</td>
<td>CCS-3</td>
<td>10-25</td>
<td>5500+</td>
<td>2200</td>
<td>1370</td>
<td>land-mobile</td>
<td>liquid</td>
<td>in service</td>
</tr>
<tr>
<td>ICBM</td>
<td>DF-5A\textsuperscript{84}</td>
<td>CSS-4</td>
<td>20</td>
<td>13,000</td>
<td>3,200</td>
<td>500</td>
<td>hardened silos</td>
<td>liquid</td>
<td>in service</td>
</tr>
<tr>
<td>ICBM</td>
<td>DF-31\textsuperscript{85}</td>
<td>CSS-X-9</td>
<td>-</td>
<td>8000</td>
<td>700</td>
<td>?</td>
<td>land-mobile</td>
<td>solid</td>
<td>after 2000</td>
</tr>
<tr>
<td>ICBM</td>
<td>DF-41\textsuperscript{86}</td>
<td>CSS-X-10</td>
<td>-</td>
<td>12,000</td>
<td>800</td>
<td>?</td>
<td>land-mobile</td>
<td>solid</td>
<td>after 2010</td>
</tr>
<tr>
<td>MRBM</td>
<td>DF-3A\textsuperscript{87}</td>
<td>CSS-2</td>
<td>40+</td>
<td>2800</td>
<td>2150</td>
<td>1000</td>
<td>land-mobile</td>
<td>liquid</td>
<td>in service</td>
</tr>
<tr>
<td>MRBM</td>
<td>DF-21\textsuperscript{88}</td>
<td>CSS-5</td>
<td>10</td>
<td>1800</td>
<td>600</td>
<td>?</td>
<td>Mobile-TEL</td>
<td>solid</td>
<td>in service</td>
</tr>
<tr>
<td>MRBM</td>
<td>DF-25\textsuperscript{89}</td>
<td>-</td>
<td>-</td>
<td>1700</td>
<td>2000</td>
<td>?</td>
<td>land-mobile</td>
<td>solid</td>
<td>after 2000</td>
</tr>
<tr>
<td>SLBM</td>
<td>JL-1\textsuperscript{90}</td>
<td>CSS-N-3</td>
<td>12</td>
<td>1700</td>
<td>600</td>
<td>?</td>
<td>Xia SSBN</td>
<td>liquid</td>
<td>in service</td>
</tr>
<tr>
<td>SLBM</td>
<td>JL-2\textsuperscript{91}</td>
<td>CSS-NX-5</td>
<td>-</td>
<td>8000</td>
<td>700</td>
<td>?</td>
<td>094 SSBN</td>
<td>solid</td>
<td>after 2005/2010</td>
</tr>
<tr>
<td>SRBM</td>
<td>DF-15\textsuperscript{92}</td>
<td>CSS-6</td>
<td>4+</td>
<td>600</td>
<td>500</td>
<td>300</td>
<td>Mobile TEL</td>
<td>solid</td>
<td>in service</td>
</tr>
<tr>
<td></td>
<td>M-9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRBM</td>
<td>DF-11\textsuperscript{93}</td>
<td>CSS-7</td>
<td>?</td>
<td>300</td>
<td>500</td>
<td>?</td>
<td>Mobile TEL</td>
<td>solid</td>
<td>in service</td>
</tr>
<tr>
<td></td>
<td>M-11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRBM</td>
<td>8610\textsuperscript{94}</td>
<td>CSS-8</td>
<td>?</td>
<td>150</td>
<td>190</td>
<td>?</td>
<td>Mobile</td>
<td>solid</td>
<td>in service</td>
</tr>
<tr>
<td></td>
<td>M-71 (mod HQ-2 SAM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>launcher</td>
<td></td>
</tr>
</tbody>
</table>

Notes
DF: Dong Feng means “East Wind.”
JL: Julang means “Giant Wave.”

According to “The Bulletin of the Atomic Scientist, Chinese Nuclear Forces, 2000,” China canceled the development of a sixth type of Dong Feng missile, the DF, it has begun developing a new mobile. Solid-propellant ICBM. The nuclear capability of the 600-kilometer range M-9 and the 300-kilometer range M-11 is unconfirmed.
The Chinese define missile ranges as follows: short range, <1,000 kilometers; medium-range,1,000-3,000 kilometers; long-range,3,000-8,000 kilometers; and intercontinental range,>8,000 kilometers
The Problem of Proliferation

The Russian and Chinese nuclear and missile threats unquestionably are the largest potential current threats to the American homeland. They currently, however, present little political risk. As such, they are not the threats the US currently plans to meet in deploying NMD – although such deployments would provide substantial defense capability against Chinese strikes and some capability against Russian accidental launches that did not involve weapons with sophisticated penetration aids.

As has been explained earlier, the US has down-sized its NMD programs to deal primarily only with “accidents” and the kind of missile threats posed by powers that are attempting to develop missile systems that can attack the US, potentially with biological or nuclear warheads. These threats are reflected in Table III.4, which lists nations that are known to have made significant efforts to research, develop, produce, or deploy weapons of mass destruction and long-range missile delivery systems since the end of World War II.

These activities of these states do not mean that the growth of new missile-borne threats to the American homeland is inevitable, and many proliferators now pose little or no threat to the US. Table III.4 lists a number of current proliferating states that clearly are unlikely to be threats to the US homeland. Similarly, it also lists a number of countries like Argentina, Brazil, Canada, Sweden, and South Africa which have frozen or rolled-back their efforts to proliferate.

The two most important potential threats to the US listed in Table III.4 are Iran and North Korea, and it is still possible that Iran and North Korea may not develop missiles that can directly threaten the American Homeland. Table III.4 also shows that current pace and scale of proliferation is serious, and there is no way to predict who will join the club of those states that can directly attack the US, or with what forces and what intent.

The resulting uncertainties regarding the long-term impact of proliferation and technology transfer have helped polarize many of the arguments for and against NMD. There are well-developed bodies of literature that attempt to disprove that the proliferation of missile
threats will present a major threat to the American homeland and an equally well-developed body of literature attempting to prove that the emerging threat is extremely serious. Neither body of literature is particularly convincing as a source of reliable prophecy.

The past history of efforts to predict the rate of proliferation is littered with false prophecies, failed analytic methodologies, and questionable intelligence – although there has been rough balance between exaggerating and underestimating the threat. The literature on potential threats is also often highly ideological, reflecting long-standing biases for and against SDI and NMD, attitudes towards given regimes, and a transfer of known hostility to America’s friends and allies to possible willingness to attack the American homeland. As is discussed in the next chapter, much of the American literature also focuses far too rigidly on the threat from missiles and nuclear weapons, and tends to ignore other methods of delivery and weapons of mass destruction.

At this point in time, it seems fair to say that virtually any position regarding the seriousness of the threat from nations like Iran and North Korea has some intellectual credibility simply because it is so impossible to predict the future. On the one hand, it is possible that missiles may remain a “regional” threat that does not lead new nations to target ballistic missiles on the US. On the other hand, it is clear that it is becoming easier for hostile states to acquire the capability to use missiles to strike at the US. The problems in technology systems integration, and manufacturing necessary to acquire acquiring boosters with ICBM ranges are becoming less serious. A number of developing states will acquire the technology to build missiles with the range and payload to deliver a nuclear or biological weapon against a target in the US over the next decade if they choose to do so. The history of past arms races is sometimes one of rollback, but it is also filled with sudden and unpredictable surges in new weapons and technologies.
### Table III.4

Who Has, Can Have, or Will Have Weapons of Mass Destruction?

<table>
<thead>
<tr>
<th>Country</th>
<th>Type of Weapon of Mass Destruction</th>
<th>Long-Range Missiles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chemical</td>
<td>Biological</td>
</tr>
<tr>
<td><strong>East-West</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Britain</td>
<td>Breakout</td>
<td>Breakout</td>
</tr>
<tr>
<td>Canada</td>
<td>-</td>
<td>Technology</td>
</tr>
<tr>
<td>France</td>
<td>Breakout</td>
<td>Breakout</td>
</tr>
<tr>
<td>Germany</td>
<td>Breakout</td>
<td>Breakout</td>
</tr>
<tr>
<td>Sweden</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Russia</td>
<td>Residual</td>
<td>Residual</td>
</tr>
<tr>
<td>US</td>
<td>Residual</td>
<td>Breakout</td>
</tr>
<tr>
<td><strong>Middle East</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>Residual</td>
<td>Breakout</td>
</tr>
<tr>
<td>Israel</td>
<td>Breakout</td>
<td>Breakout</td>
</tr>
<tr>
<td>Iran</td>
<td>Deployed?</td>
<td>Breakout</td>
</tr>
<tr>
<td>Iraq</td>
<td>Deployed</td>
<td>Deployed</td>
</tr>
<tr>
<td>Libya</td>
<td>Deployed</td>
<td>Research</td>
</tr>
<tr>
<td>Syria</td>
<td>Deployed</td>
<td>Technology?</td>
</tr>
<tr>
<td>Yemen</td>
<td>Residual</td>
<td>-</td>
</tr>
<tr>
<td><strong>Asia and South Asia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Deployed?</td>
<td>Breakout?</td>
</tr>
<tr>
<td>India</td>
<td>Breakout?</td>
<td>Breakout?</td>
</tr>
<tr>
<td>Japan</td>
<td>Breakout?</td>
<td>Breakout?</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Breakout?</td>
<td>Breakout?</td>
</tr>
<tr>
<td>North Korea</td>
<td>Deployed</td>
<td>Deployed</td>
</tr>
<tr>
<td>South Korea</td>
<td>Breakout?</td>
<td>Breakout?</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Breakout?</td>
<td>Breakout?</td>
</tr>
<tr>
<td>Thailand</td>
<td>Residual</td>
<td>Breakout?</td>
</tr>
<tr>
<td>Vietnam</td>
<td>Residual</td>
<td>Breakout?</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Brazil</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>South Africa</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
North Korean Force Developments

An examination of the key case studies in proliferation makes these issues more clear. Each of the three nations involved -- North Korea, Iran, and Iraq -- present a different potential threat. In the case of North Korea, there are major debates among experts over just how serious a threat North Korea can be to US territory. Some experts believe that North Korea will pursue the development of long-range missiles and nuclear weapons regardless of what it may appear to agree to at the political level. Some believe that the North Korean regime cannot last long enough to present a serious threat, and others believe that North Korea will give up its efforts in return for aid and economic ties to other Asian states and the US. They point to a perceived breakthrough in the talks between North and South Korea in June 2000.

North Korea and Nuclear Weapons

There is no debate within the US intelligence community over the fact that North Korea has long had large stocks of chemical and biological weapons, and has deployed them in warheads that can be used in its Scud and extended range Scud missiles. There is more debate over whether North Korean has nuclear weapons and is continuing its nuclear weapons development and production program.

The first major reports of North Korea's nuclear program began in 1993, when analysts found satellite reconnaissance evidence that a North Korean nuclear reprocessing center at Yongbyon had begun to process plutonium. This led to a diplomatic confrontation and talks where the Clinton administration obtained a North Korean pledge to freeze plutonium production at the site. In exchange, the United States, South Korea and Japan agreed to give the North oil and technical assistance to build a peaceful nuclear power program. The agreement called for international monitoring of the Yongbyon site, and Energy Department experts were allowed to encase the spent fuel rods at the center to ensure that they could not be used for warheads. Before this production freeze, however, North Korea was able to produce about 26 pounds of weapons-grade plutonium. As a result, a consensus developed that North Korea could produce one or two...
bombs.

The current debate focuses on what North Korean has done since that time. The Clinton Administration initially declared that North Korea had agreed to freeze its entire nuclear program. It later became clear, however, that the agreement covered only Yongbyon and did not preclude nuclear activity at other sites. North Korea then dumped radioactive nuclear fuel out of the heavy water reactor into a cooling pool in order to replace it with fresh fuel rods. The US intelligence community estimated that the spent fuel rods contained enough plutonium for 10 nuclear warheads, and this raised serious questions as to whether North Korea was covertly going on with its nuclear program.

A report in the New York Times, which has been informally confirmed by several US experts, indicates that the Defense Intelligence Agency (DIA) began to report that it had detected a series of other secret sites, many of them underground, that analysts suspected were related to an ongoing nuclear program. By the late-1990's, DIA and the National Imagery and Mapping Agency, compiled a list of at least 10 potential sites which raised questions about their function without providing clear evidence of any weapons activity.

One installation, at Kumchangri, was believed to house an underground nuclear reactor and plutonium reprocessing operation. In May 1999, this led the US to pressure North Korea to allow an inspection of the installation which had the same visual signatures as if North Korea was installing an underground reactor, including the water supplies for water-cooling. When North Korea did allow inspection, however, the US only found a series of empty tunnels with no large underground chamber able to hold a nuclear reactor. Another inspection in May 2000 had the same result.

The Times reported that some intelligence experts feel the US gave North Korea too much warning before inspecting the site, making it possible for the North Koreans to hide its purpose. However, State Department officials became leery of the DIA estimates, another installation DIA suspected proved to be nothing more that an underground storage site for the memorabilia of the
North Korean leadership.

This eventually led Secretary of State Madeleine K. Albright and Lt. Gen. Patrick Hughes, director of the DIA, to clash over intelligence report suggesting that North Korea had built a storage installation that housed components for nuclear warheads. State Department officials indicated that DIA was reporting an over-pessimistic picture. DIA indicated in turn that the State Department was too willing to overlook reports of suspicious activity. In their view, the failure of a single inspection does not mean the United States should stop pressing the North Koreans about suspect installations, including the building suspected of housing warhead components. Some of the debate focused on an installation DIA suspected of being a storage building for components of nuclear warheads. The identity and exact location of this center, whose existence has not been released, but the Times reports that intelligence on the storage center was obtained at least three years ago, and was based not only on spy satellite photographs and intercepted communications, but also on "human intelligence" -- spies -- reporting to DIA.95

North Korea and Long-Range Missiles

What is clear is that North Korea is steadily acquiring more advanced missile forces in spite of major economic problems, its rapprochement talks with South Korea in June 2000, and its agreements to suspend the test firing of long-range missiles in September 1999 and June 2000. Its ballistic missile force comprises some 36 launchers and 700 missiles and P’yongyang fields the largest ballistic missile force in the Third World.96 It has tested a booster that could allow it to develop missiles that could strike the US, and it has had a serious nuclear weapons development effort in the past. As Table III.5 shows, North Korea also has a wide range of missile programs. It also has already deployed large numbers of shorter-range missiles with chemical and probably biological warheads. These include extended range Scud-type missiles with ranges over 1,300 kilometers. The US intelligence community also reported in June 2000 that North Korea did not suspend any other aspects of development and production after it agreed to suspend missile tests in September 1999.

North Korea launched a multistage Taepo Dong-1 missile across Japan on August 31,
1998 -- in an effort to place a satellite in orbit. The mission failed, but the United States and its allies were surprised and shocked by the missile's 2,000-kilometer range. David J. Osias, an officer of the Defense Intelligence Agency, stated that "The third stage concerns us. Nobody knew they had it," during a national media update April 26-27, 1998 at the Army Space and Missile Defense Command headquarters.\textsuperscript{97}

North Korea has limits. The Taep’o-dong 1 test was a failure, and the missile was anything but an advanced design. The first stage was modified from a liquid-fueled Scud and the second from the No Dong. Both are 1960s technology. The third stage was a small, solid-fueled rocket designed to put a small satellite into space. It was too small to carry a nuclear weapon or an effective biological payload and dispersal system, and the system was so inherently inaccurate that it was unclear it had growth potential to hit a city-sized target. US experts feel that North Korea has since abandoned work on the Taep’o-dong-1 missile, and is now developing the Taep’o-dong-2. This missile is a two-stage system that uses a cluster of No-dong engines in the first stage and a single No-dong in the second stage. It has never been tested.\textsuperscript{98}

Furthermore, North Korea agreed to suspend further tests of long-range missiles in September 1999 -- largely as a result of the negotiating efforts of former Secretary of Defense William Perry.\textsuperscript{99} This agreement was reached after the NIC report was written, and was renewed in June 2000. However, US intelligence community also reported in June 2000 that North Korea did not suspend any other aspects of development and production after it agreed to suspend missile tests in September 1999.

A CIA report in August 2000 summarized the state of proliferation in North Korea as follows,\textsuperscript{100}

\begin{quote}
P’yongyang continues to acquire raw materials from out-of-country entities to produce WMD and ballistic missiles. During the reporting period, there were increased reflections of North Korean procurement of raw materials and components for its ballistic missile programs from various foreign sources, especially through firms in China. North Korea produces and is capable of using a wide variety of chemical and possibly biological agents, as well as their delivery means.

During the second half of 1999, Pyongyang sought to procure technology worldwide that could have applications in its nuclear program, but we do not know of any procurement directly linked to the nuclear
\end{quote}
weapons program. We assess that North Korea has produced enough plutonium for at least one, and possibly two, nuclear weapons. The United States and North Korea are nearing completion on the joint project of canning spent fuel from the Yongbyon complex for long-term storage and ultimate shipment out of the North in accordance with the 1994 Agreed Framework. That reactor fuel contains enough plutonium for several more weapons.

P’yongyang continues to seek conventional weapons via the gray market. In 1999, for example, North Korea acquired MiG-21 fighter aircraft from Kazakhstan.

…Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

These factors help explain why the report of the National Intelligence Council has seen North Korea as presenting the most serious near term threat to the US, and why this threat has been used as the rationale for setting early deadlines for the deployment of a US NMD system:101

“After Russia and China, North Korea is the most likely to develop ICBMs capable of threatening the United States during the next 15 years.

• North Korea attempted to orbit a small satellite using the Taepo Dong-1 SLV in August 1998, but the third stage failed during powered flight; other aspects of the flight, including stage separation, appear to have been successful.

• If it had an operable third stage and a reentry vehicle capable of surviving ICBM flight, a converted Taepo Dong-1 SLV could deliver a light payload to the United States. In these cases, about two-thirds of the payload mass would be required for the reentry vehicle structure. The remaining mass is probably too light for an early generation nuclear weapon but could deliver biological or chemical (BW/CW) warfare agent.

• Most analysts believe that North Korea probably will test a Taepo Dong-2 this year, unless delayed for political reasons. A two-stage Taepo Dong-2 could deliver a several-hundred kilogram payload to Alaska and Hawaii, and a lighter payload to the western half of the United States. A three-stage Taepo Dong-2 could deliver a several-hundred kilogram payload anywhere in the United States.

• North Korea is much more likely to weaponize the more capable Taepo Dong-2 than the three-stage Taepo Dong-1 as an ICBM.”

These comments are particularly striking in view of the fact North Korea launched a multistage Taepo Dong-1 missile across Japan on August 31, 1998 -- in an effort to place a satellite in orbit. The mission failed, but the United States and its allies were surprised and shocked by the missile’s 2,000-kilometer range. David J. Osias, an officer of the Defense Intelligence Agency, stated that "The third stage concerns us. Nobody knew they had it," during
a national media update April 26-27, 1998 at the Army Space and Missile Defense Command headquarters.\textsuperscript{102}

The fact remains, however, that the Korean test was a failure, and that the missile was anything but an advanced design. The first stage was modified from a liquid-fueled Scud and the second from the No Dong. Both are 1960s technology. The third stage was a small, solid-fueled rocket designed to put a small satellite into space. It was too small to carry a nuclear weapon or an effective biological payload and dispersal system, and the system was so inherently inaccurate that it was unclear it had growth potential to hit a city-sized target. US experts feel that North Korea has since abandoned work on the Taepo Dong-1 missile, and is now developing the Taepo Dong-2. This missile is a two-stage system that uses a cluster of No Dong engines in the first stage and a single No Dong in the second stage. It has never been tested.\textsuperscript{103}

**North Korea’s Uncertain Public Profile in Proliferation**

North Korea agreed to suspend further tests of long-range missiles in September 1999 -- largely as a result of the negotiating efforts of former Secretary of Defense William Perry.\textsuperscript{104} This agreement was reached after the NIC report was written, and was renewed in June 2000.

The problem with such agreements is that North Korea has followed a pattern where it moves towards the acquisition of nuclear and missile capabilities, and then pulls back in response to US diplomatic efforts and incentives. In 1994, North Korea signed an “Agreed Framework” in which it agreed to give up its use of the nuclear reactor at Yongbyon, that it was evidently using to produce fissile materials, in return for aid in developing two nuclear power reactors that have little or no value in producing such weapons. Similarly, North Korea agreed in May 1995, to allow the inspection of an underground site at Kumchangni, North Korea, which was believed to be large enough to house a reactor and a reprocessing facility. The agreement to allow a visit, and the inspection that followed, removed this concern.

North Korea has tended to see each new agreement as a bargaining step in its continuing challenge to the US, South Korea, and Japan. The Arms Control Association provides the
following chronology of the negotiations with North Korea before and after the Perry agreement.\textsuperscript{105}

- October 21, 1994: With North Korea threatening to withdraw from the NPT and the specter of war looming, the United States and North Korea culminated four months of negotiations by adopting the Agreed Framework in Geneva. To resolve U.S. concerns about Pyongyang’s plutonium producing reactors and Yongbyon reprocessing facility, the nuclear agreement calls for North Korea to freeze and eventually eliminate its nuclear facilities and allow the International Atomic Energy Agency to verify its holdings of fissile materials. In exchange, Pyongyang will receive two light-water reactors (LWRs) and annual shipments of heavy fuel oil during construction of the LWRs. Calling for improvement in political and economic relations, the nuclear accord has also served as a jumping off point for U.S.-North Korean dialogue over Pyongyang’s development and exports of ballistic missiles and their technology, as well as other bilateral issues of concern.

- January 9, 1995: North Korea announces the lifting of restrictions on imports of U.S. products into North Korea and restrictions on port calls by U.S. vessels into North Korean ports.

- January 20, 1995: The Clinton administration eases sanctions on North Korea allowing limited financial transactions, telecommunications and information trade and U.S. imports of North Korean magnesite. The previous day, the first shipment of 50,000 tons of heavy fuel oil required by the Agreed Framework is shipped to Sonbong, North Korea.

- March 13, 1995: A statement released by the U.S. Embassy from U.S. Under Secretary of State for Arms Control and International Security Lynn Davis announces that U.S.-North Korean relations will not be normalized until Pyongyang ends its sales of ballistic missiles and related technology to countries like Iran and Syria.

- January 1996: In a letter to North Korea’s Foreign Ministry, Deputy Assistant Secretary of State for East Asia Affairs Thomas Hubbard proposes new meetings to discuss missile proliferation issues. North Korea asserts that U.S. economic sanctions would have to be eased before a date for talks could be set. Washington counters that for greater sanctions relief, Pyongyang must address U.S. concerns about missile sales, forward-deployed conventional forces, terrorism, direct North-South talks and accounting for the missing-in-action from the Korean War.

- April 21-22, 1996: The U.S. and North Korea meet for their first round of bilateral missile talks in Berlin. The United States reportedly suggested that North Korea should adhere to the Missile Technology Control Regime (MTCR), an agreed policy of 29 nations to control sales of ballistic missiles, their components and technology. North Korea allegedly demanded the U.S. provide compensation for lost missile-related revenue. Assistant Secretary of State for East Asian and Pacific Affairs Winston Lord announced that Washington is willing to lift economic sanctions against North Korea in exchange for the termination of its missile production and export programs.

- May 24, 1996: The U.S. imposes sanctions on North Korea and Iran for missile technology related transfers. The sanctions prohibit any imports or exports to the sanctioned firms and a large sector of the North Korean economy considered missile-related. A general ban on trade with both countries makes the sanctions largely symbolic.

- June 22, 1996: North Korean shipments to Egypt of materials and support equipment for building Scud-C missiles are reported in a Washington Times story based on a leaked CIA report. The State Department refuses to confirm or deny the story, but U.S. officials say that ambiguities in the intelligence could prevent
MTCR-related sanctions from being imposed on either country.

- September 18, 1996: A North Korean reconnaissance submarine runs aground on the eastern coast of South Korea, prompting Seoul to insist that implementation of the Agreed Framework be suspended until Pyongyang apologizes. After weeks of talks between U.S. and North Korean officials, Pyongyang issues an apology on December 29.

- October 16, 1996: After detecting North Korean preparations for a test of its 1,300-kilometer-range Nodong missile, The United States deploys a reconnaissance ship and aircraft to Japan. Following several meetings in New York between U.S. and North Korean diplomats, on November 8, the State Department confirms that the missile test has been canceled.

- June 11-13, 1997: The second round of U.S.-North Korean missile talks take place in Seoul with U.S. negotiators pressing North Korea not to deploy the Nodong missile and to end sales of Scud missiles and their components. The parties reach no agreement but reportedly lay the foundation for future talks.

- August 6, 1997: The United States imposes new sanctions on North Korea for unspecified missile-proliferation activities.

- August 27, 1997: A third round of U.S.-North Korea missile talks in New York are canceled by North Korea after Pyongyang’s ambassador to Egypt and his brother, a Paris-based diplomat, defect to the United States. The ambassador is considered an intelligence ‘gold mine’ for his probable knowledge of North Korean missile sales in the Middle East and Persian Gulf regions.

- September 27, 1997: Adm. Joseph Prueher, commander of the U.S. Pacific Command, announces that North Korea is deploying military units with equipment designed to carry the Nodong missile.

- April 17, 1998: The U.S. imposes sanctions on North Korea and Pakistan in response to Pyongyang’s transfer of missile technology and components to Pakistan’s Khan Research Laboratory. The sanctions follow Pakistan’s April 6 test of its new 1,300-kilometer-range Ghauri missile, which is believed to be based on North Korea’s Nodong missile.

- June 10, 1998: Department of Defense officials confirm that North Korea’s Nodong missile has now been deployed to field units, according to a story in the Washington Times.

- June 16, 1998: The official Korean Central News Agency (KCNA) reports that Pyongyang is willing to end its missile technology exports in exchange for suitable compensation. Later stories place North Korean estimates of appropriate compensation between $500 million and $1 billion per year. The lower amount is believed to approximate the peak revenue Pyongyang received from missile-related transfers to Tehran during the Iran-Iraq war.

- July 9, 1998: Secretary of Defense William Cohen says that development of North Korea’s Nodong missile has been completed, but does not comment on deployment.

- July 22, 1998: Iran tests its 1,300-kilometer-range Shahab-3 missile. The State Department says the missile is largely derived from North Korea’s Nodong missile.

- August 17, 1998: North Korean construction of an underground facility in Kumchang-ni that may be used for nuclear weapons-related purposes is reported by the New York Times. The Clinton administration says North Korea remains in compliance with the Agreed Framework but commences talks with Pyongyang to
clarify the status of the site.

- August 31, 1998: North Korea launches a three-stage 1,500-2,000-kilometer-range Taepo Dong-1 missile that overflies Japan. North Korea announces the rocket successfully placed a small satellite into orbit, a claim denied by U.S. Space Command. Japan suspends signing a cost-sharing agreement for the Agreed Framework’s LWR project until November 1998. The U.S. intelligence community admits to being taken by surprise by Pyongyang’s mastery of missile staging technology and the use of a solid-rocket booster for the missile’s third stage.


- October 1, 1998: The third round of U.S.-North Korean missile talks begins in New York but makes little progress. The U.S. repeats its request for Pyongyang to circumscribe its missile programs in exchange for relief from economic sanctions. North Korea rejects the U.S. offer, on the grounds that the lifting of sanctions is implicit in the 1994 Agreed Framework.

- October 21, 1998: President Clinton signs the 1999 Defense Authorization bill, which includes funds to support the Agreed Framework. The money, however, is provided with several security-related conditions including the appointment of a North Korea policy coordinator.

- November 12, 1998: Former Secretary of Defense William Perry is appointed by the president to be North Korea policy coordinator. He immediately undertakes an interagency review of U.S. policy towards North Korea and begins consultations with South Korea and Japan aimed at forming a unified approach to dealing with Pyongyang.

- December 4-11, 1998: The United States and North Korea hold talks aimed at addressing U.S. concerns over the suspected underground nuclear facility in Kumchang-ni. Pyongyang reportedly accepts in principle the idea of a U.S. inspection of the site but is unable to agree with U.S. proposals for “appropriate compensation.”

- February 2, 1999: CIA Director George Tenant testifies before the Senate Armed Services Committee that with some technical improvements, North Korea would be able to use the Taepo Dong-1 to deliver small payloads to parts of Alaska and Hawaii. Tenant also says that Pyongyang’s Taepo Dong-2, if it had a third stage like the Taepo Dong-1, would be able to deliver large payloads to the continental United States, albeit with poor accuracy.

- March 16, 1999: U.S. and North Korean officials announce an agreement to provide a team of U.S. inspectors with access to the underground construction site in Kumchang-ni to verify North Korea’s compliance with the Agreed Framework. Washington announces that in exchange, it will arrange a pilot agricultural program for North Korea. The Clinton administration also commits itself to providing 400,000 tons of food aid to North Korea on strictly humanitarian grounds.

- March 29-30, 1999: U.S. and North Korean officials hold a fourth round of missile talks in Pyongyang. The United States again expresses concern over North Korea’s missile development and proliferation activities and proposes a deal exchanging North Korean restraint for U.S. sanctions relief. The talks were described by U.S. officials as “serious and intensive,” but succeed only in reaching agreement to meet again at an unspecified date.

- May 24-28, 1999: A U.S. inspection team visits the suspected nuclear site in Kumchang-ni. According to
the State Department they find no evidence of nuclear activity or any evidence that Pyongyang has violated the Agreed Framework.

- May 25-28: Traveling to Pyongyang as a presidential envoy, William Perry meets with senior North Korean political, diplomatic and military officials to discuss a major expansion in bilateral relations if Pyongyang is willing to address U.S. security concerns. Perry delivers a letter from President Clinton to North Korean Supreme Leader Kim Jong II, but the two do not meet. Perry reportedly calls on North Korea to satisfy U.S. concerns about ongoing nuclear weapons-related activities beyond the scope of the Agreed Framework and ballistic missile development and proliferation, in exchange for lifting U.S. sanctions, normalizing diplomatic relations and potentially, providing some form of security guarantee.

- June 17, 1999: North Korean preparations for a test of the new Taepo Dong-2 missile are reported by Japan’s NHK public television citing unidentified U.S. military sources. On June 30, U.S. Deputy Assistant Defense Secretary Kurt Campbell confirms that North Korea has begun preparations for a launch. Campbell warns that any further missile testing would have “very real consequences for U.S. foreign policy toward North Korea.”

- July 8, 1999: Japan’s ambassador to the United States, Saito Kunihiko warns Tokyo would withhold its $1 billion commitment to the Agreed Framework if North Korea conducts another missile test, the Washington Times reported.

- July 27, 1999: Secretary of State Madeleine Albright, South Korean Foreign Minister Hong Soon-Young, and Japanese Foreign Minister Komura Masahiko meet in Singapore to coordinate their policies and warn Pyongyang that any potential missile test “would have serious negative consequences” for North Korea.

- September 7-12, 1999: During general talks in Berlin, North Korea agrees to a moratorium on testing any long-range missiles for the duration of high-level talks with the United States. The United States agrees to a partial lifting of economic sanctions in North Korea. The two parties agree to continue high-level discussions. (Sanctions are not actually lifted until June 2000.)

- September 9, 1999: A U.S. National Intelligence Estimate reports that North Korea will “most likely” develop an ICBM capable of delivering a 200-kilogram warhead to the U.S. mainland by 2015.

- September 15, 1999: North Korean policy coordinator William Perry submits his review of U.S. policy toward North Korea to Congress and releases an unclassified version of the report on

- October 12, The report recommends “a new, comprehensive and integrated approach to…negotiations with the DPRK,” which would involve a coordinated reduction in isolation by the United States and its allies in a “step-by-step and reciprocal fashion.” Potential engagement mechanisms would include the normalization of diplomatic relations and the relaxation of trade sanctions.

- December 15, 1999: Five years after the Agreed Framework was signed, KEDO officials sign a turn-key contract with the Korea Electric Power Corporation (KEPCO) to begin construction on the two light-water reactors in Kumho, North Korea. KEDO officials attribute the delay in reaching the turn-key contract to complex legal and financial challenges and the tense political climate generated by the North Korean Taepo-Dong I test in August 1998.

- April 14, 2000: The United States announces sanctions on a North Korean firm, Changgwang Sinyong Corporation, for proliferating Category I items as defined by the MTCR, possibly to Iran. Category I items include complete missile systems with ranges exceeding 300 kilometers and payloads over 500 kilograms, major subsystems, rocket stages or guidance systems, production facilities for MTCR-class missiles, or technology associated with such missiles.
June 14, 2000: Following a historic summit, North and South Korea sign a joint declaration stating they have “agreed to resolve” the question of reunification of the Korean Peninsula. The agreement includes promises to reunite families divided by the Korean War and other economic and cultural exchanges. No commitments are made regarding nuclear weapons or missile programs or military deployments in the Demilitarized Zone.

June 19, 2000: Encouraged by the North-South agreement, the United States relaxes sanctions on North Korea, allowing a “wide range” of trade in commercial and consumer goods, easing restrictions on investment, and eliminating prohibitions on direct personal and commercial financial transactions. Sanctions related to terrorism and missile proliferation remain in place. In response, North Korea reaffirms its moratorium on missile tests.

July 12, 2000: The fifth round of U.S.-North Korean missile talks ends without resolution in Kuala Lumpur. North Korea refuses to halt production of long-range missiles, citing self-defense in the face of “thousands” of U.S. nuclear warheads. However, North Korea does offer to stop missile production in exchange for $1 billion per year. The United States rejects the proposition.

July 19, 2000: During a meeting with Russian President Vladimir Putin, North Korean leader Kim Jong-Il reportedly promises to end his country’s missile program in exchange for assistance with satellite launches from those countries that have expressed concern about North Korea’s missile program.

July 28, 2000: At the ASEAN Regional Forum in Bangkok, Thailand, Secretary of State Madeleine Albright engages in a “substantively modest” meeting with North Korea Foreign Minister Paek Nam Sun, the highest level of exchange to date. Paek gives no additional details about North Korea’s purported offer to end its missile program for space research assistance.

August 13, 2000: Kim Jong-Il tells a meeting of 46 South Korean media executives in Pyongyang that his missile proposal was meant “in humor, while talking about science and state-of-the-art technologies,” according to the Korea Times. The report of the event is widely interpreted as undercutting the seriousness of Kim’s offer; however, English-language excerpts of Kim’s speech seem to confirm the offer of a deal: “I told…Putin that we would stop developing rockets when the United States comes forward and launches our satellites.”

August 28, 2000: U.S. Ambassador Wendy Sherman travels to Moscow to confirm the details of Kim Jong-Il’s apparent missile proposal with her Russian counterparts. The State Department reiterates that it is taking the North Korean offer “seriously.”

September 27, 2000: U.S.-North Korean talks resume in New York on nuclear issues, missiles, and terrorism. The two countries issue a joint statement on terrorism, a move that indicates progress toward removing North Korea from the State Department’s terrorism list.

October 9-12, 2000: Kim Jong-Il’s second-in-command, Vice Marshal Jo Myong Rok, visits Washington as his special envoy, to deliver a letter to President Clinton and to meet with the secretaries of State and Defense. The move is seen as an affirmation of Kim Jong-Il’s commitment to improving U.S.-North Korean ties.

October 12, 2000: The United States and North Korea issue a joint statement noting that resolution of the missile issue would “make an essential contribution to fundamentally improved relations” and reiterating the two countries’ commitment to implementation of the Agreed Framework. The statement also says that Secretary Albright will visit the North in the near future to prepare for a possible visit by President Clinton.

October 18, 2000: Albright announces that she will travel to North Korea to meet with senior North Korean officials, including Kim Jong-Il.
• January 31, 2000: The US State Department announces that North Korea has agreed to send a high-level delegation to the US in March to discuss limits on long-range missile tests and its nuclear programs. The announcement comes after seven days of meetings between US and North Korean officials in Berlin.\textsuperscript{106}

• June 2000: The leaders of North and South Korea meet and discuss a rapprochement and eventual reunification.

• June 2000: The US removes many trade sanctions. North Korea agrees to extend its suspension of long-range missile testing.

This chronology shows that North Korea has been highly unpredictable in the past and that it may well continue with covert or overt long-range missile, and weapons of mass destruction, programs in the future.

At the same time, there has been limited progress on missile issues with North Korea. A Joint Comunique issued October 12 noted in writing by the two sides that, “resolution of the missile would make an essential contribution to a fundamentally improved relationship between them and to peace and security in the Asia-Pacific region. To further the efforts to build new relations, the D.P.R.K. informed the U.S. that it will not launch long-range missiles of any kind while talks on the missile issue continue.”\textsuperscript{107} In addition, the US Secretary of State visited P’yongyang on October 23-24, and discussed on missile issues with Chairman Kim Jong-Ill. The US and North Korean officials resumed missile talks in Kuala Lumpur on November 1-3, and it has been noted that “the delegation further clarified their respective position on the full range of missile issues and continued to expand areas of common ground, although significant issues remain to be explored and resolved.”\textsuperscript{108}

**North Korea and Strategic Warning**

It also helps explain why the National Intelligence Council report uses North Korea as a case study for illustrating how difficult it is to give accurate strategic warning of new missile threats to the US homeland:

“In our 1998 annual report, we stated we had high confidence that we could provide warning five years before deployment that a potentially hostile country was trying to develop and deploy an ICBM. Because countries of concern could threaten to use ballistic missiles following limited flight-testing and before a missile is deployed in the traditional sense, we broadened our warning in the 1998 update memorandum to encompass the first successful flight test as the beginning of an "initial threat availability."
“Our ability to provide warning for a particular country is depends highly on our collection capabilities. For some countries, we have relatively large bodies of evidence on which to base our assessments; for others, our knowledge of the programs being pursued is limited. Our monitoring and warning about North Korea’s efforts to achieve an ICBM capability constitute an important case study on warning. In 1994, we were able to give five years warning of North Korea’s efforts to acquire an ICBM capability. At that time, the Intelligence Community judged that:

- The Taepo Dong-1 was a two-stage, medium-range missile that could be tested in 1994 and deployed as early as 1996.
- The Taepo Dong-2 was a larger two-stage missile that would provide P’yongyang and other countries the potential to deliver nuclear weapons to parts of the United States, and biological and chemical weapons further. The Community judged that the Taepo Dong-2 flight test program would begin within a few years of 1994 with initial deployment in 2000 or later.

Thus, the Intelligence Community warned that North Korea was pursuing an ICBM capability and would flight test an ICBM (the Taepo Dong-2) in the mid- to late 1990s. When North Korea did not flight test either Taepo Dong missile until 1998, and then used the Taepo Dong-1 as a space launch vehicle, it became clear that the Intelligence Community had:

- Overestimated that North Korea would begin flight testing the Taepo Dong-1 and Taepo Dong-2 missiles years earlier than turned out to be the case.
- Projected correctly the timing of a North Korean missile with the potential to deliver payloads to the ICBM range of 5,500-km.
- Underestimated the capabilities of the Taepo Dong-1 by failing to anticipate the use of the third stage.”

North Korea demonstrated intercontinental-range booster capabilities roughly on the timetable projected in 1994, but with a completely unanticipated vehicle configuration. The Intelligence Community had expected North Korea to achieve an ICBM-range capability initially with the two-stage Taepo Dong-2, not the Taepo Dong-1 with an unguided third stage. North Korea’s use of the Taepo Dong-1 with a third stage as a space launch vehicle was completely unexpected. Until the flight test, the Intelligence Community was unaware of the third stage and the intended use of the Taepo Dong-1 as a space launch vehicle.”

**North Korea and SLV Development**

It is worth noting in this regard, that the NIC also warns that the growing spread of space launch-vehicle (SLV) technology is making it progressively harder to distinguish between peaceful and military acquisition of the technologies and production capabilities needed to deploy a missile threat against the US. Once again, North Korea is a key case in point.\(^{109}\)

“We detecting or suspecting a missile development program and projecting the timing of the emerging threat, although difficult, are easier than forecasting the vehicle's configuration or performance with accuracy. Thus, we have more confidence in our ability to warn of efforts by countries to develop ICBMs than we have in our ability to describe accurately the missile configurations that will comprise that threat, especially years prior to flight testing. Furthermore, countries practice denial and deception to hide or mask their intentions—for example, testing an ICBM as a space launch vehicle.

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We continue to judge that we may not be able to provide much warning if a country purchased an ICBM or if a country already had an SLV capability. Nevertheless, the initiation of an SLV program is an indicator of a potential ICBM program. North Korea and other countries, such as Iran and an unconstrained Iraq, could develop an SLV booster, then flight-test it as an ICBM with a reentry vehicle (RV) with little or no warning. Thus, we consider space launch vehicles, especially in the hands of countries hostile to the United States, to have significant ballistic missile potential.

We also judge that we may not be able to provide much, if any, warning of a forward-based ballistic missile or land-attack cruise missile (LACM) threat to the United States. Moreover, LACM development can draw upon dual-use technologies. We expect to see acquisition of LACMs by many countries to meet regional military requirements.

Space Launch Vehicle (SLV) Conversion. Nations with SLVs could convert them into ICBMs relatively quickly with little or no chance of detection before the first flight test. Such a conversion would include the development of a reentry vehicle (RV). A nation could try to buy an SLV with the intent to convert it into an ICBM; detection of the sale should provide a few years of warning before a flight test, although we are not confident that we could detect a covert sale. Finally, many SLVs would be cumbersome as converted military systems and could not be made readily survivable, a task that in many cases would be technologically and economically formidable.

Countries might mask their ICBM developments as SLV programs. They could test the complete booster and in most cases the guidance system, which would have to be reprogrammed to fly a ballistic missile trajectory. They could not mask a warhead reentry under the guise of a space launch. Nevertheless, they could develop RVs and maintain them untested for future use, albeit with significantly reduced confidence in their reliability.

- If the country had Russian or Chinese assistance in a covert development effort, it could have relatively high confidence that the RV would survive and function properly.

- If a country developed an untested RV without foreign assistance, its confidence would diminish, but we could not be confident it would fail. Significant amounts of information about reentry vehicles are available in open sources. A low performing RV with high flight stability would be a logical choice for developing an ICBM RV with minimal, or no, testing. The developing country could have some confidence that the system would survive reentry, although confidence in its proper delivery of the weapon would be lower without testing.”

A more recent report by the NIC also warns that,\(^{110}\)

P’yongyang continues to acquire raw materials from out-of-country entities to produce WMD and ballistic missiles. During the reporting period, North Korea obtained raw materials for its ballistic missile programs from various foreign sources, especially from firms in China. North Korea produces and is capable of using a wide variety of chemical and possibly biological agents, as well as their delivery means.

During the first half of 1999, Pyongyang sought to procure technology worldwide that could have applications in its nuclear program, but we do not know of any procurement directly linked to the nuclear weapons program. We assess that North Korea has produced enough plutonium for at least one, and possibly two, nuclear weapons. The United States and North Korea are nearing completion on the joint project of canning spent fuel from the Yongbyon complex for long-term storage and ultimate shipment out of the North in accordance with the 1994 Agreed Framework. That reactor fuel contains enough plutonium for several more weapons.
During this reporting period, P’yongyang also attempted to obtain advanced conventional weapons and related technologies such as aircraft electronics and spare parts from several countries, including Kazakhstan.

… Throughout the first half of 1999, North Korea continued to export ballistic missile-related equipment and missile components, materials and technical expertise to countries in the Middle East and Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency.

Given this background, it is impossible to dismiss the possibility that North Korea might continue to develop nuclear weapons and long-range missiles in spite of its agreements not to do so and in spite of the public “rapprochement” it seemed to initiate with South Korea in June 2000.111

The Impact of North and South Korean Rapprochement and the New Kim Jong-Il

At the same time, there has been progress. US and North Korean negotiations over North Korea’s missile program resumed after 16 months of halt in July 2000. During the four previous rounds of missile talks, which began in 1996, each time Pyongyang had offered to end missile exports if the U.S. agreed to compensate it in hard currency for lost earnings. The talks ended in a stalemate on July 12, 2000, when the United States refused to pay Pyongyang to curb its exports of missile technology. For the first time, the North Koreans priced their offer: $1 billion a year in exchange for a halt to missile technology exports, and refused to stop developing missiles for self-defense.

When the US refused to pay, North Korea refused to stop developing missiles for self-defense, claiming the US had deployed “thousands of missiles” that threatened North Korea. Jang Chang Chon, head of North Korea’s bureau on U.S. affairs, stated, “That is why the United States has no right to make such unjust claims for the freeze of our missile capabilities.” Jang also said that Pyongyang regarded its missile program as part of its right to self-defense but that, North Korea remained willing to discuss the possibility of curbing exports of missile technology if paid enough. “We clarified that we will continue our discussions on the condition that the U.S. gives compensation for our economic and political losses in case of suspension.”
Robert Einhorn, assistant secretary of state for proliferation, then stated that no breakthrough had been expected. They agreed to meet again at an undetermined time and location. “The North Koreans should not be compensated for agreeing to stop conducting activities they should not be conducting in the first place. We are not prepared to pay cash compensation.” Einhorn indicated that the North Korea would gain far more politically and economically from a better security environment and normalized relations with Washington.

Somewhat ironically, the US then asked Russian President Vladimir Putin's to pass on its concerns that Pyongyang “deal” with its missile program during Putin’s visit to North Korea in July 2000. Putin was making the first trip by a Russian or Soviet head of state to the country.

President Clinton's deputy national security adviser, Jim Steinberg, issued a statement saying that, “We welcome Russia taking an interest in issues of regional security,” he told reporters in response to a question at a briefing at the White House to discuss Clinton’s upcoming visit to Japan. We very much hope and expect that when President Putin meets with (North Korean leader) Kim Jong-II that he will reiterate the message the rest of the international community is giving which is one to welcome steps toward reconciliation between North and South and to encourage North Korea to take steps to deal particularly with its missile program.”

Putin gave reporters an interview before his visit in which he said that Russia would do everything it could to facilitate the process of normalization between the two Koreas and implied, that he might raise the issue of North Korea's missile program precisely because Russia opposed an NMD system. Putin was quoted as saying that the best way to prevent missile use in the Korean peninsula was to guarantee security for the communist north, and as welcoming Pyongyang's pledge last year not to repeat 1998 missile tests and backed stiffer control of technologies.

Putin announced on the first day of his visit to Pyongyang, that North Korean leader Kim Jong-II had promised his country would abandon its missile program if other states provide it with technology for "peaceful space research." Exactly what North Korea was not clear, but
Putin suggested that it was not just launch services that would be provided by other nations, but foreign rocket boosters that would be brought to North Korea so that it could launch satellites into space. Putin said that Kim Jong-Il had, "voiced an idea under which North Korea is even prepared to use exclusively the rocket equipment of other countries for peaceful space research if they offered it.” He stated that "North Korea is altogether prepared to use exclusively rocket equipment of other states for space research…We can minimize the threat by providing [rocket] boosters to North Korea." Putin and Kim Jong-Il also signed a joint declaration that called for "preservation and strengthening" of the ABM treaty. The Interfax news agency said Kim assured Putin that Pyongyang's rocket program is entirely peaceful.

A senior State Department official responded by stating that Putin's comment, "lends itself to at least two interpretations--one constructive and promising and the other very much the opposite…If what Putin and Kim Jung-Il agreed to would be that Russia and others provide launch capability outside North Korea…that could push a difficult and dangerous situation to a solution. If what they are talking about is Russia providing to North Korea the technology to accelerate its own rocket program, that would go very much in the other direction. That means this would exacerbate the problem instead of contributing to the solution."  

There were good reasons for this caution. It soon became clear that any comments made by Kim Jong Il offering to halt North Korea’s missile program were either recanted by Kim Jong Il or misinterpreted by Putin. According to an August 15, 2000 report, Kim Jong-Il stated that the suggestion he made to Putin that North Korea would halt its program was made “laughingly.” Kim Jong Il commented that “I told President Putin that if the US can launch a satellite for us, then we will not develop (missiles).”  He went on to say that “We were talking about such a subject laughingly, and I said [it] to President Putin as a laughing subject but President Putin didn’t say anything.” Kim Jung-Il went on to say that Putin “grabbed my words” and reported them. Whether or not Kim Jung-Il is developing a story of misinterpretation as a means of withdrawing a formerly legitimate offer has yet to be determined. This may just be another case of the erratic foreign policy of the eccentric North Korean leader.
North Korea made it clear that it would not halt any of its missile programs without compensation. On July 13, 2000, Jang Chang Chon, head of North Korea's bureau on U.S. affairs accused the US of deploying "thousands of missile" that threatened North Korea "That is why the United States has no right to make such unjust claims for the freeze of our missile capabilities." He said that North Korea’s missile program would go on, and that North Korea demanded compensation of up to $1 billion a year to permanently suspend missile technology exports. Shortly thereafter, the North Korean news agency reported that, “Today the biggest destabilizing military factor in East Asia is the development of the ‘Theater Missile Defense’ system jointly stepped up by the United States and Japan.” The KCNA also accused Japan of trying to gain military supremacy in East Asia by deploying a missile defense program. “This proves that Japan is the most unstable state in the world that sparks a new arms race.”

Is North Korea a Continuing Threat?

The fact that North Korea has suspended long range missile testing does not mean that its programs do not continue. North Korea has honored its pledge not to test-fire its missiles and even renewed that pledge early in 2000, but US experts still detect work at the launch site, as well as other types of testing. "They continue to test motors, missile engines and things like that," said a senior military officer who closely monitors North Korea. "There's nothing on their launch pads, but they're continuing to make improvements."

The US intelligence community issued a report on proliferation in August 2000, an NIE called "Foreign Responses to U.S. National Missile Defense Deployment" that saw North Korean force modernization as a serious threat. Reports on the NIE, in both the New York Times and Washington Post, indicated that Iraq, Iran and North Korea could develop ballistic missiles capable of hitting the United States by 2015. It also indicated that the threat from North Korea might be more imminent, despite a flurry of diplomatic activity by North Korea.

Although the NIE found that North Korea had abided by a pledge that it made last year not to test its long-range missiles, it had continued building a three-stage missile that could hit the United States and could deploy it "in reasonably short order." The CIA's public report on
proliferation found that North Korea procured raw materials and components for its ballistic missile program "from various foreign sources in 1999, especially through firms in China." While the CIA said it found no evidence of procurement activities directly linked to North Korea's nuclear weapons program, it did report that North Korean agents were searching worldwide for technology that could have applications for building such weapons.\textsuperscript{120}

At this point in time, there is no way to predict that North Korea \textit{will} pose such a threat, or to predict the size, timing, and effectiveness, of any forces it may deploy. There is no way that the justification for an NMD system can be built around the certainty of a North Korean threat or tailored to some clear concept of what that threat will be. There equally is no way that the need for an NMD system can be dismissed because of the lack of a valid potential threat. As Secretary Cohen noted in a speech on July 11, 2000,\textsuperscript{121}

\begin{quote}
The North Koreans have stopped testing, but they could go forward whenever they choose to do so . . . depending upon their progress that they make [in talks] with South Korea. We cannot adjust or calibrate whether or not we are going to go forward with an NMD program based upon what the North Koreans may say from time to time. We have to assess what the capability is, and then make our own determination. I think it's clear based on what they have done in the past, they could achieve a long-range capability by 2005.\textsuperscript{120}
\end{quote}

Similarly, President Clinton made the following remarks about North Korea during his speech announcing a delay in NMD deployment on September 1, 2000:

\begin{quote}
In 1994, six years after the United States first learned that North Korea had a nuclear weapons program, we negotiated the agreement that verifiably has frozen its production of plutonium for nuclear weapons. Now, in the context of the United States negotiations with the north, of the diplomatic efforts by former Defense Secretary Bill Perry and most lately the summit between the leaders of North and South Korea, North Korea has refrained from flight testing a new missile that could pose a threat to America. And we should be clear, North Korea’s capability remains a serious issue and its intentions remain unclear. But its missile testing moratorium is a good development worth pursuing.

Until there is far more evidence regarding North Korea’s long-term intentions, the US will have no way to know whether to be cautiously optimistic or cautiously pessimistic, and it certainly will not be able to rely on North Korean diplomatic rhetoric or the words of third country diplomats. The US will also not be in a position to know whether it will get firm strategic warning that North Korea is nearing the ability to deploy a nuclear-armed ICBM,
\end{quote}
although some warning seems likely in the form of a missile test program.\textsuperscript{122}
Table III. 5

North Korean Missile Programs and Developments

<table>
<thead>
<tr>
<th>Type</th>
<th>Names</th>
<th>Range (KM)</th>
<th>Warhead (Kg)</th>
<th>Stages</th>
<th>Service Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRBM</td>
<td>Hawsong 5, Scud B</td>
<td>302-340</td>
<td>1000</td>
<td>1</td>
<td>Since 1985</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRBM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hwasong 6, Scud C</td>
<td>500</td>
<td>770</td>
<td>1</td>
<td>Since 1989</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRBM</td>
<td>No Dong 1, Rodong 1,</td>
<td>1,350</td>
<td>1200</td>
<td>1</td>
<td>Since 1997</td>
</tr>
<tr>
<td></td>
<td>Scud D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MRBM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taep’o-Dong 1, No-Dong 2.</td>
<td>1,500-2,200</td>
<td>700-1,000</td>
<td>2</td>
<td>1998?</td>
</tr>
<tr>
<td></td>
<td>Rodong 2, Scud X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Some reports is similar to the Chinese DF-3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IRBM</td>
<td>Taep’o-Dong 1 Space</td>
<td>4,000</td>
<td>50-100</td>
<td>3</td>
<td>1998</td>
</tr>
<tr>
<td></td>
<td>Launch-Vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLV</td>
<td>Taep’o-Dong 1 Space</td>
<td>4,000</td>
<td>50-100</td>
<td>3</td>
<td>1998</td>
</tr>
<tr>
<td></td>
<td>Launch-Vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICBM</td>
<td>Taep’o-Dong 2, No Dong 3</td>
<td>4,000-6,000</td>
<td>700-1,000</td>
<td>2</td>
<td>2000+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICBM</td>
<td>?</td>
<td>6,000+</td>
<td>100-500</td>
<td>3</td>
<td>?</td>
</tr>
</tbody>
</table>

Iranian Force Developments

As is the case with North Korea, experts differ over the seriousness of the Iranian threat. Most experts believe that Iran continues to pursue the development of long-range missiles, and of nuclear and biological warheads. Much will depend heavily on whether President Khatami and the more moderate elements in Iran’s leadership can consolidate power and rein in Iran’s hard-line extremists, as well as on Iran’s perception of the threat the US poses once it is ready to deploy and the cost of that deployment. This creates an extremely uncertain political climate.

The Problem of Iranian “Moderation” and Intentions

On the one hand, one must be careful about either assuming that Iran’s “moderates” will win, or that “moderation” will mean that Iran will not continue to proliferate. The details of Iran’s effort to proliferate is described in detail Table III.6, and it is clear that Iran has a long history of efforts to acquire very long-range missile technology that can be used in designing ICBMs as well as efforts to acquire weapons of mass destruction. It is also clear that efforts to downplay or minimize the Iranian threat have to ignore a wide range of historical evidence that Iran has evolved a sophisticated program involving major efforts at deception and using dual-use technology.

On the other hand, one must be extremely careful about assuming that Iran’s hostility to Iraq and Israel, and concern with Pakistan, will be translated into the deployment of ICBM forces capable of delivering nuclear or biological weapons against the American homeland. Most of Iran’s most visible missile and weapons of mass destruction programs are now directed at regional threats like Iraq, and at achieving regional influence. Iran cannot ignore the fact that India and Pakistan are becoming nuclear powers with missiles that can strike at any target in the region.

Even Iran’s “moderate” leadership may have concluded, however, that proliferation is the only way to give Iran political and strategic credibility as a major power in the region and to offset US power projection capabilities and the strength of any US-Southern Gulf coalition. The
more hostile elements in the Iranian regime may also have concluded that some kind of threat to the American Homeland would give it critical leverage in limiting US freedom of action in the region. Even a neutral or non-hostile regime might conclude that the possession of strong regional strike capabilities with long-range missiles and weapons of mass destruction could hold US power projection forces, bases, and allied territory hostage in the region, and that developing a **limited** strike capability against the US would help deter any US strikes on such a regional capability.

The practical problem is that the US cannot possibly predict the character of an Iranian regime over the next 10-25 years, nor can it predict that Iranian regimes will share the risk perceptions of the US or act as “rational bargainers” from an American perspective. This means there is no way to predict what kind of threat Iran may or may not develop against the US homeland.

**Iranian Missile Developments**

What is clear from Table III.6, is that Iran is *currently* developing the missile production capabilities and technology, and weapons of mass destruction, that *could* eventually allow it to deploy a threat to the US. In September 1999, National Intelligence Council summarized this potential Iranian ballistic missile threat to the US as follows:^{123}

“Iran is the next hostile country most capable of testing an ICBM capable of delivering a weapon to the United States during the next 15 years.”^{124}

- Iran *could test* an ICBM that could deliver a several-hundred kilogram payload to many parts of the United States in the latter half of the next decade, using Russian technology and assistance.
- Iran *could pursue* a Taepo Dong-type ICBM. Most analysts believe it could test a three-stage ICBM patterned after the Taepo Dong-1 SLV or a three-stage Taepo Dong-2-type ICBM, possibly with North Korean assistance, in the next few years.
- Iran is *likely to test* an SLV by 2010 that—once developed—could be converted into an ICBM capable of delivering a several-hundred kilogram payload to the United States.
- Analysts differ on the likely timing of Iran's first flight test of an ICBM that could threaten the United States. Assessments include:
  - *likely* before 2010 and *very likely* before 2015 (noting that an SLV with ICBM capabilities will *probably*
be tested within the next few years);
—no more than an even chance by 2010 and a better than even chance by 2015;
—and less than an even chance by 2015.”

**Iranian Warheads and Penetration Aids**

The NIC also estimated that Iran, as well as other advanced proliferators, will be able to deploy warheads with some degree of penetration aids by the time it can deploy missiles capable of reaching the US. 125

“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.

• 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 (RAM), booster fragmentation, low-power jammers, chaff, and simple (balloon) decoys—to develop penetration aids and countermeasures.

• These countries could develop countermeasures based on these technologies by the time they flight test their missiles.

Foreign espionage and other collection efforts are likely to increase. China, for example, has been able to obtain significant nuclear weapons information from espionage, contact with scientists from the United States and other countries, publications and conferences, unauthorized media disclosures, and declassified US weapons information. We assess that China, Iran, and others are targeting US missile information as well.”

**US Assessments of Iranian Long-Range Missile Developments**

These conclusions regarding penetration aids are not mentioned in many unclassified studies of the missile threat to the US and the unclassified discussions of the nominal program architecture for the National Missile Defense system. They do, however, raise important questions about whether a single site with a limited number of interceptors and the current configuration can provide highly reliable coverage against the kind of Iranian threat that might develop by 2010-2020.

The US intelligence community is divided whether Iran will sustain its current programs, and actually deploy a system capable of striking the US. A number of US intelligence officials feel the NIC report was politicized by pressure from the policy level to support the NMD
program and to not disagree with the results of the Rumsfeld Commission. They feel that Iran still faces problems in its program to build the Shahab-3, which some feel is a missile with a range of only 780 miles. At least one official has been quoted on background as stating that, “There is an Iranian threat to U.S. forces in the region, not to the continental United States.”

Nevertheless, Iran announced on July 15, 2000 that it had successfully test-fired an upgraded version of its medium-range Shahab missile. An Iranian defense ministry source was quoted by state media as saying that the missile was test-fired to ensure it conforms to the latest technological standards. It was first tested in 1998. “This missile is part of our program for the defense industry and it would in no way threaten other countries.” The Iranian announcement stated that the Shahab-3 was a ballistic missile, with a range of 800 miles, and could travel at a speed of 4,320 mph with a 1-ton warhead.

US experts indicated that they estimated the missile had a range of 1,300 km (800 miles), making it capable of hitting Israel, and that the Shahab-3 was modeled mainly on North Korea's Nodong-1, but has been improved with Russian technology. Iran's Defence Minister Admiral Ali Shamkhani has said a larger missile, Shahab 4, was in production as a vehicle for launching satellites into space. US officials agree that Iran is considering developing a rocket that can put satellites in orbit, but note that the development of such a booster would give Iran significantly enhanced capabilities to develop an intercontinental ballistic missile. US Defense Department spokesman Ken Bacon stated that, “From everything we can tell, it was a successful firing. It is another sign they are determined to build longer-range weapons of mass destruction.”

Secretary of Defense William Cohen stated that, 

This does not come as a surprise...I have pointed to Iran and the testing of the Shahab-3 and what I assume will be the testing of the 4 in the future and beyond that, as one of the reasons why it is important for the United States to undertake to research, develop and potentially deploy an NMD (national missile defense) system that would provide protection against countries such as Iran posing a threat to the United States. This represents a continuation of their testing program, whether it was scheduled to coincide with the discussions in Washington is a matter only the Iranians can determine, we don't have any information pertaining to that... We accept it for what it is, we know that they will continue to test it, they will continue to develop a longer-range missile capability and that is one of the reasons why we believe it is important that the United States continue its research and testing and the development program for the NMD, precisely to deal with countries such as North Korea, Iran, Iraq and others. Anytime you have success in a
particular missile system, that gives you confidence to move forward with more tests, with greater capability...So I think there is obviously a potential to accelerate development with each successful test...we have discussed this in the past, we believe that North Korea, Iran, potentially Iraq in the future and others will develop long-range missile capability. This is what we anticipate, this confirms our anticipation, and so this is a factor that will have to be taken into account in terms of what the time frame will be when Iran will have the capability of striking U.S. territory or that of European nations....Only the president can decide whether we should go forward at this point," Cohen said. "But I think this is an issue that is not going to go away with the elections, and if there is any delay in the program, that another president will have to face it at some point because the threat will continue to expand.

Israel expressed its own concerns. Amos Yaron, director-general of the Defense Ministry, told Israel Radio that, "We are looking at this matter for the moment with some concern because in any event they have the ability. We don't believe they have any intention whatsoever to attack the state of Israel for the moment... It must be remembered that Iran developed these capabilities as a result of the lessons they had from the wars of the past, which is to say from its big war against Iraq. Iran didn't develop this missile against the state of Israel...Now the Iranians have this ability. Between the ability and the intention, there is a great distance." A senior Israeli military source did predict, however, that by 2005, Iran would, with Russian help, achieve a military nuclear capability. Israel's army chief, Lieutenant-General Shaul Mofaz, told Israel Radio that the combined development of the missile and a non-conventional capacity posed a threat not only to Israel, but also to any country within range of the missile.¹³⁰

Iran’s foreign minister Kamal Kharraz responded by stating that, “as it was announced before, the test was done to boost the country's defensive capability and as a deterring force. It looks like America and Israel are using Iran's efforts to boost its defensive capability, which are its natural and legitimate right, as a scapegoat to secure the budget to race for arms...Who says Israel has the right to be equipped with all kinds of offensive arms, including weapons of mass destruction, but other countries in the region should not even have defensive weapons? The propaganda against Iran is aimed at deflecting world concerns over the U.S. missile shield.”¹³¹

**Iran and Weapons of Mass Destruction**

The chain of evidence surrounding Iran’s overall efforts to proliferate is both uncertain and complex. It is summarized in Table III.6, and it is clear that there is substantially less evidence that Iran could have a nuclear weapon than is the case for North Korea. At the same
time, Iran does seem to be making substantial progress in deploying highly lethal biological weapons.

A CIA report in August 2000 summarized the state of proliferation in Iran as follows:

Iran remains one of the most active countries seeking to acquire WMD and ACW technology from abroad. In doing so, Tehran is attempting to develop an indigenous capability to produce various types of weapons—nuclear, chemical, and biological—and their delivery systems. During the reporting period, the evidence indicates increased reflections of Iranian efforts to acquire WMD- and ACW- related equipment, materials, and technology primarily on entities in Russia, China, North Korea and Western Europe.

For the second half of 1999, entities in Russia, North Korea, and China continued to supply the largest amount of ballistic missile-related goods, technology, and expertise to Iran. Tehran is using this assistance to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.” Such statements, made against the backdrop of sustained cooperation with Russian, North Korean, and Chinese entities, strongly suggest that Tehran intends to develop a longer-range ballistic missile capability in the near future.

For the reporting period, Tehran expanded its efforts to seek considerable dual-use biotechnical materials, equipment, and expertise from abroad—primarily from entities in Russia and Western Europe—ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.

Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the second half of 1999, Tehran continued to seek production technology, training, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure.

Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the second half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and developmental program.

Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1998 and January 1999 imposed
administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were penalized in 1998) remain in effect, although sanctions against two entities—Polyus and Inor—are being lifted.

China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

Iran claims that it is attempting to establish a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite international efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

On the ACW side, Iran (which has acknowledged a need for Western military equipment and spare parts) continues to acquire Western equipment, such as attack helicopters, but also is developing indigenous production capabilities with assistance from countries such as Russia, China, and North Korea. Indigenous efforts involve such systems as tanks, TOW missiles, fighter aircraft, Chinese-designed SAMs and anti-ship missiles, and attack helicopters.

...Russian entities (have) continued to supply a variety of ballistic missile-related goods and technical know-how to countries such as Iran, India, and Libya. Iran’s earlier success in gaining technology and materials from Russian entities accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the second six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to develop new ballistic missile systems.

During the second half of 1999, Russia also remained a key supplier for civilian nuclear programs in Iran, primarily focused on the Bushehr Nuclear Power Plant project. With respect to Iran’s nuclear infrastructure, Russian assistance enhances Iran’s ability to support a nuclear weapons development effort. By its very nature, even the transfer of civilian technology may be of use in Iran’s nuclear weapons program. We remain concerned that Tehran is seeking more than a buildup of its civilian infrastructure, and the IC will be closely monitoring the relationship with Moscow for any direct assistance in support of a military program. In addition, Russia supplied India with material for its civilian nuclear program during this reporting period.

Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

Following intense and continuing engagement with the US, Russian officials took some positive steps to strengthen the legal basis of export controls. President Yel’tsin in July 1999 signed a federal export control law, which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators. Russian export enforcement and prosecution still remains weak, however. The export law is still awaiting completion of implementing decrees and its legal status is unclear. Public comments by the head of Russia’s security council indicate that Russia obtained only three convictions for export control violations involving WMD and missile technology during
Nonetheless, the Russian government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Specifically, Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.

Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

…Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya….China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

Prior to the reporting period, Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. Evidence during the current reporting period suggests Iran continues to seek such assistance from Chinese entities, but it is unclear to what extent these efforts have succeeded. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

**Iran and the Justification for NMD**

In short, it is impossible to dismiss the possibility that Iran might continue to develop nuclear weapons and long-range missiles in spite of its agreements not to do so. At the same time, there is no way to predict that Iran will definitely pose such a threat, or the size, timing, and effectiveness, of any forces it may deploy.

The justification for an NMD system can be built around the *possibility* of an Iranian threat. On the other hand, as is the case with North Korea, there is no way that the justification for an NMD system can be based on the *certainty* of an Iranian missile threat or that the US can now tailor the architecture of its NMD system to a clear concept of what that threat will be. There equally is no way that the need for an NMD system can be dismissed because of the lack of a valid potential threat.
Table III.6

Iranian Missile Threats and Proliferation

Delivery Systems

- Air delivery systems include:
  - Su-24 long-range strike fighters with range-payloads roughly equivalent to US F-111 and superior to older Soviet medium bombers.
  - F-4D/E fighter bombers with capability to carry extensive payloads to ranges of 450 miles.
  - Can modify HY-2 Silkworm missiles and SA-2 surface-to-air missiles to deliver weapons of mass destruction.
- Iran has made several indigenous-long range rockets.
  - The Iran-130, or Nazeat, since the end of the Iran-Iraq War. The full details of this system remain unclear, but it seems to use commercially available components, a solid fuel rocket, and a simple inertial guidance system to reach ranges of about 90-120 kilometers. It is 355-mm in diameter, 5.9 meters long, weighs 950 kilograms, and has a 150 kilogram warhead. It seems to have poor reliability and accuracy, and its payload only seems to be several hundred kilograms.
  - The Shahin 2. It too has a 355-mm diameter, but is only 3.87 meters long, and weighs only 580 kilograms. It evidently can be equipped with three types of warheads: A 180 kilogram high explosive warhead, another warhead using high explosive submunitions, and a warhead that uses chemical weapons.
  - Iranian Oghab (Eagle) rocket with 40+ kilometers range.
  - New SSM with 125 mile range may be in production, but could be modified FROG.
  - Large numbers of multiple rocket launchers and tube artillery for short range delivery of chemical weapons.
- Iran has shorter missile range systems:
  - In 1990, Iran bought CSS-8 surface-to-surface missiles (converted SA-2s) from China with ranges of 130-150 kilometers.
  - Has Chinese sea and land-based anti-ship cruise missiles. Iran fired 10 such missiles at Kuwait during Iran-Iraq War, hitting one US-flagged tanker.
  - The Soviet-designed Scud B (17E) guided missile currently forms the core of Iran’s ballistic missile forces.
    - Iran acquired its Scuds in response to Iraq’s invasion. It obtained a limited number from Libya and then obtained larger numbers from North Korea. It deployed these units with a special Khatam ol-Anbya force attached to the air element of the Pasdaran. Iran fired its first Scuds in March, 1985. It fired as many as 14 Scuds in 1985, 8 in 1986, 18 in 1987, and 77 in 1988. Iran fired 77 Scud missiles during a 52 day period in 1988, during what came to be known as the “war of the cities.” Sixty-one were fired at Baghdad, nine at Mosul, five at Kirkuk, one at Takrit, and one at Kuwait. Iran fired as many as five missiles on a single day, and once fired three missiles within 30 minutes. This still, however, worked out to an average of only about one missile a day, and Iran was down to only 10-20 Scuds when the war of the cities ended.
    - Iran's missile attacks were initially more effective than Iraq's attacks. This was largely a matter of geography. Many of Iraq's major cities were comparatively close to its border with Iran, but Tehran and most of Iran's major cities that had not already been targets in the war were outside the range of Iraqi Scud attacks. Iran's missiles, in contrast, could hit key Iraqi cities like Baghdad. This advantage ended when Iraq deployed extended range Scuds.
    - The Scud B is a relatively old Soviet design which first became operational in 1967, designated as the R-17E or R-300E. The Scud B has a range of 290-300 kilometers with its normal conventional payload. The export version of the missile is about 11 meters long, 85-90 centimeters in diameter, and weighs 6,300 kilograms. It has a nominal CEP of 1,000 meters. The Russian versions can be equipped with conventional high explosive, fuel air explosive, runway penetrator, submunition, chemical, and nuclear warheads.
• The export version of the Scud B comes with a conventional high explosive warhead weighing about 1,000 kilograms, of which 800 kilograms are the high explosive payload and 200 are the warhead structure and fusing system. It has a single stage storable liquid rocket engine and is usually deployed on the MAZ-543 eight wheel transporter-erector-launcher (TEL). It has a strap-down inertial guidance, using three gyros to correct its ballistic trajectory, and uses internal graphite jet vane steering. The warhead hits at a velocity above Mach 1.5.

• Most estimates indicate that Iran now has 6-12 Scud launchers and up to 200 Scud B (R-17E) missiles with 230-310 KM range.

• Some estimates give higher figures. They estimate Iran bought 200-300 Scud Bs from North Korea between 1987 and 1992, and may have continued to buy such missiles after that time. Israeli experts estimate that Iran had at least 250-300 Scud B missiles, and at least 8-15 launchers on hand in 1997.

• US experts also believe that Iran can now manufacture virtually all of the Scud B, with the possible exception of the most sophisticated components of its guidance system and rocket motors. This makes it difficult to estimate how many missiles Iran has in inventory and can acquire over time, as well as to estimate the precise performance characteristics of Iran’s missiles, since it can alter the weight of the warhead and adjust the burn time and improve the efficiency of the rocket motors.

• Iran has new long range North Korean Scuds - with ranges near 500 kilometers.

• The North Korean missile system is often referred to as a "Scud C." Typically, Iran formally denied the fact it had such systems long after the transfer of these missiles became a reality. Hassan Taherian, an Iranian foreign ministry official, stated in February, 1995, “There is no missile cooperation between Iran and North Korea whatsoever. We deny this.”

• In fact, a senior North Korean delegation traveled to Tehran to close the deal on November 29, 1990, and met with Mohsen Rezaei, the former commander of the IRGC. Iran either bought the missile then, or placed its order shortly thereafter. North Korea then exported the missile through its Lyongaksan Import Corporation. Iran imported some of these North Korean missile assemblies using its B-747s, and seems to have used ships to import others.

• Iran probably had more than 60 of the longer range North Korean missiles by 1998, although other sources report 100, and one source reports 170.

• Iran may have 5-10 Scud C launchers, each with several missiles. This total seems likely to include four new North Korean TELs received in 1995.

• Iran seems to want enough missiles and launchers to make its missile force highly dispersible.

• Iran has begun to test its new North Korean missiles. There are reports it has fired them from mobile launchers at a test site near Qom about 310 miles (500 kilometers) to a target area south of Shahroud. There are also reports that units equipped with such missiles have been deployed as part of Iranian exercises like the Saeqer-3 (Thunderbolt 3) exercise in late October, 1993.

• The missile is more advanced than the Scud B, although many aspects of its performance are unclear. North Korea seems to have completed development of the missile in 1987, after obtaining technical support from the People's Republic of China. While it is often called a “Scud C,” it seems to differ substantially in detail from the original Soviet Scud B. It seems to be based more on the Chinese-made DF-61 than on a direct copy of the Soviet weapon.

• Experts estimate that the North Korean missiles have a range of around 310 miles (500 kilometers), a warhead with a high explosive payload of 700 kilograms, and relatively good accuracy and reliability. While this payload is a bit limited for the effective delivery of chemical agents, Iran might modify the warhead to increase payload at the expense of range and restrict the use of new chemical munitions to the most lethal agents such as persistent nerve gas. It might also concentrate its development efforts on arming its Scud C forces with more lethal biological agents. In any case, such missiles are likely to have enough range-payload to give Iran the ability to strike all targets on the southern coast of the Gulf and all of the populated areas in Iraq, although not the West. Iran could also reach targets in part of eastern Syria, the eastern third of Turkey, and cover targets in the border area of the former Soviet Union, western Afghanistan, and western Pakistan.

• Accuracy and reliability remain major uncertainties, as does operational CEP. Much would also depend on the precise level of technology Iran deployed in the warhead. Neither Russia nor the People's Republic of China seem to have transferred the warhead technology for biological and chemical weapons to Iran or Iraq when they sold them the Scud B missile and CSS-8. However, North Korea may have sold Iran such technology as part of the Scud C sale. If it did so, such a technology transfer would save Iran years of development and testing in obtaining highly lethal biological
and chemical warheads. In fact, Iran would probably be able to deploy far more effective biological and chemical warheads than Iraq had at the time of the Gulf War.

- Iran may be working with Syria in such development efforts, although Middle Eastern nations rarely cooperate in such sensitive areas. Iran served as a transshipment point for North Korean missile deliveries during 1992 and 1993. Some of this transshipment took place using the same Iranian B-747s that brought missile parts to Iran. Others moved by sea. For example, a North Korean vessel called the Des Hung Ho, bringing missile parts for Syria, docked at Bandar Abbas in May, 1992. Iran then flew these parts to Syria. An Iranian ship coming from North Korea and a second North Korean ship followed, carrying missiles and machine tools for both Syria and Iran. At least 20 of the North Korean missiles have gone to Syria from Iran, and production equipment seems to have been transferred to Iran and to Syrian plants near Hama and Aleppo.

- Iran has created shelters and tunnels in its coastal areas which it could use to store Scud and other missiles in hardened sites and reduce their vulnerability to air attack.

- Iran can now assemble Scud and Scud C missiles using foreign-made components. It may soon be able to make entire missile systems and warhead packages in Iran.

- A US examination of Iran’s dispersal, sheltering, and hardening programs for its anti-ship missiles and other missile systems indicate that Iran has developed effective programs to ensure that they would survive a limited number of air strikes and that Iran had reason to believe that the limited number of preemptive strikes Israel could conduct against targets in the lower Gulf could not be effective in denying Iran the capability to deploy its missiles.

- Iran is developing an indigenous missile production capability with both solid and liquid fueled missiles.

  - The present scale of Iran’s production and assembly efforts is unclear. Iran seems to have a design center, at least two rocket and missile assembly plants, a missile test range and monitoring complex, and a wide range of smaller design and refit facilities.

  - The design center is said to be located at the Defense Technology and Science Research Center, which is a branch of Iran’s Defense Industry Organization, and located outside Karaj -- near Tehran. This center directs a number of other research efforts. Some experts believe it has support from Russian and Chinese scientists.

  - Iran’s largest missile assembly and production plant is said to be a North Korean-built facility near Isfahan, although this plant may use Chinese equipment and technology. There are no confirmations of these reports, but this region is the center of much of Iran's advanced defense industry, including plants for munitions, tank overhaul, and helicopter and fixed wing aircraft maintenance. Some reports say the local industrial complex can produce liquid fuels and missile parts from a local steel mill.

  - A second missile plant is said to be located 175 kilometers east of Tehran, near Seman. Some sources indicate this plant is Chinese-built and began rocket production as early as 1987. It is supposed to be able to build 600-1,000 Oghab rockets per year, if Iran can import key ingredients for solid fuel motors like ammonium perchlorate. The plant is also supposed to produce the Iran-130.

  - Another facility may exist near Bandar Abbas for the assembly of the Seersucker. China is said to have built this facility in 1987, and is believed to be helping the naval branch of the Guards to modify the Seersucker to extend its range to 400 kilometers. It is possible that China is also helping Iran develop solid fuel rocket motors and produce or assemble missiles like the CS-801 and CS-802. There have, however, been reports that Iran is developing extended range Scuds with the support of Russian experts, and of a missile called the Tondar 68, with a range of 700 kilometers.

  - Still other reports claim that Iran has split its manufacturing facilities into plants near Pairzan, Semen, Shiraz, Maghdad, and Islaker. These reports indicate that the companies involved in building the Scuds are also involved in Iran’s production of poison gas and include Defense Industries, Shahid, Bagheri Industrial Group, and Shahid Hemat Industrial Group.

  - Iran’s main missile test range is said to be further east, near Shahroud, along the Tehran-Mashhad railway. A telemetry station is supposed to be 350 kilometers to the south at Taba, along the Mashhad-Isfahan road. All of these facilities are reportedly under the control of the Islamic Revolutionary Guards Corps.

  - There were many reports during the late 1980s and early 1990s that Iran had ordered the North Korean No Dong missile, which was planned to have the capability to carry nuclear and biological missile ranges of up to 900 kilometers. This range would allow the missile could reach virtually any target in Gulf, Turkey, and Israel. The status of the No Dong program has since become increasingly uncertain, although North Korea deployed some developmental
The No-Dong underwent flight tests at ranges of 310 miles (500 kilometers) on May 29, 1993. Some sources indicate that Iranians were present at these tests. Extensive further propulsion tests began in August 1994, and some reports indicate operational training began for test crews in May 1995. Missile storage facilities began to be built in July 1995, and four launch sites were completed in October 1995.

The progress of the program has been slow since that time, and may reflect development problems. However, mobile launchers were seen deployed in northeast North Korea on March 24, 1997. According to some reports, a further seven launcher units were seen at a facility about 100 kilometers from Pyongyang.

The No-Dong 1 is a single-stage liquid-fueled missile, with a range of up to 1,000 to 1,300 kilometers (810 miles), although longer ranges may be possible with a reduced warhead and maximum burn. There are also indications that there may be a No-Dong 2, using the same rocket motor, but with an improved fuel supply system that allows the fuel to burn for a longer period.

The missile is about 15.2 meters long -- four meters longer than the Scud B -- and 1.2 meters in diameter. The warhead is estimated to weigh 770 kilograms (1,200-1,750 pounds) and a warhead manufacturing facility exists near Pyongyang. The No-Dong has an estimated theoretical CEP of 700 meters at maximum range, versus 900 meters for the Scud B, although its practical accuracy could be as wide as 3,000-4,000 meters. It has an estimated terminal velocity of Mach 3.5, versus 2.5 for the Scud B, which presents added problems for tactical missile defense. The missile is be transportable on a modified copy of the MAZ-543P TEL that has been lengthened with a fifth axle and which is roughly 40 meters long. The added support stand for the vertical launch modes brings the overall length to 60 meters, and some experts questioned whether a unit this big is practical.

Reports during the late 1980s and early 1990s indicated that Iran was also interested in two developmental North Korean IRBMs called the Tapeo Dong 1 and Tapeo Dong 2.

The Tapeo Dong 1 missile has an estimated maximum range of 2,000 kilometers, and the Tapeo Dong 2 may have a range up to 3,500 kilometers.

Both Tapeo Dongs are liquid fueled missiles which seem to have two stages.

Unlike the No-Dong, the Tapeo Dongs must be carried to a site in stages and then assembled at a fixed site. The No-Dong transporter may be able to carry both stages of the Tapeo Dong 1, but some experts believe that a special transporter is needed for the first stage of the Tapeo Dong 1, and for both stages of the Tapeo Dong 2.

Since the early 1990s, however, the focus of reports on Iran’s missile efforts have shifted, and it has since become clear that Iran is developing its own longer-range variants of the No Dong for indigenous production with substantial Russian and some Chinese aid:

As early as 1992, one such missile was reported to have a range of 800-930 miles and a 1,650 pound warhead. Reports differ sharply on its size. Jane’s estimates a launch weight up to 16,000 kilograms, provided the system is derived from the No Dong. It could have a launch weight of 15,000 kilograms, a payload of 600 kilograms, and a range of 1,700-1,800 kilometers if it is based on a system similar to the Chinese CSS-5 (DF-21) and CSS-N3 ((JL-1). These systems entered service in 1983 and 1987.

A longer-range missile was said to have improved guidance components, a range of up to 1,240 miles and a warhead of up to 2,200 pounds.

IOC dates were then estimated to be 1999-2001.

These developments may help explain the background to Iran’s new Shahab system:

Some US experts believe that Iran tested booster engines in 1997 capable of driving a missile ranges of 1,500 kilometers. Virtually all US experts believe that Iran is rapidly approaching the point where it will be able to manufacture missiles with much longer ranges than the Scud B.

Eitan Ben Eliyahu -- the commander of the Israeli Air Force -- reported on April 14, 1997 that Iran had tested a missile capable of reaching Israel. The background briefings to his statement implied that Russia was assisting Iran in developing two missiles -- with ranges of 620 and 780 miles. Follow-on intelligence briefings that Israel provided in September, 1997, indicated that Russia was helping Iran develop four missiles. US intelligence reports indicate that China has also been helping Iran with some aspects of these missile efforts.
• These missiles included the Shahab ("meteor") missiles, with performance similar to those previously identified with Iranian missiles adapted from North Korean designs.

• The Israeli reports indicated that the Shahab 3 was a liquid-fueled missile with a range of 810 miles (1,200-1,500 kilometers) and a payload of 1,550 pounds (700 kilometers).

• Israel claimed the Shahab might be ready for deployment as early as 1999.

• Iran tested the Shahab 3 on July, 21 1998, claiming that it was a defensive action to deal with potential threats from Israel.

• The missile flew for a distance of up to 620 miles, before it exploded about 100 seconds after launch. US intelligence sources could not confirm whether the explosion was deliberate, but indicated that the final system might have a range of 800-940 miles (a maximum of 1,240 kilometers), depending on its payload. The test confirmed the fact the missile was a liquid fueled system.

• Gen. Mohammad Bagher Qalibaf, head of the Islamic Revolutionary Guards Corps' air wing publicly reported on August 2, 1998 that the Shahab-3 is 53-foot-long ballistic missile that can travel at 4,300 mph and carry a one-ton warhead at an altitude of nearly 82,000 feet. He claimed that the weapon was guided by an Iranian-made system that gives it great accuracy: “The final test of every weapon is in a real war situation but, given its warhead and size, the Shahab-3 is a very accurate weapon.”

• Other Iranian sources reported that the missile had a range of 800 miles. President Mohammad Khatami on August 1, 1998 stated that Iran was determined to continue to strengthen its armed forces, regardless of international concerns: “Iran will not seek permission from anyone for strengthening its defense capability.”

• Martin Indyck, the US Assistant Secretary for Near East Affairs testified on July 28, that the US estimated that the system needed further refinement but might be deployed in its initial operational form between September, 1998 and March, 1999.

• Iran publicly displayed the Shahab 3 on its launcher during a parade on September 25, 1998. The missile carrier bore signs saying, “The US can do nothing” and “Israel would be wiped from the map.”

• There are some reports of a Shahab-3B missile with extended range and a larger booster.

• The resulting system seems to be close to both the No-Dong and Pakistani Ghauri or Haff-5 missile, first tested in April 1998, raising questions about Iranian-North Korean-Pakistani cooperation.

• North Korean parades exhibiting the Tapeo Dong in September 1999 exhibited a missile with rocket motor and nozzle characteristics similar to those of the Sahab 3.

• The Shahab 3 was tested in a launch from a transporter-erector-launcher (TEL) from a new air base of the Islamic Revolutionary Guards at Mashad on February 20, 2000, and successfully demonstrated the integration of the engine and missile subsystems.

• Iranian sources indicate that the missile has a inertial navigation system with a CEP of 3 kilometers, making it so inaccurate that it can only be lethal against area targets using a weapon of mass destruction.

• Jane’s Defense Weekly claimed on March 22, 2000 that US and Israeli intelligence officials felt the Shahab 3 was now ready for deployment.

• Iran announced on July 15, 2000 that it had successfully test-fired an upgraded version of its medium-range Shahab missile. An Iranian defence ministry source was quoted by state media as saying that the missile was test-fired to ensure it conforms to the latest technological standards. It was first tested in 1998. "This missile is part of our program for the defence industry and it would in no way threaten other countries.” Iran announced that the Shahab-3 is a ballistic missile, with a range of 800 miles, and could travel at a speed of 4,320 mph with a 1-ton warhead.

• Iran's Defence Minister Admiral Ali Shamkhani has said a larger missile, Shahab 4, was in production as a vehicle for launching satellites into space.133

• The the US intelligence community is divided whether Iran will sustain its current programs, and actually deploy a system capable of striking the US. US experts indicated that they estimated the missile had a range of 1,300 km (800 miles), making it capable of hitting Israel, and that the Shahab-3 was modeled
mainly on North Korea's Nodong-1, but has been improved with Russian technology.\textsuperscript{134} 

- Secretary of Defense William Cohen stated that, "This does not come as a surprise...I have pointed to Iran and the testing of the Shahab-3 and what I assume will be the testing of the 4 in the future and beyond that, as one of the reasons why it is important for the United States to undertake to research, develop and potentially deploy an NMD (national missile defense) system that would provide protection against countries such as Iran posing a threat to the United States...This represents a continuation of their testing program, whether it was scheduled to coincide with the discussions in Washington is a matter only the Iranians can determine, we don't have any information pertaining to that... We accept it for what it is, we know that they will continue to test it, they will continue to develop a longer-range missile capability and that is one of the reasons why we believe it is important that the United States continue its research and testing and the development program for the NMD, precisely to deal with countries such as North Korea, Iran, Iraq and others. Anytime you have success in a particular missile system, that gives you confidence to move forward with more tests, with greater capability...So I think there is obviously a potential to accelerate development with each successful test...we have discussed this in the past, we believe that North Korea, Iran, potentially Iraq in the future and others will develop long-range missile capability. This is what we anticipate, this confirms our anticipation, and so this is a factor that will have to be taken into account in terms of what the time frame will be when Iran will have the capability of striking U.S. territory or that of European nations...Only the president can decide whether we should go forward at this point," Cohen said. "But I think this is an issue that is not going to go away with the elections, and if there is any delay in the program, that another president will have to face it at some point because the threat will continue to expand."\textsuperscript{135} 

- Israeli expressed its own concerns. Amos Yaron, director-general of the Defence Ministry, told Israel Radio that, "We are looking at this matter for the moment with some concern because in any event they have the ability. We don't believe they have any intention whatsoever to attack the state of Israel for the moment... It must be remembered that Iran developed these capabilities as a result of the lessons they had from the wars of the past, which is to say from its big war against Iraq. Iran didn't develop this missile against the state of Israel...Now the Iranians have this ability. Between the ability and the intention, there is a great distance." A senior Israeli military source did predict, however, that by 2005, Iran would, with Russian help, achieve a military nuclear capability by 2005 with Russian help. Israel's army chief, Lieutenant-General Shaul Mofaz, told Israel Radio that the combined development of the missile and a non-conventional capacity posed a threat not only to Israel, but also to any country within range of the missile.\textsuperscript{136} 

- In spite of these developments, a number of US intelligence officials feel the NIC report was politicized by pressure from the policy level to support the NMD program, and to not disagree with the results of the Rumsfeld Commission. They feel that Iran still faces problems in in its program to build the Shahab-3, which some feel is a missile with a range of only 780 miles. At least one official has been quoted on background as stating that, "There is an Iranian threat to U.S. forces in the region, not to the continental United States." 

- US officials agree that Iran is considering developing a rocket that can put satellites in orbit, but note that that the development of such a booster would give Iran significantly enhanced capabilities to develop an intercontinental ballistic missile.\textsuperscript{137} U.S. Defence Department spokesman Ken Bacon stated that, "From everything we can tell, it was a successful firing. It is another sign they are determined to build longer-range weapons of mass destruction."\textsuperscript{138} 

- In short, it is impossible to dismiss the possibility that Iran might continue to develop nuclear weapons and long-range missiles in spite of its agreements not to do so. At the same time, there is no way to predict that Iran will definitely pose such a threat, or the size, timing, and effectiveness, of any forces it may deploy. The justification for an NMD system can be built around the possibility of an Iranian threat but – as is the case with North Korea – there is no way that the justification for an NMD system can be based on the certainty of an Iranian missile threat or that the US can now tailor the architecture of its NMD system to a clear concept of what that threat will be. There equally is no way that the need for an NMD system can be dismissed because of the lack of a valid potential threat.

- It is still unclear when Iran will be able to bring such programs to the final development stage, carry out a full range of suitable test firings, develop highly lethal warheads, and deploy actual units. Much may still depends on the level of foreign assistance.

- In September 1999, the Revolutionary Guard exhibited another missile called the Zelzal, which it stated was "now in mass...
production.” The missile was said to have taken four and one-half years to develop and to be derived from the Zelzal 2, which the IRGC had exhibited earlier. Some estimates indicate that it can carry a warhead of 500 kilograms for up to 900 kilometers. However, the missle exhibited in Tehran was a rocket on a truck-mounted launch rail that seemed more likely to have a range of 150-200 kilometers.

- Iranian Defense Minister Shamkhani has confirmed the development of a “more capable” missile called the Shahab 4. Although he later called it a space booster. He has also mentioned a Shahab 5.
  
  - Israeli and US intelligence sources have reported that Iran is developing the Shahab 4, with a range of 2,000 kilometers (1,250 miles), a payload of around 933 kilograms (2000 pounds), and a CEP of around 2400 meters. Some estimates indicate that this system could be operational in 2-5 years.
  
  - US Assistant Secretary for Near East Affairs testified on July 28, 1998, that the US estimated that the system still needed added foreign assistance to improve its motors and guidance system.
  
  - Some reports indicate that the Shahab 4 is based on the Soviet SS-4 missile. Others that there is a longer range Shahab 5, based on the SS-4 or Tapeo Dong missile. Reports saying the Shahab is based on the SS-4 say it has a range of up to 4,000 kilometers and a payload in excess of one ton.
  
  - Iran may have two other missile programs include longer-range systems, variously reported as having maximum ranges of 3,650, 4,500-5,000, 6,250, or 10,000 kilometers.
  
  - There have been reports that Iran might be using Russian technology to develop long-range missiles with ranges from 2,000 to 6,250 kilometers.
  
  - It seems clear that Iran has obtained some of the technology and design details of the Russian SS-4. The SS-4 (also known as the R-12 or “Sandal”) is an aging Russian liquid fuel design that first went into service in 1959, and which was supposedly destroyed as part of the IRBM Treaty. It is a very large missile, with technology dating back to the early 1950s, although it was evidently updated at least twice during the period between 1959 and 1980. It has a CEP of 2-4 kilometers and a maximum range 2,000 kilometers, which means it can only be lethal with a nuclear warhead or a biological weapon with near-nuclear lethality.
  
  - At the same time, the SS-4’s overall technology is relatively simple and it has a throwweight of nearly 1,400 kilograms (3,000 pounds). It is one of the few missile designs that a nation with a limited technology base could hope to manufacture or adapt, and its throwweight and range would allow Iran to use a relatively unsophisticated nuclear device or biological warhead. As a result, an updated version of the SS-4 might be a suitable design for a developing country.
  
  - Iran is reported to have carried out the test of a sea-launched ballistic missile in 1998.
  
  - Russia has been a key supplier of missile technology.
  
  - Russia agreed in 1994 that it would adhere to the terms of the Missile Technology Control Regime (MTCR) and would place suitable limits on the sale or transfer of rocket engines and technology. Nevertheless, the CIA has identified Russia as a leading source of Iranian missile technology, and the State Department has indicated that President Clinton expressed US concerns over this cooperation to President Yeltsin. This transfer is one reason the President appointed former Ambassador Frank Wisner, and then Robert Galluci, as his special representatives to try to persuade Russia to put a firm halt to aid support of the Iran.
  
  - These programs are reported to have continuing support from North Korea, and from Russian and Chinese firms and technicians. One such Chinese firm is Great Wall Industries. The Russian firms include the Russian Central Aerohydrodynamic Institute, which has provided Iran’s Shahid Hemmat Industrial Group (SHIG) with wind tunnels for missile design, equipment for manufacturing missile models, and the software for testing launch and reentry performance. They may also include Rosvoorouzhenie, a major Russian arms-export agency; NPO Trud, a rocket motor manufacturer; a leading research center called the Bauman Institute, and Polyus (Northstar), a major laser test and manufacturing equipment firm.
  
  - Some sources have indicated that Russian military industries have signed contracts with Iran to help produce liquid fueled missiles and provide specialized wind tunnels, manufacture model missiles, and develop specialized computer software. For example, these reports indicate that the Russian Central Aerohydrodynamic Institute is cooperating with Iran’s Defense Industries Organization (DIO) and the DIO’s Shahid Hemmat Industrial Group (SHIG). The Russian State Corporation for Export and Import or Armament and Military Equipment (Rosvoorouzhenie) and Infor are also reported to be involved in deals with the SHIG. These deals are also said to include specialized laser equipment,
mirrors, tungsten-coast graphite material, and maraging steel for missile development and production. They could play a major role in help Iran develop long range versions of the Scud B and C, and more accurate variations of a missile similar to the No Dong.

- The Israeli press reported in August, 1997 that Israeli had evidence that Iran was receiving Russian support. In September, 1997, Israel urged the US to step up its pressure on Iran, and leaked reported indicating that private and state-owned Russian firms had provided gyroscopes, electronic components, wind tunnels, guidance and propulsion systems, and the components needed to build such systems to Iran.

- President Yeltsin and the Russian Foreign Ministry initially categorically denied that such charges were true. Following a meeting with Vice President Gore, President Yeltsin stated on September 26, 1997 that, “We are being accused of supplying Iran with nuclear or ballistic missile technologies. There is nothing further from the truth. I again and again categorically deny such rumors.”

- Russia agreed, however, that Ambassador Wisner and Yuri Koptyev, the head of the Russian space program, should jointly examine the US intelligence and draft a report on Russian transfers to Iran. This report reached a very different conclusion from President Yeltsin and concluded that Russia had provided such aid to Iran. Further, on October 1, 1997 - roughly a week after Yeltsin issued his denial -- the Russian security service issued a statement that it had “thwarted” an Iranian attempt to have parts for liquid fuel rocket motors manufactured in Russia, disguised as gas compressors and pumps.

- Russian firms said to be helping Iran included the Russian Central Aerohydrodynamic Institute which developed a special wind tunnel; Rosvoorouzenie, a major Russian arms-export agency; Kuznetzov (formerly NPO Trud) a rocket motor manufacturer in Samara; a leading research center called the Bauman National Technical University in Moscow, involved in developing rocket propulsion systems; the Tsagi Research Institute for rocket propulsion development; and the Polyus (Northstar) Research Institute in Moscow, a major laser test and manufacturing equipment firm. Iranians were also found to be studying rocket engineering at the Baltic State University in St. Petersburg and the Bauman State University.

- Russia was also found to have sold Iran high strength steel and special foil for its long-range missile program. The Russian Scientific and Production Center Inor concluded an agreement as late as September, 1997 to sell Iran a factory to produce four special metal alloys used in long-range missiles. Inor’s director, L. P Chromova worked out a deal with A. Asgharzadeh, the director of an Iranian factory, to sell 620 kilograms of special alloy called 21HKMT, and provide Iran with the capability to thermally treat the alloy for missile bodies. Iran had previously bought 240 kilograms of the alloy. Inor was also selling alloy foils called 49K2F, CUBE2, and 50N in sheets 0.2-0.4 millimeters thick for the outer body of missiles. The alloy 21HKMT was particularly interesting because North Korea also uses it in missile designs. Inor had previously brokered deals with the Shahid Hemat Industrial Group in Iran to supply maraging steel for missile cases, composite graphite-tungsten material, laser equipment, and special mirrors used in missile tests.

- The result was a new and often tense set of conversations between the US and Russia in January, 1998. The US again sent Ambassador Frank Wisner to Moscow, Vice President Gore called Prime Minster Viktor Chernomyrdin, and Secretary of State Madeline Albright made an indirect threat that the Congress might apply sanctions. Sergi Yastrzhembskiy, a Kremlin spokesman, initially responded by denying that any transfer of technology had taken place.

- This Russian denial was too categorical to have much credibility. Russia had previously announced the arrest of an Iranian diplomat on November 14, 1997, that it caught attempting to buy missile technology. The Iranian was seeking to buy blueprints and recruit Russian scientists to go to Iran. Yuri Koptev, the head of the Russian Space Agency, explained this, however, by stating that that, “There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects...they were stopped long before they got to the point where any technology got out.”

- The end result of these talks was an agreement by Gore and Chernomyrdin to strengthen controls over transfer technology, but it was scarcely clear that it put an end to the problem. As Koptev has said, “There have been several cases where some Russian organizations, desperately struggling to make ends meet and lacking responsibility, have embarked on some ambiguous projects.” Conditions in Russia are getting worse, not better, and the desperation that drives sales has scarcely diminished.

- Prime Minister Chernomyrdin again promised to strengthen his efforts to restrict technology transfer to Iran in a meeting with Gore on March 12, 1998. The US informed Russia of 13 cases of possible Russian aid to Iran at the meeting and offered to increase the number of Russian commercial satellite launches it would license for US firms as an incentive.
• New arrests of smugglers took place on April 9, 1998. The smugglers had attempted to ship 22 tons of specialized steel to Iran via Azerbaijan, using several Russia shell corporations as a cover.

• On April 16, 1998, the State Department declared 20 Russian agencies and research facilities were ineligible to receive US aid because of their role in transferring missile technology to Iran.

• The CIA reported in June 1997 that Iran obtained major new transfers of new long-range missile technology from Russian and Chinese firms during 1996. Since that time, there have been many additional reports of technology transfer from Russia.

• The Rumsfeld Commission heard evidence that Iran had obtained engines or designs for the RD-214 rocket engine used in the SS-4 and SL-7 space launch vehicle.

• Reports on Chinese transfers of ballistic missile technology provide less detail:
  • There have been past reports that Iran placed orders for PRC-made M-9 (CSS-6/DF-15) missile (280-620 kilometers range, launch weight of 6,000 kilograms).
  • It is more likely, however, that PRC firms are giving assistance in developing indigenous missile R&D and production facilities for the production of an Iranian solid fueled missile.
  • The US offered to provide China with added missile technology if it would agree to fully implement an end of technology transfer to Iran and Pakistan during meetings in Beijing on March 25-26, 1998.

• Iran has, however, acquired much of the technology necessary build long-range cruise missile systems from China:
  • Such missiles would cost only 10% to 25% as much as ballistic missiles of similar range, and both the HY-2 Seersucker and CS-802 could be modified relatively quickly for land attacks against area targets.
  • Iran reported in December, 1995 that it had already fired a domestically built anti-ship missile called the Saeqe-4 (Thunderbolt) during exercises in the Strait of Hormuz and Gulf of Oman. Other reports indicate that China is helping Iran build copies of the Chinese CS-801/CS-802 and the Chinese FL-2 or F-7 anti-ship cruise missiles. These missiles have relatively limited range. The range of the CS-801 is 8-40 kilometers, the range of the CS-802 is 15-120 kilometers, the maximum range of the F-7 is 30 kilometers, and the maximum range of the FL-10 is 50 kilometers. Even a range of 120 kilometers would barely cover targets in the Southern Gulf from launch points on Iran's Gulf coast. These missiles also have relatively small high explosive warheads. As a result, Iran may well be seeking anti-ship capabilities, rather than platforms for delivering weapons of mass destruction.
  • A platform like the CS-802 might, however, provide enough design data to develop a scaled-up, longer-range cruise missile for other purposes, and the Gulf is a relatively small area where most urban areas and critical facilities are near the coast. Aircraft or ships could launch cruise missiles with chemical or biological warheads from outside the normal defense perimeter of the Southern Gulf states, and it is at least possible that Iran might modify anti-ship missiles with chemical weapons to attack tankers -- ships which are too large for most regular anti-ship missiles to be highly lethal.
  • Building an entire cruise missile would be more difficult. The technology for fusing CBW and cluster warheads would be within Iran's grasp. Navigation systems and jet engines, however, would still be a major potential problem. Current inertial navigation systems (INS) would introduce errors of at least several kilometers at ranges of 1,000 kilometers and would carry a severe risk of total guidance failure -- probably exceeding two-thirds of the missiles fired. A differential global positioning system (GPS) integrated with the inertial navigation system (INS) and a radar altimeter, however, might produce an accuracy of 15 meters. Some existing remotely piloted vehicles (RPVs), such as the South African Skua claim such performance. Commercial technology is becoming available for differential global positioning system (GPS) guidance with accuracies of 2 to 5 meters.
  • There are commercially available reciprocating and gas turbine engines that Iran could adapt for use in a cruise missile, although finding a reliable and efficient turbofan engine for a specific design application might be difficult. An extremely efficient engine would have to be matched to a specific airframe. It is doubtful that Iran could design and build such an engine, but there are over 20 other countries with the necessary design and manufacturing skills.
  • While airframe-engine-warhead integration and testing would present a challenge and might be beyond Iran's manufacturing skills, it is inherently easier to integrate and test a cruise missile than a long-range ballistic missile. Further, such developments would be far less detectable than developing a ballistic system if the program used coded or low altitude directional telemetry.
• Iran could bypass much of the problems inherent in developing its own cruise missile by modifying the HY-2 Seersucker for use as a land attack weapon and extending its range beyond 80 kilometers, or by modifying and improving the CS-801 (Ying Jai-1) anti-ship missile. There are reports that the Revolutionary Guards are working on such developments at a facility near Bandar Abbas.

• The CIA reported in January 1999 that entities in Russia and China continue to supply missile-related goods and technology to Iran. Tehran is using these goods and technologies to achieve its goal of becoming self-sufficient in the production of MRBMs. The July flight test of the Shahab-3 MRBM demonstrates the success Iran has achieved in realizing that goal. Iran already is producing Scud SRBMs with North Korean help and has begun production of the Shahab-3. In addition, Iran’s Defense Minister has publicly acknowledged the development of the Shahab-4 ballistic missile, with a “longer range and heavier payload than the 1,300-km Shahab-3.”

• Iran’s earlier success in gaining technology and materials from Russian companies accelerated Iranian development of the Shahab-3 MRBM, which was first flight tested in July 1998.

• The CIA report on missile proliferation in September 1999 estimated that Iran is the next hostile country most capable of testing an ICBM capable of delivering a weapon to the United States during the next 15 years.

• Iran could test an ICBM that could deliver a several-hundred kilogram payload to many parts of the United States in the latter half of the next decade, using Russian technology and assistance.

• Iran could pursue a Taepo Dong-type ICBM. Most analysts believe it could test a three-stage ICBM patterned after the Taepo Dong-1 SLV or a three-stage Taepo Dong-2-type ICBM, possibly with North Korean assistance, in the next few years.

• Iran is likely to test an SLV by 2010 that—once developed—could be converted into an ICBM capable of delivering a several-hundred kilogram payload to the United States.

• Analysts differ on the likely timing of Iran’s first flight test of an ICBM that could threaten the United States. Assessments include:
  • likely before 2010 and very likely before 2015 (noting that an SLV with ICBM capabilities will probably be tested within the next few years);
  • no more than an even chance by 2010 and a better than even chance by 2015;
  • and less than an even chance by 2015.

• The DCI Nonproliferation Center (NPC) reported in February 2000 that entities in Russia and China continued to supply a considerable amount and a wide variety of ballistic missile-related goods and technology to Iran. Tehran is using these goods and technologies to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998 and probably has achieved “emergency operational capability”—i.e., Tehran could deploy a limited number of the Shahab-3 prototype missiles in an operational mode during a perceived crisis situation. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.” It also stated that,

• Firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran.

• Russian entities continued to supply a variety of ballistic missile-related goods and technical know-how to Iran and were expanding missile-related assistance to Syria and India. For example, Iran’s earlier success in gaining technology and materials from Russian companies accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the first six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to build new indigenous ballistic missile systems. The government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Monitoring Russian proliferation behavior, therefore, will remain a
very high priority.

- Iranian Foreign Ministry spokesman Hamid Reza stated on February 3, 2000 that Iran had no intention of seeking missiles with the range to reach the US, and that the CIA was only making such charges to distract the world for Israel’s nuclear weapons program.

- A CIA report in August 2000 summarized the state of missile proliferation in Iran as follows:\footnote{139}
  
  For the second half of 1999, entities in Russia, North Korea, and China continued to supply the largest amount of ballistic missile-related goods, technology, and expertise to Iran. Tehran is using this assistance to support current production programs and to achieve its goal of becoming self-sufficient in the production of ballistic missiles. Iran already is producing Scud short-range ballistic missiles (SRBMs) and has built and publicly displayed prototypes for the Shahab-3 medium-range ballistic missile (MRBM), which had its initial flight test in July 1998. In addition, Iran’s Defense Minister last year publicly acknowledged the development of the Shahab-4, originally calling it a more capable ballistic missile than the Shahab-3, but later categorizing it as solely a space launch vehicle with no military applications. Iran’s Defense Minister also has publicly mentioned plans for a “Shahab 5.” Such statements, made against the backdrop of sustained cooperation with Russian, North Korean, and Chinese entities, strongly suggest that Tehran intends to develop a longer-range ballistic missile capability in the near future.

  - Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1998 and January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were penalized in 1998) remain in effect, although sanctions against two entities—Polyus and Inor—are being lifted.

  - On the ACW side, Iran (which has acknowledged a need for Western military equipment and spare parts) continues to acquire Western equipment, such as attack helicopters, but also is developing indigenous production capabilities with assistance from countries such as Russia, China, and North Korea. Indigenous efforts involve such systems as tanks, TOW missiles, fighter aircraft, Chinese-designed SAMs and anti-ship missiles, and attack helicopters.

  - …Russian entities (have) continued to supply a variety of ballistic missile-related goods and technical know-how to countries such as Iran, India, and Libya. Iran’s earlier success in gaining technology and materials from Russian entities accelerated Iranian development of the Shahab-3 MRBM, which was first flight-tested in July 1998. Russian entities during the second six months of 1999 have provided substantial missile-related technology, training, and expertise to Iran that almost certainly will continue to accelerate Iranian efforts to develop new ballistic missile systems.

  - Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

  - …Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya….China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

### Chemical Weapons

- Iran purchased large amounts of chemical defense gear from the mid-1980s onwards. Iran also obtained stocks of non-lethal CS gas, although it quickly found such agents had very limited military impact since they could only be used effectively in closed areas or very small open areas.

- Acquiring poisonous chemical agents was more difficult. Iran did not have any internal capacity to manufacture poisonous chemical agents when Iraq first launched its attacks with such weapons. While Iran seems to have made limited use of...
chemical mortar and artillery rounds as early as 1985 -- and possibly as early as 1984 -- these rounds were almost certainly captured from Iraq.

- Iran had to covertly import the necessary equipment and supplies, and it took several years to get substantial amounts of production equipment, and the necessary feedstocks. Iran sought aid from European firms like Lurgi to produce large “pesticide” plants, and began to try to obtain the needed feedstock from a wide range of sources, relying heavily on its Embassy in Bonn to manage the necessary deals. While Lurgi did not provide the pesticide plant Iran sought, Iran did obtain substantial support from other European firms and feedstocks from many other Western sources.

- By 1986-1987, Iran developed the capability to produce enough lethal agents to load its own weapons. The Director of the CIA, and informed observers in the Gulf, made it clear that Iran could produce blood agents like hydrogen cyanide, phosgene gas, and/or chlorine gas. Iran was also able to weaponize limited quantities of blister (sulfur mustard) and blood (cyanide) agents beginning in 1987, and had some capability to weaponize phosgene gas, and/or chlorine gas. These chemical agents were produced in small batches, and evidently under laboratory scale conditions, which enabled Iran to load small numbers of weapons before any of its new major production plants went into full operation.

- These gas agents were loaded into bombs and artillery shells, and were used sporadically against Iraq in 1987 and 1988.

- Reports regarding Iran’s production and research facilities are highly uncertain:
  - Iran seems to have completed completion of a major poison gas plant at Qazvin, about 150 kilometers west of Tehran. This plant is reported to have been completed between November, 1987 and January, 1988. While supposedly a pesticide plant, the facility’s true purpose seems to have been poison gas production using organophosphorous compounds.
  - It is impossible to trace all the sources of the major components and technology Iran used in its chemical weapons program during this period. Mujahideen sources claim Iran also set up a chemical bomb and warhead plant operated by the Zakaria Al-Razi chemical company near Mahshar in southern Iran, but it is unclear whether these reports are true.
  - Reports that Iran had chemical weapons plants at Damghan and Parchin that began operation as early as March, 1988, and may have begun to test fire Scuds with chemical warheads as early as 1988-1989, are equally uncertain.
  - Iran established at least one large research and development center under the control of the Engineering Research Centre of the Construction Crusade (Jahad e-Sazandegi), had established a significant chemical weapons production capability by mid-1989.
  - Debates took place in the Iranian parliament or Majlis in late 1988 over the safety of Pasdaran gas plants located near Iranian towns, and that Rafsanjani described chemical weapons as follows: “Chemical and biological weapons are poor man's atomic bombs and can easily be produced. We should at least consider them for our defense. Although the use of such weapons is inhuman, the war taught us that international laws are only scraps of paper.”
  - Post Iran-Iraq War estimates of Iran chemical weapons production are extremely uncertain:
    - US experts believe Iran was beginning to produce significant mustard gas and nerve gas by the time of the August, 1988 cease-fire in the Iran-Iraq War, although its use of chemical weapons remained limited and had little impact on the fighting
    - Iran’s efforts to equip plants to produce V-agent nerve gases seem to have been delayed by US, British, and German efforts to limit technology transfers to Iran, but Iran may have acquired the capability to produce persistent nerve gas during the mid 1990s.
    - Production of nerve gas weapons started no later than 1994.
    - Began to stockpile of cyanide (cyanogen chloride), phosgene, and mustard gas weapons after 1985. Recent CIA testimony indicates that production capacity may approach 1,000 tons annually.
    - Weapons include bombs and artillery. Shells include 155 mm artillery and mortar rounds. Iran also has chemical bombs and mines. It may have developmental chemical warheads for its Scuds, and may have a chemical package for its 22006 RPV (doubtful).
    - There are reports that Iran has deployed chemical weapons on some of its ships.
    - Iran has increased chemical defensive and offensive warfare training since 1993.
    - Iran is seeking to buy more advanced chemical defense equipment, and has sought to buy specialized equipment on world
market to develop indigenous capability to produce advanced feedstocks for nerve weapons.

- CIA sources indicated in late 1996, that China might have supplied Iran with up to 400 tons of chemicals for the production of nerve gas.
- One report indicated in 1996, that Iran obtained 400 metric tons of chemical for use in nerve gas weapons from China - including carbon sulfide.
- Another report indicated that China supplied Iran with roughly two tons of calcium-hypochlorate in 1996, and loaded another 40,000 barrels in January or February of 1997. Calcium-hypochlorate is used for decontamination in chemical warfare.
- Iran placed several significant orders from China that were not delivered. Razak Industries in Tehran, and Chemical and Pharmaceutical Industries in Tabriz ordered 49 metric tons of alkyl dimethylamine, a chemical used in making detergents, and 17 tons of sodium sulfide, a chemical used in making mustard gas. The orders were never delivered, but they were brokered by Iran’s International Movalled Industries Corporation (Imaco) and China’s North Chemical Industries Co. (Nocinco). Both brokers have been linked to other transactions affecting Iran’s chemical weapons program since early 1995, and Nocinco has supplied Iran with several hundred tons of carbon disulfide, a chemical uses in nerve gas.
- Another Chinese firm, only publicly identified as Q. Chen, seems to have supplied glass vessels for chemical weapons.
- The US imposed sanctions on seven Chinese firms in May, 1997, for selling precursors for nerve gas and equipment for making nerve gas -- although the US made it clear that it had, “no evidence that the Chinese government was involved.” The Chinese firms were the Nanjing Chemical Industries Group and Jiangsu Yongli Chemical Engineering and Import/Export Corporation. Cheong Yee Ltd., a Hong Kong firm, was also involved. The precursors included tiosyl chloride, dimethylamine, and ethylene chlorohydril. The equipment included special glass lined vessels, and Nanjing Chemical and Industrial Group completed construction of a production plant to manufacture such vessels in Iran in June, 1997.
- Iran sought to obtain impregnated Alumina, which is used to make phosphorous-oxychloride -- a major component of VX and GB -- from the US.
- It has obtained some equipment from Israelis. Nahum Manbar, an Israeli national living in France, was convicted in an Israeli court in May 1997 for providing Iran with $16 million worth of production equipment for mustard and nerve gas during the period from 1990 to 1995.
- CIA reported in June 1997 that Iran had obtained new chemical weapons equipment technology from China and India in 1996.
- India is assisting in the construction of a major new plant at Qazvim, near Tehran, to manufacture phosphorous pentasulfide, a major precursor for nerve gas. The plant is fronted by Meli Agrochemicals, and the program was negotiated by Dr. Mejid Tehrani Abbaspour, a chief security advisor to Rafsanjani.
- A recent report by German intelligence indicates that Iran has made major efforts to acquire the equipment necessary to produce Sarin and Tabun, using the same cover of purchasing equipment for pesticide plants that Iraq used for its Sa’ad 16 plant in the 1980s. German sources note that three Indian companies -- Tata Consulting Engineering, Transpek, and Rallis India -- have approached German pharmaceutical and engineering concerns for such equipment and technology under conditions where German intelligence was able to trace the end user to Iran.
- It submitted a statement in Farsi to the CWC secretariat in 1998, but this consisted only of questions in Farsi as to the nature of the required compliance.
- It has not provided the CWC with any data on its chemical weapons program.
- The CIA estimated in January 1999 that Iran obtained material related to chemical warfare (CW) from various sources during the first half of 1998. It already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. However, Tehran is seeking foreign equipment and expertise to create a more advanced and self-sufficient CW infrastructure.
- The CIA stated that Chinese entities sought to supply Iran with CW-related chemicals during 1997-1998 period. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program.
remain in effect.

• The DCI Nonproliferation Center (NPC) reported in February 2000 that Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the first half of 1999, Tehran continued to seek production technology, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure. It also stated that,

  • Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes.

  • Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

  • A CIA report in August 2000 summarized the state of chemical weapons proliferation in Iran as follows,140

    • Iran remains one of the most active countries seeking to acquire WMD and ACW technology from abroad. In doing so, Tehran is attempting to develop an indigenous capability to produce various types of weapons—nuclear, chemical, and biological—and their delivery systems. During the reporting period, the evidence indicates increased reflections of Iranian efforts to acquire WMD- and ACW- related equipment, materials, and technology primarily on entities in Russia, China, North Korea and Western Europe.

    • Iran, a Chemical Weapons Convention (CWC) party, already has manufactured and stockpiled chemical weapons, including blister, blood, and choking agents and the bombs and artillery shells for delivering them. During the second half of 1999, Tehran continued to seek production technology, training, expertise, and chemicals that could be used as precursor agents in its chemical warfare (CW) program from entities in Russia and China. It also acquired or attempted to acquire indirectly through intermediaries in other countries equipment and material that could be used to create a more advanced and self-sufficient CW infrastructure.

    • Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

    • Throughout the second half of 1999, North Korea continued to export significant ballistic missile-related equipment and missile components, materials, and technical expertise to countries in the Middle East, South Asia, and North Africa. P’yongyang attaches a high priority to the development and sale of ballistic missiles, equipment, and related technology. Exports of ballistic missiles and related technology are one of the North’s major sources of hard currency, which fuel continued missile development and production.

    • Prior to the reporting period, Chinese firms had supplied CW-related production equipment and technology to Iran. The US sanctions imposed in May 1997 on seven Chinese entities for knowingly and materially contributing to Iran’s CW program remain in effect. Evidence during the current reporting period suggests Iran continues to seek such assistance from Chinese entities, but it is unclear to what extent these efforts have succeeded. In June 1998, China announced that it had expanded its chemical export controls to include 10 of the 20 Australia Group chemicals not listed on the CWC schedules.

**Biological Weapons**

• Extensive laboratory and research capability.

• Weapons effort documented as early as 1982. Reports surfaced that Iran had imported suitable type cultures from Europe and was working on the production of Mycotoxins -- a relatively simple family of biological agents that require only limited laboratory facilities for small scale production.

• US intelligence sources reported in August, 1989, that Iran was trying to buy two new strains of fungus from Canada and the
Netherlands that can be used to produce Mycotoxins. German sources indicated that Iran had successfully purchased such cultures several years earlier.

- The Imam Reza Medical Center at Mashhad Medical Sciences University and the Iranian Research Organization for Science and Technology were identified as the end users for this purchasing effort, but it is likely that the true end user was an Iranian government agency specializing in biological warfare.

- Many experts believe that the Iranian biological weapons effort was placed under the control of the Islamic Revolutionary Guards Corps, which is known to have tried to purchase suitable production equipment for such weapons.

- Since the Iran-Iraq War, Iran has conducted research on more lethal active agents like Anthrax, hoof and mouth disease, and biotoxins. In addition, Iranian groups have repeatedly approached various European firms for the equipment and technology necessary to work with these diseases and toxins.

- Unclassified sources of uncertain reliability have identified a facility at Damghan as working on both biological and chemical weapons research and production, and believe that Iran may be producing biological weapons at a pesticide facility near Tehran.

- Some universities and research centers may be linked to biological weapons program.

- Reports surfaced in the spring of 1993 that Iran had succeeded in obtaining advanced biological weapons technology in Switzerland and containment equipment and technology from Germany. According to these reports, this led to serious damage to computer facilities in a Swiss biological research facility by unidentified agents. Similar reports indicated that agents had destroyed German bio-containment equipment destined for Iran.

- More credible reports by US experts indicate that Iran has begun to stockpile anthrax and Botulinum in a facility near Tabriz, can now mass manufacture such agents, and has them in an aerosol form. None of these reports, however, can be verified.

- The CIA has reported that Iran has, “sought dual-use biotech equipment from Europe and Asia, ostensibly for civilian use.” It also reported in 1996 that Iran might be ready to deploy biological weapons. Beyond this point, little unclassified information exists regarding the details of Iran's effort to "weaponize" and produce biological weapons.

- Iran may have the production technology to make dry storable and aerosol weapons. This would allow it to develop suitable missile warheads and bombs and covert devices.

- Iran may have begun active weapons production in 1996, but probably only at limited scale suitable for advanced testing and development.

- CIA testimony indicates that Iran is believed to have weaponized both live agents and toxins for artillery and bombs and may be pursuing biological warheads for its missiles. The CIA reported in 1996 that, “We believe that Iran holds some stocks of biological agents and weapons. Tehran probably has investigated both toxins and live organisms as biological warfare agents. Iran has the technical infrastructure to support a significant biological weapons program with little foreign assistance.

- CIA reported in June 1997 that Iran had obtained new dual use technology from China and India during 1996.

- Iran announced in June 1997 that it would not produce or employ chemical weapons including toxins.

- The CIA estimated in January 1999 that Iran continued to pursue purchasing dual-use biotechnical equipment from Russia and other countries, ostensibly for civilian uses. Its biological warfare (BW) program began during the Iran-Iraq war, and Iran may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials and equipment being sought and the many legitimate end uses for these items.

- Russia remains a key source of biotechnology for Iran. Russia’s world-leading expertise in biological weapons makes it an attractive target for Iranians seeking technical information and training on BW agent production processes.

- The DCI Nonproliferation Center (NPC) reported in February 2000 that Tehran continued to seek considerable dual-use biotechnical equipment from entities in Russia and Western Europe, ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.

- A CIA report in August 2000 summarized the state of biological weapons proliferation in Iran as follows,\(^{141}\)
• For the reporting period, Tehran expanded its efforts to seek considerable dual-use biotechnical materials, equipment, and expertise from abroad—primarily from entities in Russia and Western Europe—ostensibly for civilian uses. Iran began a biological warfare (BW) program during the Iran-Iraq war, and it may have some limited capability for BW deployment. Outside assistance is both important and difficult to prevent, given the dual-use nature of the materials, the equipment being sought, and the many legitimate end uses for these items.

• Russian entities remain a significant source of biotechnology and chemicals for Iran. Russia’s world-leading expertise in biological and chemical weapons would make it an attractive target for Iranians seeking technical information and training on BW and CW agent production processes. Russia (along with its sister republics in the FSU) also remains an important source of conventional weapons and spare parts for Iran, which is seeking to upgrade and replace its existing conventional weapons inventories.

**Nuclear Weapons**

• The Shah established the Atomic Energy Organization of Iran in 1974, and rapidly began to negotiate for nuclear power plants.
  • He concluded an extendible ten year nuclear fuel contract with the US in 1974, with Germany in 1976, and France in 1977.
  • In 1975, he purchased a 10% share in a Eurodif uranium enrichment plant being built at Tricastin in France that was part of a French, Belgian, Spanish, and Italian consortium. Under the agreement the Shah signed, Iran was to have full access to the enrichment technology Eurodif developed, and agreed to buy a quota of enriched uranium from the new plant.
  • He created an ambitious plan calling for a network of 23 power reactors throughout Iran that was to be operating by the mid-1990s, and sought to buy nuclear power plants from Germany and France.
  • By the time the Shah fell in January, 1979, he had six reactors under contract, and was attempting to purchase a total of 12 nuclear power plants from Germany, France, and the US. Two 1,300 megawatt German nuclear power plants at Bushehr were already 60% and 75% completed, and site preparation work had begun on the first of two 935 megawatt French plants at Darkhoun that were to be supplied by Framatome.

• The Shah also started a nuclear weapons program in the early to mid-1970s, building upon his major reactor projects, investment in URENCO, and smuggling of nuclear enrichment and weapons related technology from US and Europe.
  • 5 megawatt light-water research reactor operating in Tehran.
  • 27 kilowatt neutron-source reactor operating in Isfahan.
  • Started two massive 1300 megawatt reactor complexes.
  • The Shah attempted to covertly import controlled technology from the US.

• US experts believe that Shah began a low-level nuclear weapons research program, centered at the Amirabad Nuclear Research Center. This research effort included studies of weapons designs and plutonium recovery from spent reactor fuel.
  • It also involved a laser enrichment program which began in 1975, and led to a complex and highly illegal effort to obtain laser separation technology from the US. This latter effort, which does not seems to have had any success, continued from 1976 until the Shah's fall, and four lasers operating in the critical 16 micron band were shipped to Iran in October, 1978.
  • At the same time, Iran worked on other ways to obtain plutonium, created a secret reprocessing research effort to use enriched uranium, and set up a small nuclear weapons design team.
  • In 1976, Iran signed a secret contract to buy $700 million worth of yellow cake from South Africa, and appears to have reached an agreement to buy up to 1,000 metric tons a year. It is unclear how much of this ore South Africa shipped before it agreed to adopt IAEA export restrictions in 1984, and whether South Africa really honored such export restrictions. Some sources indicate that South Africa still made major deliveries as late as 1988-1989.
  • Iran also tried to purchase 26.2 kilograms of highly enriched uranium; the application to the US for this purchase was pending when the Shah fell
  • The Shah did eventually accept full IAEA safeguards but there value is uncertain.
• In 1984, Khomeini revived nuclear weapons program begun under Shah.
  • Received significant West German and Argentine corporate support in some aspects of nuclear technology during the Iran-Iraq War.
  • Limited transfers of centrifuge and other weapons related technology from PRC, possibly Pakistan.
  • It has a Chinese-supplied heavy-water, zero-power research reactor at Isfahan Nuclear Research Center, and two-Chinese supplied sub-critical assemblies -- a light water and graphite design.
  • It has stockpiles of uranium and mines in Yazd area. It may have had a uranium-ore concentration facility at University of Tehran, but status unclear.
  • Some experts feel that the IRGC moved experts and equipment from the Amirabad Nuclear Research Center to a new nuclear weapons research facility near Isfahan in the mid-1980s, and formed a new nuclear research center at the University of Isfahan in 1984 -- with French assistance. Unlike many Iranian facilities, the center at Isfahan was not declared to the IAEA until February 1992, when the IAEA was allowed to make a cursory inspection of six sites that various reports had claimed were the location of Iran's nuclear weapons efforts.
  • (Bushehr I & II), on the Gulf Coast just southwest of Isfahan, were partially completed at the time of the Shah’s fall. Iran attempted to revive the program and sought German and Argentine support, but the reactors were damaged by Iraqi air strikes in 1987 and 1988.
  • Iran may also have opened a new uranium ore processing plant close to its Shagand uranium mine in March, 1990, and it seems to have extended its search for uranium ore into three additional areas. Iran may have also begun to exploit stocks of yellow cake that the Shah had obtained from South Africa in the late 1970s while obtaining uranium dioxide from Argentina by purchasing it through Algeria.
  • Iran began to show a renewed interest in laser isotope separation (LIS) in the mid-1980s, and held a conference on LIS in September, 1987.
  • Iran opened a new nuclear research center in Isfahan in 1984, located about four kilometers outside the city and between the villages of Shahrida and Fulashans. This facility was built at a scale far beyond the needs of peaceful research, and Iran sought French and Pakistani help for a new research reactor for this center.
  • The Khomeini government may also have obtained several thousand pounds of uranium dioxide from Argentina by purchasing it through Algeria. Uranium dioxide is considerably more refined than yellow cake, and is easier to use in irradiating material in a reactor to produce plutonium.
  • The status of Iran’s nuclear program since the Iran-Iraq War is highly controversial, and Iran has denied the existence of such a program.
  • On February 7, 1990, the speaker of the Majlis publicly toured the Atomic Energy Organization of Iran and opened the new Jabir Ibn al Hayyan laboratory to train Iranian nuclear technicians. Reports then surfaced that Iran had at least 200 scientists and a work force of about 2,000 devoted to nuclear research
  • Iran’s Deputy President Ayatollah Mohajerani stated in October, 1991, that Iran should work with other Islamic states to create an “Islamic bomb.”
  • The Iranian government has repeatedly made proposals to create a nuclear-free zone in the Middle East. For example, President Rafsanjani was asked if Iran had a nuclear weapons program in an interview in the CBS program 60 Minutes in February 1997. He replied, “Definitely not. I hate this weapon.”
  • Other senior Iranian leaders, including President Khatami have made similar categorical denials. Iran’s new Foreign Minister, Kamal Kharrazi, stated on October 5, 1997, that, “We are certainly not developing an atomic bomb, because we do not believe in nuclear weapons... We believe in and promote the idea of the Middle East as a region free of nuclear weapons and other weapons of mass destruction. But why are we interested to develop nuclear technology? We need to diversify our energy sources. In a matter of a few decades, our oil and gas reserves would be finished and therefore, we need access to other sources of energy...Furthermore, nuclear technology has many other utilities in medicine and agriculture. The case of the United States in terms of oil reserve is not different from Iran’s The United States also has large oil resources, but at the same time they have nuclear power plants. So there is nothing wrong with having access to nuclear technology if it is for peaceful purposes...”
  • The IAEA reports that Iran has fully complied with its present requirements, and that it has found no indications of nuclear weapons effort, but IAEA only inspects Iran’s small research reactors.

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• The IAEA visits to other Iranian sites are not inspections, and do not use instruments, cameras, seals, etc. The are informal walk-throughs.

• The IAEA visited five suspect Iranian facilities in 1992 and 1993 in this manner, but did not conduct full inspections.

• Iran has not had any 93+2 inspections and its position on improved inspections is that it will not be either the first or the last to have them.

• Iranian officials have repeatedly complained that the West tolerated Iraqi use of chemical weapons and its nuclear and biological build-up during the Iran-Iraq War, and has a dual standard where it does not demand inspections of Israel or that Israel sign the NPT.

• These are reasons to assume that Iran still has a nuclear program:

  • Iran attempted to buy highly enriched fissile material from Kazakhstan. The US paid between $20 million and $30 million to buy 1,300 pounds of highly enriched uranium from the Ust-Kamenogorsk facility in Kazakhstan that Iran may have sought to acquire in 1992. A total of 120 pounds of the material -- enough for two bombs -- cannot be fully accounted for.

  • Iran has imported maraging steel, sometimes used for centrifuges, by smuggling it in through dummy fronts. Britain intercepted 110 pound (50 kilo) shipment in August, 1996. Seems to have centrifuge research program at Sharif University of Technology in Tehran. IAEA “visit” did not confirm.

  • Those aspects of Iran's program that are visible indicate that Iran has had only uncertain success. Argentina agreed to train Iranian technicians at its Jose Balaseiro Nuclear Institute, and sold Iran $5.5 million worth of uranium for its small Amirabad Nuclear Research Center reactor in May 1987. A CENA team visited Iran in late 1987 and early 1988, and seems to have discussed selling sell Iran the technology necessary to operate its reactor with 20% enriched uranium as a substitute for the highly enriched core provided by the US, and possibly uranium enrichment and plutonium reprocessing technology as well. Changes in Argentina's government, however, made it much less willing to support proliferation. The Argentine government announced in February, 1992, that it was canceling an $18 million nuclear technology sale to Iran because it had not signed a nuclear safeguards arrangement. Argentine press sources suggested, however, that Argentina was reacting to US pressure.

  • In February, 1990 a Spanish paper reported that Associated Enterprises of Spain was negotiating the completion of the two nuclear power plants at Bushehr. Another Spanish firm called ENUSA (National Uranium Enterprises) was to provide the fuel, and Kraftwerke Union (KWU) would be involved. Later reports indicated that a 10 man delegation from Iran's Ministry of Industry was in Madrid negotiating with the Director of Associated Enterprises, Adolofo Garcia Rodriguez.

  • Iran negotiated with Kraftwerke Union and CENA of Germany in the late 1980s and early 1990s. Iran attempted to import reactor parts from Siemens in Germany and Skoda in Czechoslovakia. None of these efforts solved Iran’s problems in rebuilding its reactor program, but all demonstrate the depth of its interest.

  • Iran took other measures to strengthen its nuclear program during the early 1990s. It installed a cyclotron from Ion Beam Applications in Belgium at a facility in Karzaj in 1991.

  • Iran conducted experiments in uranium enrichment and centrifuge technology at its Sharif University of Technology in Tehran. Sharif University was also linked to efforts to import cylinders of fluorine suitable for processing enriched material, and attempts to import specialized magnets that can be used for centrifuges, from Thyssen in Germany in 1991.

  • In 1992, Iran attempted to buy beryllium from a storage site in Kazakhstan that also was storing 600 kilograms of highly enriched uranium. These contacts then seem to have expanded to an attempt to try the material. In 1994, they helped lead the US to buy the enriched material and fly it out of the country.

  • It is clear from Iran’s imports that it has sought centrifuge technology ever since. Although many of Iran’s efforts have never been made public, British customs officials seized 110 pounds of maraging steel being shipped to Iran in July 1996.

  • Iran seems to have conducted research into plutonium separation and Iranians published research on uses of tritium that had applications to nuclear weapons boosting. Iran also obtained a wide range of US and other nuclear literature with applications for weapons designs. Italian inspectors seized eight steam condensers bound for Iran that could be used in a covert reactor program in 1993, and high technology ultrasound equipment suitable for reactor testing at the port of Bari in January, 1994.
Other aspects of Iran’s nuclear research effort had potential weapons applications. Iran continued to operate an Argentine-fueled five megawatt light water highly enriched uranium reactor at the University of Tehran. It is operated by a Chinese-supplied neutron source research reactor, and subcritical assemblies with 900 grams of highly enriched uranium, at its Isfahan Nuclear Research Center. This Center has experimented with a heavy water zero-power reactor, a light water sub-critical reactor, and a graphite sub-critical reactor. In addition, it may have experimented with some aspects of nuclear weapons design.

The German Ministry of Economics has circulated a wide list of such Iranian fronts which are known to have imported or attempted to import controlled items. These fronts include the:

- Bonyad e-Mostazafan;
- Defense Industries Organization (Sazemane Sanaye Defa);
- Pars Garma Company, the Sadadja Industrial Group (Sadadja Sanaye Daryaee);
- Iran Telecommunications Industry (Sanaye Mokhaberet Iran);
- Shahid Hemat Industrial Group, the State Purchasing Organization, Education Research Institute (ERI);
- Iran Aircraft Manufacturing Industries (IAI);
- Iran Fair Deal Company, Iran Group of Surveyors;
- Iran Helicopter Support and Renewal Industries (IHI);
- Iran Navy Technical Supply Center;
- Iran Tehran Kohakd Daftar Nezarat, Industrial Development Group;
- Ministry of Defense (Vezerate Defa).

Iran claims it eventually needs to build enough nuclear reactors to provide 20% of its electric power. This Iranian nuclear power program presents serious problems in terms of proliferation. Although the reactors are scarcely ideal for irradiating material to produce Plutonium or cannibalizing the core, they do provide Iran with the technology base to make its own reactors, have involved other technology transfer helpful to Iran in proliferating and can be used to produce weapons if Iran rejects IAEA safeguards.

Russian has agreed to build up to four reactors, beginning with a complex at Bushehr -- with two 1,000-1,200 megawatt reactors and two 465 megawatt reactors, and provide significant nuclear technology.

- Russia has consistently claimed the light water reactor designs for Bushehr cannot be used to produce weapons grade Plutonium and are similar to the reactors the US is providing to North Korea.
- The US has claimed, however, that Victor Mikhailov, the head of Russia’s Atomic Energy Ministry, proposed the sale of a centrifuge plant in April, 1995. The US also indicated that it had persuaded Russia not to sell Iran centrifuge technology as part of the reactor deal during the summit meeting between President’s Clinton and Yeltsin in May, 1995.
- It was only after US pressure that Russia publicly stated that it never planned to sell centrifuge and advanced enrichment technology to Iran, and Iran denied that it had ever been interested in such technology. For example, the statement of Mohammed Sadegh Ayatollahi, Iran’s representative to the IAEA, stated that, “We’ve had contracts before for the Bushehr plant in which we agreed that the spent fuel would go back to the supplier. For our contract with the Russians and Chinese, it is the same.” According to some reports, Russia was to reprocess the fuel at its Mayak plant near Chelyabinsk in the Urals, and could store it at an existing facility, at Krasnoyarsk-26 in southern Siberia.
- The CIA reported in June 1997 that Iran had obtained new nuclear technology from Russia during 1996.
- A nuclear accident at plant at Rasht, six miles north of Gilan, exposed about 50 people to radiation in July, 1996.
- Russian Nuclear Energy Minister Yevgeny Adamov and Russian Deputy Prime Minister Vladimir Bulgak visited in March, 1998, and Iran and dismissed US complaints about the risk the reactors would be used to proliferate.
- Russia indicated that it would go ahead with selling two more reactors for construction at Bushehr within the next five years.
- The first 1,000 megawatt reactor at Bushehr has experienced serious construction delays. In March, 1998, Russia and
Iran agreed to turn the construction project into a turn key plant because the Iranian firms working on infrastructure had fallen well behind schedule. In February, Iran had agreed to fund improved safety systems. The reactor is reported to be on a 30-month completion cycle.

- The US persuaded the Ukraine not to sell Iran $45 million worth of turbines for its nuclear plant in early March, 1998, and to strengthen its controls on Ukrainian missile technology under the MTCR.

- The CIA reported in January 1999 that Russia remained a key supplier for civilian nuclear programs in Iran and, to a lesser extent, India. With respect to Iran's nuclear infrastructure, Russian assistance would enhance Iran's ability to support a nuclear weapons development effort. Such assistance is less likely to significantly advance India's effort, given that India's nuclear weapons program is more mature. By its very nature, even the transfer of civilian technology may be of use in the nuclear weapons programs of these countries.

- Following intense and continuing engagement with the United States, Russian officials have taken some positive steps. Russia has committed to observe certain limits on its nuclear cooperation with Iran, such as not providing militarily useful nuclear technology.

- In January 1998, the Russian Government issued a broad decree prohibiting Russian companies from exporting items known or believed to be used for developing WMD or related delivery systems, whether or not these items are on Russia's export control list. In May 1998, Russia announced a decree intended to strengthen compliance of Russian businesses with existing export controls on proliferation-related items. These actions, if enforced, could help to counter the proliferation of WMD and their delivery systems.

- However, there are signs that Russian entities have continued to engage in behavior inconsistent with these steps. Monitoring Russian proliferation behavior, therefore, will have to remain a very high priority for some time to come.

- On January 14, 2000, Russia's Minister of Defense Igor Ivanov met with Hassan Rowhani, the secretary of Iran's Supreme National Security Council, and promised that Russia would maintain defense cooperation, and that Russia, "intends to fulfill its obligations under the agreements made in 1989-1990."

- The same day, Vice Minister Ilya Klebanov met with Hassan Rowhani, and announced that Iran might order three additional Russian reactors.

- The CIA warned in January 2000 that Russia might have sold Iran heavy water and graphite technology.

- China is reported to have agreed to provide significant nuclear technology transfer and possible sale of two 300 megawatt pressurized water reactors in the early 1990s, but then to have agreed to halt nuclear assistance to Iran after pressure from the US.

- Iran signed an agreement with China's Commission on Science, Technology, and Industry for National Defense on January 21, 1991, to build a small 27-kilowatt research reactor at Iran's nuclear weapons research facility at Isfahan. On November 4, 1991, China stated that it had signed commercial cooperation agreements with Iran in 1989 and 1991, and that it would transfer an electromagnetic isotope separator (Calutron) and a smaller nuclear reactor, for "peaceful and commercial" purposes.

- The Chinese reactor and Calutron were small research-scale systems and had no direct value in producing fissile material. They did, however, give Iran more knowledge of reactor and enrichment technology, and US experts believe that China provided Iran with additional data on chemical separation, other enrichment technology, the design for facilities to convert uranium to uranium hexafluoride to make reactor fuel, and help in processing yellowcake.

- The US put intense pressure on China to halt such transfers. President Clinton and Chinese President Jiang Zemin reached an agreement at an October, 1997 summit. China strengthened this pledge in negotiations with the US in February, 1998.

- In March, 1998, the US found that the China Nuclear Energy Corporation was negotiating to sell Iran several hundred tons of anhydrous hydrogen fluoride (AHF) to Isfahan Nuclear Research Corporation in central Iran, a site where some experts believe Iran is working on the development of nuclear weapons. AHF can be used to separate plutonium, help refine yellow cake into uranium hexafluoride to produce U-235, and as a feedstock for Sarin. It is on two nuclear control lists. China agreed to halt the sale.

- Iran denied that China had halted nuclear cooperation on March 15, 1998.

- Even so, the US acting Under Secretary of State for Arms Control and International Security Affairs stated that China was keeping its pledge not to aid Iran on March 26, 1998.
The CIA reported in January 1999 that China continued to take steps to strengthen its control over nuclear exports. China promulgated new export control regulations in June 1998 that cover the sale of dual-use nuclear equipment. This follows on the heels of the September 1997 promulgation of controls covering the export of equipment and materials associated exclusively with nuclear applications. These export controls should give the Chinese Government greater accounting and control of the transfer of equipment, materials, and technology to nuclear programs in countries of concern.

China pledged in late 1997 not to engage in any new nuclear cooperation with Iran and to complete work on two remaining nuclear projects—a small research reactor and a zirconium production facility—in a relatively short period of time. During the first half of 1998, Beijing appears to have implemented this pledge. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

During the reporting period, Chinese entities provided a variety of missile-related items and assistance to several countries of proliferation concern. China also was an important supplier of ACW to Iran through the first half of 1998.

The control of fissile material in the FSU remains a major problem:

- US estimates indicate the FSU left a legacy of some 1,485 tons of nuclear material. This include 770 tons in some 27,000 weapons, including 816 strategic bombs, 5,434 missile warheads, and about 20,000 theater and tactical weapons. In addition, there were 715 tons of fissile or near-fissile material in eight countries of the FSU in over 50 sites: enough to make 35,000-40,000 bombs.

- There are large numbers of experienced FSU technicians, including those at the Russian weapons design center at Arzamas, and at nuclear production complexes at Chelyabinsk, Krasnoyarsk, and Tomsk.

- These factors led the US to conduct Operation Sapphire in 1994, where the US removed 600 kilograms of highly enriched uranium from the Ulba Metallurgy Plant in Kazakhstan at a time Iran was negotiating for the material.

- They also led to Britain and the US cooperating in Auburn Endeavor, and airlifting fissile material out of a nuclear research facility in Tbilisi, Georgia. There were 10 pounds of material at the institute, and 8.8 pounds were HEU. (It takes about 35 pounds to make a bomb.) This operation was reported in the New York Times on April 21, 1998. The British government confirmed it took place, but would not give the date.

The Jerusalem Post reported on April 9, 1998 that Iran had purchased four tactical nuclear weapons from Russian smugglers for $25 million in the early 1990s, that the weapons had been obtained from Kazakhstan in 1991, and that Argentine technicians were helping to activate the weapon.

- It quoted what it claimed was an Iranian report, dated December 26, 1991, of a meeting between Brigadier General Rahim Safavi, the Deputy Commander of the Revolutionary Guards and Reza Amrohalli, then head of the Iranian atomic energy organization.

- It also quoted a second document -- dated January 2, 1992 --- saying the Iranians were awaiting the arrival of Russian technicians to show them how to disarm the protection systems that would otherwise inactivate the weapons if anyone attempted to use them.

- The documents implied the weapons were flawed by did not indicate whether Iran had succeeded in activating them.

- The US intelligence community denied any evidence that such a transfer had taken place.

- The most detailed reports of Iran’s nuclear weapons program are the least reliable, and come from the People’s Mujahideen, a violent, anti-regime, terrorist group. Such claims are very doubtful, but the People’s Mujahideen has reported that:

- Iran’s facilities include a weapons site called Ma’allam Kelayah, near Qazvin on the Caspian. This is said to be an IRGC-run facility established in 1987, which has involved an Iranian investment of $300 million. Supposedly, the site was to house the 10 megawatt reactor Iran tried to buy from India.

- Two Soviet reactors were to be installed at a large site at Gorgan on the Caspian, under the direction of Russian physicists.

- The People's Republic of China provided uranium enrichment equipment and technicians for the site at Darkhoun, where Iran once planned to build a French reactor.

- A nuclear reactor was being constructed at Karaj; and that another nuclear weapons facility exists in the south central part of Iran, near the Iraqi border.

- The ammonia and urea plant that the British firm M. W. Kellog was building at Borujerd in Khorassan province, near the
border with Turkestan, might be adapted to produce heavy water.

- The Amir Kabar Technical University, the Atomic Energy Organization of Iran (AEOI) (also known as the Organization for Atomic Energy of Iran or AEOI), Dar Argham Ltd., the Education and Research Institute, GAM Iranian Communications, Ghoods Research Center, Iran Argham Co., Iran Electronic Industries, Iranian Research Organization, Ministry of Sepah, Research and Development Group, Sezemane Sanaye Defa, the Sharif University of Technology, Taradis Iran Computer Company, and Zakaria Al-Razi Chemical Company are all participants in the Iranian nuclear weapons effort.

- Other sources based on opposition data have listed the Atomic Energy Organization of Iran, the Laser Research Center and Ibn-e Heysam Research and Laboratory Complex, the Bonab Atomic Energy Research Center (East Azerbaijan), the Imam Hussein University of the Revolutionary Guards, the Jabit bin al-Hayyan Laboratory, the Khoshmoun uranium mine (Yazd), a possible site at Moallem Kalayeh, the Nuclear Research Center at Tehran University, the Nuclear Research Center for Agriculture and Medicine (Karaj), the Nuclear Research Center of Technology (Isfahan), the Saghand Uranium mine (Yazd), the Sharif University (Tehran) and its Physics Research Center.

- The CIA estimated in January 1999 that Iran remains one of the most active countries seeking to acquire WMD technology and ACW. During the reporting period, Iran focused its efforts to acquire WMD-related equipment, materials, and technology primarily on two countries: Russia and China. Iran is seeking to develop an indigenous capability to produce various types of nuclear, chemical, and biological weapons and their delivery systems. It also stated that,

- Russian entities continued to market and support a variety of nuclear-related projects in Iran during the first half of 1998, ranging from the sale of laboratory equipment for nuclear research institutes to the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. These projects, along with other nuclear-related purchases, will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development.

- Russia has committed to observe certain limits on its nuclear cooperation with Iran. For example, President Yel’tsin has stated publicly that Russia will not provide militarily useful nuclear technology to Iran. Beginning in January this year, the Russian Government has taken a number of steps. For example, in May 1998, Russia announced a decree intended to strengthen compliance of Russian businesses with existing export controls on proliferation-related items.

- China continued to work on one of its two remaining projects—to supply Iran’s civil nuclear program with a zirconium production facility. This facility will be used by Iran to produce cladding for reactor fuel. As a party to the Nuclear Nonproliferation Treaty, Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products. During the US-China October 1997 Summit, China pledged not to engage in any new nuclear cooperation with Iran and to complete cooperation on two ongoing nuclear projects in a relatively short time. This pledge appears to be holding. In addition, China promulgated new export regulations in June 1998 that cover the sale of dual-use nuclear equipment. The regulations took effect immediately and were intended to strengthen control over equipment and material that would contribute to proliferation. Promulgation of these regulations fulfills Jiang Zemin’s commitment to the United States last fall to implement such controls by the middle of 1998.

- Iran claims to desire the establishment of a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite outside efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

- The DCI Nonproliferation Center (NPC) reported in February 2000 that Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the first half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and developmental program. It also reported that:

- Russia has committed to observe certain limits on its nuclear cooperation with Iran. For example, President Yel’tsin has stated publicly that Russia will not provide militarily useful nuclear technology to Iran. Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed
in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were identified in 1998) remain in effect.

- Following intense and continuing engagement with the US, Russian officials took some positive steps to enhance oversight of Russian entities and their interaction with countries of concern. Russia has reiterated previous commitments to observe certain limits on its nuclear cooperation with Iran, such as not providing militarily useful nuclear technology, although as indicated above—Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. President Yeltsin in July 1999 signed a federal export control law, which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators.

- China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

- Iran is attempting to establish a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite international efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

- The Washington Times reported on June 30, 2000, that a June 8th U.S. intelligence report by the National Security Agency, had stated that stated that Russia is sending tritium gas to a nuclear weapons research center in Tehran.

- The Iranian Ministry of Defense stated on January 18, 2000 that, “The Islamic Republic of Iran, which has taken the initiative to launch a dialogue of civilizations does not need to resort to nuclear weapons...or violence.”

- On May 17, 2000, Gholamreza Aghazadeh, the head of Iran’s Atomic Energy Organization told the visiting Director General of the IAEA, Mohammed ElBaradei, that Iran was seeking IAEA help in running a nuclear research center west of Teheran studying nuclear applications in medicine and agriculture. He again stated that Iran opposed the use of nuclear technology in weapons, and claimed that Iran’s nuclear power program had suffered because of US efforts to block technology transfer.

- A CIA report in August 2000 summarized the state of nuclear weapons proliferation in Iran as follows, \(^{142}\)

  - Iran remains one of the most active countries seeking to acquire WMD and ACW technology from abroad. In doing so, Tehran is attempting to develop an indigenous capability to produce various types of weapons—nuclear, chemical, and biological—and their delivery systems. During the reporting period, the evidence indicates increased reflections of Iranian efforts to acquire WMD- and ACW-related equipment, materials, and technology primarily on entities in Russia, China, North Korea and Western Europe.

  - Iran sought nuclear-related equipment, material, and technical expertise from a variety of sources, especially in Russia, during the second half of 1999. Work continues on the construction of a 1,000-megawatt nuclear power reactor in Bushehr, Iran, that will be subject to International Atomic Energy Agency (IAEA) safeguards. In addition, Russian entities continued to interact with Iranian research centers on various activities. These projects will help Iran augment its nuclear technology infrastructure, which in turn would be useful in supporting nuclear weapons research and development. The expertise and technology gained, along with the commercial channels and contacts established—even from cooperation that appears strictly civilian in nature—could be used to advance Iran’s nuclear weapons research and development program.

  - Beginning in January 1998, the Russian Government took a number of steps to increase its oversight of entities involved in dealings with Iran and other states of proliferation concern. In 1999, it pushed a new export control law through the Duma. Russian firms, however, faced economic pressures to circumvent these controls and did so in some cases. The Russian Government, moreover, failed in some cases regarding Iran to enforce its export controls. Following repeated warnings, the US Government in January 1998 and January 1999 imposed administrative measures against Russian entities that had engaged in nuclear- and missile-related cooperation with Iran. The measures imposed on these and other Russian entities (which were penalized in 1998) remain in effect, although sanctions against two entities—Polyus and Inor—are being lifted.

  - China pledged in October 1997 not to engage in any new nuclear cooperation with Iran but said it would complete cooperation on two ongoing nuclear projects, a small research reactor and a zirconium production facility at Esfahan.
that Iran will use to produce cladding for reactor fuel. The pledge appears to be holding. As a party to the Nuclear Nonproliferation Treaty (NPT), Iran is required to apply IAEA safeguards to nuclear fuel, but safeguards are not required for the zirconium plant or its products.

- Iran claims that it is attempting to establish a complete nuclear fuel cycle for its civilian energy program. In that guise, it seeks to obtain whole facilities, such as a uranium conversion facility, that, in fact, could be used in any number of ways in support of efforts to produce fissile material needed for a nuclear weapon. Despite international efforts to curtail the flow of critical technologies and equipment, Tehran continues to seek fissile material and technology for weapons development and has set up an elaborate system of military and civilian organizations to support its effort.

- During the second half of 1999, Russia also remained a key supplier for civilian nuclear programs in Iran, primarily focused on the Bushehr Nuclear Power Plant project. With respect to Iran’s nuclear infrastructure, Russian assistance enhances Iran’s ability to support a nuclear weapons development effort. By its very nature, even the transfer of civilian technology may be of use in Iran’s nuclear weapons program. We remain concerned that Tehran is seeking more than a buildup of its civilian infrastructure, and the IC will be closely monitoring the relationship with Moscow for any direct assistance in support of a military program. In addition, Russia supplied India with material for its civilian nuclear program during this reporting period.

- Following intense and continuing engagement with the US, Russian officials took some positive steps to strengthen the legal basis of export controls. President Yel’tsin in July 1999 signed a federal export control law, which formally makes WMD-related transfers a violation of law and codifies several existing decrees—including catch-all controls—yet may lessen punishment for violators. Russian export enforcement and prosecution still remains weak, however. The export law is still awaiting completion of implementing decrees and its legal status is unclear. Public comments by the head of Russia’s security council indicate that Russia obtained only three convictions for export control violations involving WMD and missile technology during 1998-99.

- Nonetheless, the Russian government’s commitment, willingness, and ability to curb proliferation-related transfers remain uncertain. Moreover, economic conditions in Russia continued to deteriorate, putting more pressure on Russian entities to circumvent export controls. Despite some examples of restraint, Russian businesses continue to be major suppliers of WMD equipment, materials, and technology to Iran. Specifically, Russia continues to provide Iran with nuclear technology that could be applied to Iran’s weapons program. Monitoring Russian proliferation behavior, therefore, will remain a very high priority.

- …Chinese missile-related technical assistance to Pakistan increased during this reporting period. In addition, firms in China provided missile-related items, raw materials, and/or assistance to several countries of proliferation concern—such as Iran, North Korea, and Libya…China’s 1997 pledge not to engage in any new nuclear cooperation with Iran has apparently held, but work associated with two remaining nuclear projects—a small research reactor and a zirconium production facility—continues. The Intelligence Community will continue to monitor carefully Chinese nuclear cooperation with Iran.

- US estimates of Iran’s progress in acquiring nuclear weapons have changed over time.

  - In 1992, the CIA estimated that Iran would have the bomb by the year 2000. In 1995, John Holum testified that Iran could have the bomb by 2003.

  - In 1997, after two years in which Iran might have made progress, he testified that Iran could have the bomb by 2005-2007.

  - In 1999, the NIE on proliferation estimated that Iran could test a missile that could reach the US by 2010, but did not change the 1997 estimate or when Iran might acquire a bomb.

  - In early 2000, the New York Time reported that the CIA had warned that Iran might now be able to make a nuclear weapon. The assessment stated that the CIA could not monitor Iran closely enough to be certain whether Iran had acquired fissile material from an outside source.

  - US experts increasingly refer to Iran’s efforts as “creeping proliferation” and there is no way to tell when or if Iranian current efforts will produce a weapon, and unclassified lists of potential facilities have little credibility.

  - Timing of weapons acquisition depends heavily on whether Iran can buy fissile material -- if so it has the design capability and can produce weapons in 1-2 years -- or must develop the capability to process Plutonium or enrich Uranium -- in which case, it is likely to be 5-10 years.
Missile Defenses

- Seeking Russian S-300 or S-400 surface-to-air missile system with limited anti tactical ballistic missile capability.
**Iraqi Force Developments**

Iraq is currently under UN sanctions that include controls on its imports and how it uses its oil revenues, the sanctions also prohibit the sale or transfer of weapons, and dual-use technology. UNSCOM dismantled much of its missile holdings and production capabilities between 1991 and 1998. In addition, many of its stocks and capabilities to produce weapons of mass destruction were dismantled during this time. The US and Britain struck hard at Iraq’s remaining missile production capabilities in Operation Desert Fox in December 1998.

Nevertheless, Table III.7 shows that Iraq retains significant capabilities to design and build long-range missiles, and biological and nuclear weapons. Although UNSCOM and the IAEA succeeded in destroying much of its capabilities, and virtually all of its fissile material production facilities, Iraq has managed to retain the capability to build missiles with ranges of 150 kilometers or less, and has exploited this situation to develop facilities which can rapidly be converted to the production of longer-range missiles.

**US Assessments of Iraqi Capabilities**

The sheer complexity and persistence of the Iraqi effort described in Table III.7 is a warning of what the current regime in Iraq may do if it can ever free itself of UN sanctions. It shows that Iraq continues to try to import dual-use components that can be used in the production of nuclear weapons, and much of its biological weapons equipment has never been found. It is also important to note that Iraq has persisted in such efforts at the cost of nearly a decade of sanctions, massive economic sacrifices, and the inability to import conventional arms. Table III.7 is a history of immense costs and immense sacrifices involving a full spectrum of massive programs – facts that are generally ignored by those who focus on the human costs of sanctions while ignoring the potential cost of not maintaining them.

The National Intelligence Council summarizes the Iraqi ballistic missile threat to the US as follows:

> Although the Gulf war and subsequent United Nations activities destroyed much of Iraq's missile infrastructure, Iraq could test an ICBM capable of reaching the United States during the next 15 years.
• After observing North Korean activities, Iraq most likely would pursue a three-stage Taepo Dong-2 approach to an ICBM (or SLV), which could deliver a several-hundred kilogram payload to parts of the United States. If Iraq could buy a Taepo Dong-2 from North Korea, it could have a launch capability within months of the purchase; if it bought Taepo Dong engines, it could test an ICBM by the middle of the next decade. Iraq probably would take until the end of the next decade to develop the system domestically.

• Although much less likely, most analysts believe that if Iraq were to begin development today, it could test a much less capable ICBM in a few years using Scud components and based on its prior SLV experience or on the Taepo Dong-1.

• If it could acquire No Dongs from North Korea, Iraq could test a more capable ICBM along the same lines within a few years of the No Dong acquisition.

• Analysts differ on the likely timing of Iraq’s first flight test of an ICBM that could threaten the United States. Assessments include unlikely before 2015; and likely before 2015, possibly before 2010—foreign assistance would affect the capability and timing.'

A CIA report in August 2000 summarized the state of proliferation in Iraq as follows.\textsuperscript{144}

Since Operation Desert Fox in December 1998, Baghdad has refused to allow United Nations inspectors into Iraq as required by Security Council Resolution 687. Although UN Security Council Resolution (UNSCR) 1284, adopted in December 1999, established a follow-on inspection regime to the United Nations Special Commission on Iraq (UNSCOM) in the form of the United Nations Monitoring, Verification, and Inspection Committee (UNMOVIC), there have been no UN inspections during this reporting period. Moreover, the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq’s WMD programs.

Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment—in principle subject to UN scrutiny—also could be diverted for WMD purposes. Since the suspension of UN inspections in December 1998, the risk of diversion has increased.

Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.

UNSCOM reported to the Security Council in December 1998 that Iraq continued to withhold information related to its CW and BW programs. For example, Baghdad seized from UNSCOM inspectors an Air Force document discovered by UNSCOM that indicated that Iraq had not consumed as many CW munitions during the Iran-Iraq War in the 1980s as had been declared by Baghdad. This discrepancy indicates that Iraq may have an additional 6,000 CW munitions hidden.

We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. We assess that since the suspension of UN inspections in December of 1998, Baghdad has had the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so. We know, however, that Iraq has continued to work on its unmanned aerial vehicle (UAV) program, which involves converting L-29 jet trainer aircraft originally acquired from Eastern Europe. These modified and refurbished L-29s are believed to be intended for delivery of chemical or biological agents.
Iraq continues to pursue development of two SRBM systems which are not prohibited by the United Nations: the liquid-propellant Al-Samoud, and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down Scud, and the program allows Baghdad to develop technological improvements that could be applied to a longer range missile program. We believe that the Al-Samoud missile, as designed, is capable of exceeding the UN-permitted 150-km-range restriction with a potential operational range of about 180 kilometers. Personnel previously involved with the Condor II/Badr-2000 missile—which was largely destroyed during the Gulf War and eliminated by UNSCOM—are working on the Ababil-100 program. If economic sanctions against Iraq were lifted, Baghdad probably would attempt to convert these efforts into longer range missile systems, regardless of continuing UN monitoring and continuing restrictions on WMD and long-range missile programs.

**Iraqi Post-Sanctions Capabilities and Iraqi Intentions**

Once again, there is no way to determine whether Iraq will actually create such capabilities to strike the US. It does seem likely, however, that if Saddam Hussein or his immediate coterie remain in power that Iraq will be an aggressive and revisionist state. This could take the form of an effort to create a missile threat to the US. Any Iraqi leadership with ambitions to seize the territory of another power in the region might conclude that Iraq would need a credible deterrent capability to strike the US in order to prevent the US from using its forces to halt Iraqi military action.

The sheer scale and complexity of the past Iraqi efforts shown in Table III.7 is a warning that Iraq is perfectly capable of acting in such a manner. At the same time, it is far from clear that a future Iraqi leadership will have the ambitions and attitudes of Saddam Hussein. Even a relatively hostile leadership might conclude that deploying ICBMs to strike the US would be so provocative that the US might preempt - as it did in striking Iraqi missile production facilities in December 1998 during operation Desert Fox. Such a regime might conclude that creating a regional capability to strike with missiles and weapons of mass destruction would hold the allies, power projection forces, and bases of the US as hostages without triggering the kind of reaction the US might make to a direct threat to its Homeland. Given the other major proliferators in the region which include India, Iran, Israel, Pakistan, and Syria, even a regime that is not actively hostile to the US might continue to develop nuclear weapons and long-range missiles in spite of its agreements not to do so.

At the same time, there is no way to predict that Iraq will pose such a threat, or the size, timing, and effectiveness, of any forces it may deploy. Iraq presents the same dilemma for NMD.
planning purposes as North Korea and Iran. There is no way that the justification for an NMD system can be built around the certainty of an Iraqi threat or tailored to some clear concept of what that threat will be. There equally is no way that the need for an NMD system can be dismissed because of the lack of a valid potential threat.
Table III.7

Iraqi Missile Threats and Proliferation

**Delivery Systems**

- Prior to the Gulf War Iraq had extensive delivery systems incorporating long-range strike aircraft with refueling capabilities and several hundred regular and improved, longer-range Scud missiles, some with chemical warheads. These systems included:
  - Tu-16 and Tu-22 bombers.
  - MiG-29 fighters.
  - Mirage F-1, MiG-23BM, and Su-22 fighter attack aircraft.
  - A Scud force with a minimum of 819 missiles.
  - Extended range Al Husayn Scud variants (600 kilometer range) extensively deployed throughout Iraq, and at three fixed sites in northern, western, and southern Iraq.
  - Developing Al-Abbas missiles (900 kilometer range), which could reach targets in Iran, the Persian Gulf, Israel, Turkey, and Cyprus.
  - Long-range super guns with ranges of up to 600 kilometers.
- Iraq also engaged in efforts aimed at developing the Tamuz liquid fueled missile with a range of over 2,000 kilometers, and a solid fueled missile with a similar range. Clear evidence indicates that at least one design was to have a nuclear warhead.
- Iraq attempted to conceal a plant making missile engines from the UN inspectors. It only admitted this plant existed in 1995, raising new questions about how many of its missiles have been destroyed.
- Iraq had design work underway for a nuclear warhead for its long-range missiles.
- The Gulf War deprived Iraq of some of its MiG-29s, Mirage F-1s, MiG-23BMs, and Su-22s.
- Since the end of the war, the UN inspection regime has also destroyed many of Iraq’s long-range missiles:
  - UNSCOM has directly supervised the destruction of 48 Scud-type missiles.
  - It has verified the Iraqi unilateral destruction of 83 more missiles and 9 mobile launchers.
- A State Department summary issued on November 16, 1998, indicates that UNSCOM has supervised the destruction of:
  - 48 operational missiles;
  - 14 conventional missile warheads;
  - six operational mobile launchers; 28 operational fixed launch pads;
  - 32 fixed launch pads;
  - 30 missile chemical warheads;
  - other missile support equipment and materials, and a variety of assembled and non-assembled supergun components.
  - 38,537 filled and empty chemical munitions;
  - 90 metric tons of chemical weapons agent;
  - more than 3,000 metric tons of precursor chemicals;
  - 426 pieces of chemical weapons production equipment; and,
  - 91 pieces of related analytical instruments.
• The entire al-Hakam biological weapons production facility and a variety of production equipment and materials.
• The UN estimates that it is able to account for 817 of the 819 long-range missiles that Iraq imported in the period ending in 1988:
  • Pre-1980 expenditures, such as training 8
  • Expenditures during the Iran-Iraq War (1980-1981), including the war of the cities in February-April 1988 516
  • Testing activities for the development of Iraq’s modifications of imported missiles and other experimental activities (1985-1990) 69
  • Expenditures during the Gulf War (January-March 1991) 93
  • Destruction under the supervision of UNSCOM 48
  • Unilateral destruction by Iraq (mid-July and October 1991 83
  • UNSCOM’s analysis has shown that Iraq had destroyed 83 of the 85 missiles it had claimed were destroyed. at the same time, it stated that Iraq had not given an adequate account of its proscribed missile assets, including launchers, warheads, and propellants.
  • UNSCOM also reports that it supervised the destruction of 10 mobile launchers, 30 chemical warheads, and 18 conventional warheads.
• Iraq maintains a significant delivery capability consisting of:
  • HY-2, SS-N-2, and C-601 cruise missiles, which are unaffected by UN cease-fire terms.
  • FROG-7 rockets with 70 kilometer ranges, also allowed under UN resolutions.
  • Multiple rocket launchers and tube artillery.
  • Experimental conversions such as the SA-2.
• Iraq claims to have manufactured only 80 missile assemblies, 53 of which were unusable. UNSCOM claims that 10 are unaccounted for.
  • US experts believe Iraq may still have components for several dozen extended-range Scud missiles.
• In addition, Iraq has admitted to:
  • Hiding its capability to manufacture its own Scuds.
  • Developing an extended range variant of the FROG-7 called the Laith. The UN claims to have tagged all existing FROG-7s to prevent any extension of their range beyond the UN imposed limit of 150 kilometers for Iraqi missiles.
  • Experimenting with cruise missile technology and ballistic missile designs with ranges up to 3,000 kilometers.
  • Flight testing Al Husayn missiles with chemical warheads in April 1990.
  • Developing biological warheads for the Al Husayn missile as part of Project 144 at Taji.
  • Initiating a research and development program for a nuclear warhead missile delivery system.
  • Successfully developing and testing a warhead separation system.
  • Indigenously developing, testing, and manufacturing advanced rocket engines to include liquid-propellant designs.
  • Conducting research into the development of Remotely Piloted Vehicles (RPVs) for the dissemination of biological agents.
  • Attempting to expand its Ababil-100 program designed to build surface-to-surface missiles with ranges beyond the permitted 100-150 kilometers.
  • Importing parts from Britain, Switzerland, and other countries for a 350 mm “super gun,” as well as starting an indigenous 600 mm supergun design effort.
• Iraq initially claimed that it had 45 missile warheads filled with chemical weapons in 1992. It then stated that it had 20 chemical and 25 biological warheads in 1995. UNSCOM established that it had a minimum of 75 operational warheads and 5 used for trials. It has evidence of the existence of additional warheads. It can only verify that 16 warheads were filled with Sarin, and 34 with chemical warfare binary components, and that 30 were destroyed under its supervision — 16 with Sarin and 14 with binary components.

• US and UN officials conclude further that:
  - Iraq is trying to rebuild its ballistic missile program using a clandestine network of front companies to obtain the necessary materials and technology from European and Russian firms.
  - This equipment is then concealed and stockpiled for assembly concomitant with the end of the UN inspection regime.
  - The equipment clandestinely sought by Iraq includes advanced missile guidance components, such as accelerometers and gyroscopes, specialty metals, special machine tools, and a high-tech, French-made, million-dollar furnace designed to fabricate engine parts for missiles.

• Recent major violations and smuggling efforts:
  - In November, 1995, Iraq was found to have concealed an SS-21 missile it had smuggled in from Yemen.
  - Jordan found that Iraq was smuggling missile components through Jordan in early December, 1995. These included 115 gyroscopes in 10 crates, and material for making chemical weapons. The shipment was worth an estimated $25 million. Iraq claimed the gyroscopes were for oil exploration but they are similar to those used in the Soviet SS-N-18 SLBM. UNSCOM also found some gyroscopes dumped in the Tigris.
  - Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.
  - The fact the agreement allows Iraq to continue producing and testing short-range missiles (less than 150 kilometers range) means it can retain significant missile development effort.
    • The SA-2 is a possible test bed, but UNSCOM has tagged all missiles and monitors all high apogee tests.
    • Iraq’s Al-Samoud and Ababil-100 programs are similar test beds. The Al-Samoud is a scaled-down Scud which Iraq seems to have tested.
    • Iraq continues to expand its missile production facility at Ibn Al Haytham, which has two new buildings large enough to make much longer-range missiles.
    • US satellite photographs reveal that Iraq has rebuilt its Al-Kindi missile research facility.

• Ekeus reported on December 18, 1996 that Iraq retained missiles, rocket launchers, fuel, and command system to “make a missile force of significance”. UNSCOM reporting as of October, 1997 is more optimistic, but notes that Iraq, “continued to conceal documents describing its missile propellants, and the material evidence relating to its claims to have destroyed its indigenous missile production capabilities indicated in might has destroyed less than a tenth of what it claimed”

• The CIA reported in January 1999 that Iraq is developing two ballistic missiles that fall within the UN-allowed 150-km range restriction. The Al Samoud liquid-propellant missile—described as a scaled-down Scud—began flight-testing in 1997. .......

• Technicians for Iraq’s pre-war Scud missiles are working on the Al Samoud program and, although under UNSCOM supervision, are developing technological improvements that could be applied to future longer-range missile programs. The Ababil-100 solid-propellant missile is also under development, although progress on this system lags the Al Samoud. After economic sanctions are lifted and UN inspections cease, Iraq could utilize expertise from these programs in the development of longer-range missile systems.

• A State Department report in September 1999 noted that:
  - Iraq has refused to credibly account for 500 tons of SCUD propellant, over 40 SCUD biological and conventional warheads, 7 Iraqi-produced Scuds, and truckloads of SCUD components.
  - Iraq refuses to allow inspection of thousands of Ministry of Defense and Military Industries Commission documents relating to biological and chemical weapons and long-range missiles.
  - The CIA estimated in September 1999 that although the Gulf war and subsequent United Nations activities destroyed much
of Iraq’s missile infrastructure, Iraq could test an ICBM capable of reaching the United States during the next 15 years.

- After observing North Korean activities, Iraq most likely would pursue a three-stage Taepo Dong-2 approach to an ICBM (or SLV), which could deliver a several-hundred kilogram payload to parts of the United States. If Iraq could buy a Taepo Dong-2 from North Korea, it could have a launch capability within months of the purchase; if it bought Taepo Dong engines, it could test an ICBM by the middle of the next decade. Iraq probably would take until the end of the next decade to develop the system domestically.

- Although much less likely, most analysts believe that if Iraq were to begin development today, it could test a much less capable ICBM in a few years using Scud components and based on its prior SLV experience or on the Taepo Dong-1.

- If it could acquire No Dongs from North Korea, Iraq could test a more capable ICBM along the same lines within a few years of the No Dong acquisition.

- Analysts differ on the likely timing of Iraq’s first flight test of an ICBM that could threaten the United States. Assessments include unlikely before 2015; and likely before 2015, possibly before 2010—foreign assistance would affect the capability and timing.

- The DCI Nonproliferation Center (NPC) reported in February 2000 that Iraq has continued to work on the two SRBM systems authorized by the United Nations: the liquid-propellant Al-Samoud, and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down Scud, and the program allows Baghdad to develop technological improvements that could be applied to a longer range missile program. We believe that the Al-Samoud missile, as designed, is capable of exceeding the UN-permitted 150-km-range restriction with a potential operational range of about 180 kilometers. Personnel previously involved with the Condor II/Badr-2000 missile—which was largely destroyed during the Gulf war and eliminated by UNSCOM—are working on the Ababil-100 program. Once economic sanctions against Iraq are lifted, Baghdad probably will begin converting these efforts into longer range missile systems, unless restricted by future UN monitoring.

- Defense intelligence experts say on background that Iraq has rebuilt many of the facilities the US struck in Desert Fox, including 12 factories and sites associated with missile construction and the production of weapons of mass destruction. These are said to include the missile facilities at Al Taji.145

- US intelligence reports in June 2000 indicated that Iraq has resumed testing of missiles under 150 kilometers in range, possibly the system modified from the SA-2. They say that the system is not ready for deployment, and that there are problems with the rocket motor, guidance system, and there is no evidence Iraq is ready to start production.

- A CIA report in August 2000 summarized the state of missile development in Iraq as follows,146

  - Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment—in principle subject to UN scrutiny—also could be diverted for WMD purposes. Since the suspension of UN inspections in December 1998, the risk of diversion has increased.

  - Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.

  - Iraq continues to pursue development of two SRBM systems which are not prohibited by the United Nations: the liquid-propellant Al-Samoud, and the solid-propellant Ababil-100. The Al-Samoud is essentially a scaled-down Scud, and the program allows Baghdad to develop technological improvements that could be applied to a longer range missile program. We believe that the Al-Samoud missile, as designed, is capable of exceeding the UN-permitted 150-km-range restriction with a potential operational range of about 180 kilometers. Personnel previously involved with the Condor II/Badr-2000 missile—which was largely destroyed during the Gulf war and eliminated by UNSCOM—are working on the Ababil-100 program. If economic sanctions against Iraq were lifted, Baghdad probably would attempt to convert these efforts into longer range missile systems, regardless of continuing UN monitoring and continuing restrictions on WMD and long-range missile programs.

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**Chemical Weapons**

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Iraq is the only major recent user of weapons of mass destruction. US intelligence sources report the following Iraqi uses of chemical weapons:

<table>
<thead>
<tr>
<th>Date</th>
<th>Area</th>
<th>Type of Gas</th>
<th>Approximate Casualties</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 1983</td>
<td>Haij Umran</td>
<td>Mustard</td>
<td>Less than 100</td>
<td>Iranians/Kurds</td>
</tr>
<tr>
<td>October-November 1983</td>
<td>Panjwin</td>
<td>Mustard</td>
<td>3,0000</td>
<td>Iranians/Kurds</td>
</tr>
<tr>
<td>February-March 1984</td>
<td>Majnoon Island</td>
<td>Mustard</td>
<td>2,500</td>
<td>Iranians</td>
</tr>
<tr>
<td>March 1984</td>
<td>Al Basrah</td>
<td>Tabun</td>
<td>50-100</td>
<td>Iranians</td>
</tr>
<tr>
<td>March 1985</td>
<td>Hawizah Marsh</td>
<td>Mustard/Tabun</td>
<td>3,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>February 1996</td>
<td>Al Faw</td>
<td>Mustard/Tabun</td>
<td>8,000-10,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>December 1986</td>
<td>Umm ar Rasas</td>
<td>Mustard</td>
<td>1,000s</td>
<td>Iranians</td>
</tr>
<tr>
<td>April 1987</td>
<td>Al Basrah</td>
<td>Mustard/Tabun</td>
<td>5,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>October 1987</td>
<td>Sumar/Mehran</td>
<td>Mustard/Nerve Agents</td>
<td>3,000</td>
<td>Iranians</td>
</tr>
<tr>
<td>March 1988</td>
<td>Halabjah</td>
<td>Mustard/Nerve Agents</td>
<td>Hundreds</td>
<td>Iranians/Kurds</td>
</tr>
</tbody>
</table>

Note: Iranians also used poison gas at Halabjah and may have caused some of the casualties.

In revelations to the UN, Iraq admitted that, prior to the Gulf War, it:

- Procured more than 1,000 key pieces of specialized production and support equipment for its chemical warfare program.
- Maintained large stockpiles of mustard gas, and the nerve agents Sarin and Tabun.
- Produced binary Sarin filled artillery shells, 122 mm rockets, and aerial bombs.
- Manufactured enough precursors to produce 70 tons (70,000 kilograms) of the nerve agent VX. These precursors included 65 tons of choline and 200 tons of phosphorous pentasulfide and di-isopropylamine.
- Tested Ricin, a deadly nerve agent, for use in artillery shells.
- Had three flight tests of long-range Scuds with chemical warheads.
- Had a large VX production effort underway at the time of the Gulf War. The destruction of the related weapons and feedstocks has been claimed by Iraq, but not verified by UNSCOM. Iraq seems to have had at least 3,800 kilograms of V-agents by time the of the Gulf War, and 12-16 missile warheads.

The majority of Iraq’s chemical agents were manufactured at a supposed pesticide plant located at Muthanna. Various other production facilities were also used, including those at Salman Pak, Samara, and Habbiniyah. Though severely damaged during the war, the physical plant for many of these facilities has been rebuilt.

Iraq possessed the technology to produce a variety of other persistent and non-persistent agents.

The Gulf War and the subsequent UN inspection regime may have largely eliminated some of stockpiles and reduced production capability.

During 1991-1994, UNSCOM supervised the destruction of:
• 38,537 filled and unfilled chemical munitions.
• 690 tons of chemical warfare agents.
• More than 3,000 tons of precursor chemicals.
• Over 100 pieces of remaining production equipment at the Muthan State Establishment, Iraq’s primary CW research, production, filling and storage site.

• Since that time, UNSCOM has forced new disclosures from Iraq that have led to:
  • The destruction of 325 newly identified production equipment, 120 of which were only disclosed in August, 1997.
  • The destruction of 275 tons of additional precursors.
  • The destruction of 125 analytic instruments.
  • The return of 91 analytic pieces of equipment to Kuwait.

• As of February, 1998, UNSCOM had supervised the destruction of a total of:
  • 40,000 munitions, 28,000 filled and 12,000 empty.
  • 480,000 liters of chemical munitions
  • 1,800,000 liters of chemical precursors.
  • eight types of delivery systems including missile warheads.

• US and UN experts believe Iraq has concealed significant stocks of precursors. Iraq also appears to retain significant amounts of production equipment dispersed before, or during, Desert Storm and not recovered by the UN.

• UNSCOM reports that Iraq has failed to account for
  • Special missile warheads intended for filling with chemical or biological warfare agent.
  • The material balance of some 550 155 mm mustard gas shells, the extent of VX programs, and the rationale for the acquisition of various types of chemical weapons
  • 130 tons of chemical warfare agents.
  • Some 4,000 tons of declared precursors for chemical weapons,
  • The production of several hundred tons of additional chemical warfare agents, the consumption of chemical precursors,
  • 107,500 empty casings for chemical weapons,
  • Whether several thousand additional chemical weapons were filled with agents,
  • The unilateral destruction of 15, 620 weapons, and the fate of 16,038 additional weapons Iraq claimed it had discarded. “The margin of error” in the accounting presented by Iraq is in the neighborhood of 200 munitions.”

• Iraq systematically lied about the existence of its production facilities for VX gas until 1995, and made “significant efforts” to conceal its production capabilities after that date. Uncertainties affecting the destruction of its VX gas still affect some 750 tons of imported precursor chemicals, and 55 tons of domestically produced precursors. Iraq has made unverifiable claims that 460 tons were destroyed by Coalition air attacks, and that it unilaterally destroyed 212 tons. UNSCOM has only been able to verify the destruction of 155 tons and destroy a further 36 tons on its own.

• Iraq has developed basic chemical warhead designs for Scud missiles, rockets, bombs, and shells. Iraq also has spray dispersal systems.

• Iraq maintains extensive stocks of defensive equipment.

• The UN feels that Iraq is not currently producing chemical agents, but Iraq has offered no evidence that it has destroyed its VX production capability and/or stockpile. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.

• Recent UNSCOM work confirms that Iraq did deploy gas-filled 155 mm artillery and 122 mm multiple rocket rounds into
the rear areas of the KTO during the Gulf War.

- Iraq’s chemical weapons had no special visible markings, and were often stored in the same area as conventional weapons.
- Iraq has the technology to produce stable, highly lethal VX gas with long storage times.
- May have developed improved binary and more stable weapons since the Gulf War.
- Since 1992, Iraq attempted to covertly import precursors and production equipment for chemical weapons through Qatar, Saudi Arabia, and Jordan since the Gulf War.
- The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998 and corrected by the National Intelligence Council on November 16, 1998):

<table>
<thead>
<tr>
<th>Agent</th>
<th>Declared</th>
<th>Potential</th>
<th>Unaccounted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Agents</td>
<td>(Metric Tons)</td>
<td>(Metric Tons)</td>
<td></td>
</tr>
<tr>
<td>VX Nerve Gas</td>
<td>3</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>G Agents (Sarin)</td>
<td>100-150</td>
<td>200</td>
<td>Figures include weaponized and bulk agents</td>
</tr>
<tr>
<td>Mustard Gas</td>
<td>500-600</td>
<td>200</td>
<td>Figures include weaponized and bulk agents</td>
</tr>
<tr>
<td>Delivery Systems</td>
<td>(Number)</td>
<td>(Number)</td>
<td></td>
</tr>
<tr>
<td>Missile Warheads</td>
<td>75-100</td>
<td>2-25</td>
<td>UNSCOM supervised destruction of 30</td>
</tr>
<tr>
<td>Rockets</td>
<td>100,000</td>
<td>15,000-25,000</td>
<td>UNSCOM supervised destruction of 40,000, 28,000 of which were filled.</td>
</tr>
<tr>
<td>Aerial Bombs</td>
<td>16,000</td>
<td>2,000-8,000</td>
<td>High estimate reflects the data found in an Iraqi Air Force document in July, 1998.</td>
</tr>
<tr>
<td>Artillery shells</td>
<td>30,000</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>Aerial Spray Tanks</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
</tbody>
</table>

- A US State Department spokesman reported on November 16, 1998 that Iraq has reported making 8,800 pounds (four tons) of VX nerve gas, 220,000 pounds (100 tons) to 330,000 pounds (150 tons) of nerve agents such as Sarin and 1.1 million pounds (500 tons) to 1.32 million pounds (600 tons) of mustard gas. Data from UN weapons inspectors indicates that Iraq may have produced an additional 1.32 million pounds (600-tons) of these agents, divided evenly among the three. “In other words, these are the differences between what they say they have and what we have reason to believe they have.”
- The CIA reported in January 1999 that Iraq had purchased numerous dual-use items for legitimate civilian projects—in principle subject to UN scrutiny—that also could be diverted for WMD purposes. Since the Gulf war, Baghdad has rebuilt key portions of its chemical production infrastructure for industrial and commercial use. Some of these facilities could be converted fairly quickly for production of CW agents. The recent discovery that Iraq had weaponized the advanced nerve agent VX and the convincing evidence that fewer CW munitions were consumed during the Iran-Iraq war than Iraq had declared provide strong indications that Iraq retains a CW capability and intends to reconstitute its pre-Gulf war capability as rapidly as possible once sanctions are lifted.
- A State Department report in September 1999 noted that:
  - In July 1998, Iraq seized from the hands of UNSCOM inspectors an Iraqi Air Force document indicating that Iraq had misrepresented the expenditure of over 6,000 bombs which may have contained over 700 tons of chemical agent. Iraq continues to refuse to provide this document to the UN.
  - Iraq continues to deny weaponizing VX nerve agent, despite the fact that UNSCOM found VX nerve agent residues on Iraqi SCUD missile warhead fragments. Based on its investigations, international experts concluded that “Iraq has the know-how and process equipment, and may possess precursors to manufacture as much as 200 tons of VX ... The retention of a VX capability by Iraq cannot be excluded by the UNSCOM international expert team.”
  - The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has
A CIA report in August 2000 summarized the state of chemical weapons proliferation in Iraq as follows,

- Since Operation Desert Fox in December 1998, Baghdad has refused to allow United Nations inspectors into Iraq as required by Security Council Resolution 687. As a result, there have been no UN inspections during this reporting period, and the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq’s WMD programs.

- Since the Gulf war, Iraq has rebuilt key portions of its chemical production infrastructure for industrial and commercial use, as well as its missile production facilities. It has attempted to purchase numerous dual-use items for, or under the guise of, legitimate civilian use. This equipment—in principle subject to UN scrutiny—also could be diverted for WMD purposes. Following Desert Fox, Baghdad again instituted a reconstruction effort on those facilities destroyed by the US bombing, to include several critical missile production complexes and former dual-use CW production facilities. In addition, it appears to be installing or repairing dual-use equipment at CW-related facilities. Some of these facilities could be converted fairly quickly for production of CW agents.

- The United Nations Special Commission on Iraq (UNSCOM) reported to the Security Council in December 1998 that Iraq continued to withhold information related to its CW and BW programs. For example, Baghdad seized from UNSCOM inspectors an Air Force document discovered by UNSCOM that indicated that Iraq had not consumed as many CW munitions during the Iran-Iraq War in the 1980s as declared by Baghdad. This discrepancy indicates that Iraq may have an additional 6,000 CW munitions hidden. This intransigence on the part of Baghdad ultimately led to the Desert Fox bombing by the US.

- Iraqi defector claims in February 2000 that Iraq had maintained a missile force armed with chemical and biological warheads that can be deployed from secret locations, and they that warheads are stored separately near Baghdad and have been deployed to the missiles in the field in exercises. The United Nations Monitoring, Verification, and Inspection Committee (UNMOVIC), there have been no UN inspections during this reporting period. Moreover, the automated video monitoring system installed by the UN at known and suspect WMD facilities in Iraq has been dismantled by the Iraqis. Having lost this on-the-ground access, it is difficult for the UN or the US to accurately assess the current state of Iraq’s WMD programs.

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Biological Weapons

- Had highly compartmented “black” program with far tighter security regulations than chemical program.
- Had 18 major sites for some aspect of biological weapons effort before the Gulf War. Most were nondescript and had no guards or visible indications they were a military facility.
- The US targeted only one site during the Gulf War. It struck two sites, one for other reasons. It also struck at least two targets with no biological facilities that it misidentified.
- Systematically lied about biological weapons effort until 1995. First stated that had small defensive efforts, but no offensive effort. In July, 1995, admitted had a major defensive effort. In October, 1995, finally admitted major weaponization effort.
- Iraq has continued to lie about its biological weapons effort since October, 1995. It has claimed the effort was headed by Dr. Taha, a woman who only headed a subordinate effort. It has not admitted to any help by foreign personnel or contractors. It has claimed to have destroyed its weapons, but the one site UNSCOM inspectors visited showed no signs of such destruction and was later said to be the wrong site. It has claimed only 50 people were employed full time, but the scale of the effort would have required several hundred.
- Since July 1995, Iraq has presented three versions of FFCDs and four “drafts.”
  - The most recent FFCD was presented by Iraq on 11 September 1997. This submission followed the UNSCOM’s rejection, of the FFCD of June 1996. In the period since receiving that report, UNSCOM conducted eight inspections in an attempt to investigate critical areas of Iraq’s proscribed activities such as warfare agent production and destruction, biological munitions manufacturing, filling and destruction, and military involvement in and support to the proscribed program. Those investigations, confirmed the assessment that the June 1996 declaration was deeply deficient. The UNSCOM concluded that the new FFCD, it received on 11 September 1997, contains no significant changes from the June 1996 FFCD.
  - Iraq has not admitted to the production of 8,500 liters of anthrax, 19,000 liters of Botulinum toxin, 2,200 liters of Aflatoxin.
  - Reports indicate that Iraq tested at least 7 principal biological agents for use against humans.
    - Anthrax, Botulinum, and Aflatoxin are known to be weaponized.
    - Looked at viruses, bacteria, and fungi. Examined the possibility of weaponizing gas gangrene and Mycotoxins. Some field trials were held of these agents.
    - Examined foot and mouth disease, hemorrhagic conjunctivitis virus, rotavirus, and camel pox virus.
    - Conducted research on a “wheat pathogen” and a Mycotoxin similar to “yellow rain” defoliant.
    - The “wheat smut” was first produced at Al Salman, and then put in major production during 1987-1988 at a plant near Mosul. Iraq claims the program was abandoned.
  - The August 1995 defection of Lieutenant general Husayn Kamel Majid, formerly in charge of Iraq’s weapons of mass destruction, revealed the extent of this biological weapons program. Lt. General Kamel’s defection prompted Iraq to admit that it:
    - Imported 39 tons of growth media (31,000 kilograms or 68,200 pounds) for biological agents obtained from three European firms. According to UNSCOM, 3,500 kilograms or 7,700 pounds) remains unaccounted for. Some estimates go as high as 17 tons. Each ton can be used to produce 10 tons of bacteriological weapons.
    - Imported type cultures from the US which can be modified to develop biological weapons.
    - Had a laboratory- and industrial-scale capability to manufacture various biological agents including the bacteria which cause Anthrax and botulism; Aflatoxin, a naturally occurring carcinogen; clostridium perfringens, a gangrene-causing agent; the protein toxin Ricin; tricothecene Mycotoxins, such as T-2 and DAS; and an anti-wheat fungus known as wheat cover smut. Iraq also conducted research into the rotavirus, the camel pox virus and the virus which causes hemorrhagic conjunctivitis.
    - Created at least seven primary production facilities including the Sepp Institute at Muthanna, the Ghazi Research Institute at Amaria, the Daura Foot and Mouth Disease Institute, and facilities at Al-Hakim, Salman Pak Taji, and Fudaliyah. According to UNSCOM, weaponization occurred primarily at Muthanna through May, 1987 (largely Botulinum), and then moved to Al Salman. (Anthrax). In March, 1988 a plant was open at Al Hakim, and in 1989...

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an Aflatoxin plant was set up at Fudaliyah.

- Had test site about 200 kilometers west of Baghdad, used animals in cages and tested artillery and rocket rounds against live targets at ranges up to 16 kilometers.
- Took fermenters and other equipment from Kuwait to improve effort during the Gulf War.
- Iraq had least 79 civilian facilities capable of playing some role in biological weapons production still in existence in 1997.

- The Iraqi program involving Aflatoxin leaves many questions unanswered.
  - Iraqi research on Aflatoxin began in May 1988 at Al Salman, where the toxin was produced by the growth of fungus aspergillus in 5.3 quart flasks.
  - The motives behind Iraq’s research on Aflatoxin remain one of the most speculative aspects of its program. Aflatoxin is associated with fungal-contaminated food grains, and is considered non-lethal. It normally can produce liver cancer, but only after a period of months to years and in intense concentrations. There is speculation, however, that a weaponized form might cause death within days and some speculation that it can be used as an incapacitating agent.
  - It developed 16 R-400 Aflatoxin bombs and two Scud warheads. Conducted trials with Aflatoxin in 122 mm rockets and R-400 bombs in November 1989 and May and August 1990. Produced a total of 572 gallons of toxin and loaded 410.8 gallons into munitions.
  - UNSCOM concluded in October, 1997, that Iraq’s accounting for its Aflatoxin production was not credible.

- Total Iraqi production of more orthodox biological weapons reached at least 19,000 liters of concentrated Botulinum (10,000 liters filled into munitions); 8,500 liters of concentrated Anthrax (6,500 liters filled into munitions); and 2,500 liters of concentrated Aflatoxin (1,850 liters filled into munitions).
  - It manufactured 6,000 liters of concentrated Botulinum toxin and 8,425 liters of Anthrax at Al-Hakim during 1990; 5400 liters of concentrated Botulinum toxin at the Daura Foot and Mouth Disease Institute from November 1990 to January 15, 1991; 400 liters of concentrated Botulinum toxin at Taji; and 130 liters of concentrated Anthrax at Salman Pak.
  - Iraq is also known to have produced at least:
    - 1,850 liters of Aflatoxin in solution at Fudaliyah.
    - 340 liters of concentrated clostridium perfringens, a gangrene-causing biological agent, beginning in August 1990.
    - 10 liters of concentrated Ricin at Al Salam. Claim abandoned work after tests failed.

- Iraq weaponized at least three biological agents for use in the Gulf War. The weaponization consisted of at least:
  - 100 bombs and 16 missile warheads loaded with Botulinum.
  - 50 R-400 air-delivered bombs and 5 missile warheads loaded with anthrax; and
  - 4 missile warheads and 7 R-400 bombs loaded with Aflatoxin, a natural carcinogen.
  - The warheads were designed for operability with the Al Husayn Scud variant.

- Iraq had other weaponization activities:
  - Armed 155 mm artillery shells and 122 mm rockets with biological agents.
  - Conducted field trials, weaponization tests, and live firings of 122 mm rockets armed with Anthrax and Botulinum toxin from March 1988 to May 1990.
  - Tested Ricin, a deadly protein toxin, for use in artillery shells.
  - Iraq produced at least 191 bombs and 25 missile warheads with biological agents.
• Developed and deployed 250 pound aluminum bombs coverage in fiberglass. Bombs were designed so they could be mounted on both Soviet and French-made aircraft. They were rigged with parachutes for low altitudes drops to allow efficient slow delivery and aircraft to fly under radar coverage. Some debate over whether bombs had cluster munitions or simply dispersed agent like LD-400 chemical bomb.

• Deployed at least 166 R-400 bombs with 85 liters of biological agents each during the Gulf War. Deployed them at two sites. One was near an abandoned runway where it could fly in aircraft, arm them quickly, and disperse with no prior indication of activity and no reason for the UN to target the runway.

• Filled at least 25 Scud missile warheads, and 157 bombs and aerial dispensers, with biological agents during the Gulf War.

• Developed and stored drop tanks ready for use for three aircraft or RPV’s with the capability of dispersing 2,000 liters of anthrax. Development took place in December 1990. Claimed later that tests showed the systems were ineffective.

• The UN found, however, that Iraq equipped crop spraying helicopters for biological warfare and held exercises and tests simulating the spraying of Anthrax spores.

• Iraqi Mirages were given spray tanks to disperse biological agents.
  • Held trials as late as January 13, 1991.
  • The Mirages were chosen because they have large 2,200 liter belly tanks and could be refueled by air, giving them a longer endurance and greater strike range.
  • The tanks had electric valves to allow the agent to be released and the system was tested by releasing simulated agent into desert areas with scattered petri dishes to detect the biological agent. UNSCOM has video tapes of the aircraft.

• Project 144 at Taji produced at least 25 operational Al Husayn warheads. Ten of these were hidden deep in a railway tunnel, and 15 in holes dug in an unmanned hide site along the Tigris.

• Biological weapons were only distinguished from regular weapons by a black stripe.

• The UN claims that Iraq has offered no evidence to corroborate its claims that it destroyed its stockpile of biological agents after the Gulf War. Further, Iraq retains the technology it acquired before the war and evidence clearly indicates an ongoing research and development effort, in spite of the UN sanctions regime.

• UNSCOM reported in October 1997 that:
  • Iraq has never provided a clear picture of the role of its military in its biological warfare program, and has claimed it only played a token role.
  • It has never accounted for its disposal of growth media. The unaccounted for media is sufficient, in quantity, for the production of over three times more of the biological agent -- Anthrax -- Iraq claims to have been produced.
  • Bulk warfare agent production appears to be vastly understated by Iraq. Expert calculations of possible agent production quantities, either by equipment capacity or growth media amounts, far exceed Iraq’s stated results
  • Significant periods when Iraq claims its fermenters were not utilized are unexplained
  • Biological warfare field trials are underreported and inadequately described.
  • Claims regarding field trials of chemical and biological weapons using R400 bombs are contradictory and indicate that, “more munitions were destroyed than were produced.
  • The Commission is unable to verify that the unilateral destruction of the BW-filled Al Hussein warheads has taken place.”
  • There is no way to confirm whether Iraq destroyed 157 bombs of the R400 type, some of which were filled with Botulin or anthrax spores.
  • “The September 1997 FFCD fails to give a remotely credible account of Iraq’s biological program. This opinion has been endorsed by an international panel of experts.”

• The current status of the Iraqi program is as follows (according to US intelligence as of February 19, 1998):
<table>
<thead>
<tr>
<th>Agent</th>
<th>Declared Concentrated Amount</th>
<th>Declared Total Amount</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liters</td>
<td>Gallons</td>
<td>Liters</td>
</tr>
<tr>
<td>Anthrax</td>
<td>8500</td>
<td>12,245</td>
<td>85000</td>
</tr>
<tr>
<td>Botulinum toxin</td>
<td>19,400</td>
<td>NA</td>
<td>380,000</td>
</tr>
<tr>
<td>Gas Gangrene Clostridium Perfungens</td>
<td>340</td>
<td>90</td>
<td>3,400</td>
</tr>
<tr>
<td>Aflatoxin</td>
<td>NA</td>
<td>NA</td>
<td>2,200</td>
</tr>
<tr>
<td>Ricin</td>
<td>NA</td>
<td>NA</td>
<td>10</td>
</tr>
</tbody>
</table>

- UNSCOM cannot confirm the unilateral destruction of 25 warheads. It can confirm the destruction of 23 of at least 157 bombs. Iraq may have more aerosol tanks.
- UN currently inspects 79 sites -- 5 used to make weapons before war; 5 vaccine or pharmaceutical sites; 35 research and university sites; thirteen breweries, distilleries, and dairies with dual-purpose capabilities; eight diagnostic laboratories.
- Iraq retains laboratory capability to manufacture various biological agents including the bacteria which cause anthrax, botulism, tularemia and typhoid.
- Many additional civilian facilities are capable of playing some role in biological weapons production.
- A State Department spokesman reported on November 16, 1998 that there is a large discrepancy between the amount of biological growth media -procured and the amount of agents that were or could have been produced. Baghdad has not adequately explained where some 8,000 pounds (3,500 kg) of the material went out of some 68,000 pounds (31,000 kg) of biological growth media it imported. Iraq's accounting of the amount of the agent it produced and the number of failed batches is seriously flawed and cannot be reconciled on the basis of this full disclosure Iraq has made.
- The CIA reported in January 1999 that Iraq continues to refuse to disclose fully the extent of its BW program. After four years of denials, Iraq admitted to an offensive program resulting in the destruction of Al Hakam-a large BW production facility Iraq was trying to hide as a legitimate biological plant. Iraq still has not accounted for over a hundred BW bombs and over 80 percent of imported growth media-directly related to past and future Iraqi production of thousands of gallons of biological agent. This lack of cooperation is an indication that Baghdad intends to reconstitute its BW capability when possible.
- A State Department report in September 1999 noted that:
  - Iraq refuses to allow inspection of thousands of Ministry of Defense and Military Industries Commission documents relating to biological and chemical weapons and long-range missiles.
  - In 1995, Iraqis who conducted field trials of R-400 bombs filled with biological agents described the tests to UNSCOM experts in considerable detail, including the use of many animals. These field trials were reflected in Iraq’s June 1996 biological weapons declaration. Yet, amazingly, Iraq now denies that any such trials were conducted at all.
  - In September 1995, Iraq finally declared the existence of two projects to disseminate biological agents from Mirage F-1 and MiG-21 aircraft, yet there is no evidence that the prototype weapons and aircraft were ever destroyed. There is also no evidence that the 12 Iraqi helicopter-borne aerosol generators for biological weapon delivery were ever destroyed.
  - Apart from one document referring to a single year, no Iraqi biological weapon production records have been given to the UN—no records of storage, of filling into munitions, or of destruction. This is why UNSCOM refers to Iraq’s biological weapons program—which deployed SCUD missile warheads filled with anthrax and botulinum toxin to be ready for use against Coalition forces—as a “black hole.”
  - The Iraqis have repeatedly changed their story about their biological weapons warheads. Iraq has revised several times its declarations regarding the precise locations of warhead destruction and the fill of warheads. The movements of
concealed warheads prior to unilateral destruction, claimed by Iraq, have been proven to be false.

- The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so.”

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**Nuclear Weapons**

- Inspections by UN teams have found evidence of two successful weapons designs, a neutron initiator, explosives and triggering technology needed for production of bombs, plutonium processing technology, centrifuge technology, Calutron enrichment technology, and experiments with chemical separation technology. Iraq had some expert technical support, including at least one German scientist who provided the technical plans for the URENCO TC-11 centrifuge.

- Iraq’s main nuclear weapons related facilities were:
  - Al Aheer - center of nuclear weapons program. Uranium metallurgy; production of shaped charges for bombs, remote controlled facilities for high explosives manufacture.
  - Al Tuwaitha - triggering systems, neutron initiators, uranium metallurgy, and hot cells for plutonium separation. Laboratory production of UO₂, UCL₄, UF₆, and fuel fabrication facility. Prototype-scale gas centrifuge, prototype EMIS facility, and testing of laser isotope separation technology.


• Al Qa - high explosives storage, testing of detonators for high explosive component of implosion nuclear weapons.
• Al Musaibib/Al Hatteen - high explosive testing, hydrodynamic studies of bombs.
• Al Hadre - firing range for high explosive devices, including FAE.
• Ash Sharqat - designed for mass production of weapons grade material using EMIS.
• Al Furat - designed for mass production of weapons grade material using centrifuge method.
• Al Jesira (Mosul) - mass production of UCL4.
• Al Qaim - phosphate plant for production of U308.
• Akashat uranium mine.

• Iraq had three reactor programs:
  • Osiraq/Tammuz I 40 megawatt light-water reactor destroyed by Israeli air attack in 1981.
  • Isis/Tammuz II 800 kilowatt light water reactor destroyed by Coalition air attack in 1991.
  • IRT-5000 5 megawatt light water reactor damaged by Coalition air attack in 1991.

• Iraq used Calutron (EMIS), centrifuges, plutonium processing, chemical diffusion and foreign purchases to create new production capability after Israel destroyed most of Osiraq.
• Iraq established a centrifuge enrichment system in Rashidya and conducted research into the nuclear fuel cycle to facilitate development of a nuclear device.
• After invading Kuwait, Iraq attempted to accelerate its program to develop a nuclear weapon by using radioactive fuel from French and Russian-built reactors. It made a crash effort in September, 1990 to recover enriched fuel from its supposedly safe-guarded French and Russian reactors, with the goal of producing a nuclear weapon by April, 1991. The program was only halted after Coalition air raids destroyed key facilities on January 17, 1991.
• Iraq conducted research into the production of a radiological weapon, which disperses lethal radioactive material without initiating a nuclear explosion.
  • Orders were given in 1987 to explore the use of radiological weapons for area denial in the Iran-Iraq War.
  • Three prototype bombs were detonated at test sites -- one as a ground level static test and two others were dropped from aircraft.
  • Iraq claims the results were disappointing and the project was shelved but has no records or evidence to prove this.
• UN teams have found and destroyed, or secured, new stockpiles of illegal enriched material, major production and R&D facilities, and equipment-- including Calutron enriching equipment.
• UNSCOM believes that Iraq’s nuclear program has been largely disabled and remains incapacitated, but warns that Iraq retains substantial technology and established a clandestine purchasing system in 1990 that it has used to import forbidden components since the Gulf War.
• The major remaining uncertainties are:
  • Iraq still retains the technology developed before the Gulf War and US experts believe an ongoing research and development effort continues, in spite of the UN sanctions regime.
  • Did Iraq conceal an effective high speed centrifuge program.
  • Are there elements for radiological weapons.
  • Is it actively seeking to clandestinely buy components for nuclear weapons and examining the purchase of fissile material from outside Iraq.
  • Is it continuing with the development of a missile warhead suited to the use of a nuclear device.
  • A substantial number of declared nuclear weapons components and research equipment has never been recovered. There is no reason to assume that Iraqi declarations were comprehensive.
• The CIA reported in January 1999 that Iraq continues to hide documentation, and probably some equipment, relating to key aspects of past nuclear activities. After years of Iraqi denials, the IAEA was able to get Iraq to admit to a far more advanced nuclear weapons program and a project based on advanced uranium enrichment technology. However, Baghdad continues to withhold significant information about enrichment techniques, foreign procurement, and weapons design.

• The DCI Nonproliferation Center (NPC) reported in February 2000 that “We do not have any direct evidence that Iraq has used the period since Desert Fox to reconstitute its WMD programs, although given its past behavior, this type of activity must be regarded as likely. The United Nations assesses that Baghdad has the capability to reinitiate both its CW and BW programs within a few weeks to months, but without an inspection monitoring program, it is difficult to determine if Iraq has done so.”

• Press reports in February 2000 claimed that Iraq might have developed biological warfare agents it had kept secret from UNSCOM inspectors and which were never discovered. The reports followed similar warnings by UNSCOM experts on January 25, 2000 that Iraq might have done so, that not all suspected biological weapons production and research facilities had been inspected, and that the undiscovered weapons might include infectious viral agents.\textsuperscript{151}

Source: Prepared by Anthony H. Cordesman, Co-Director, Middle East Program, CSIS.
“Nth” Country Missile Threats and the Heisenberg Uncertainty Principle

There are studies that predict far more definite threats to the American Homeland from nations like North Korea, Iran, and Iraq than the work of the National Intelligence Council. No unclassified evidence has surfaced to validate such studies, however, and conversations with members of the intelligence community do not indicate that access to classified data would validate the existence of clear plans by any additional state to create missile forces targeted against the US. The “Nth” threat is rather the fact that the widespread dissemination of the technology to design and build long-range missiles and weapons of mass destruction means that other countries pose a potential threat that may or may not materialize. Known hostile proliferators are only part of the problem.

At this point in time, the deployment of any National Missile Defense system cannot be based on any clear picture of the timing, character, size, or effectiveness of any given “rogue” or “Nth” country threat, or combination of threats, or any clear picture of threat intentions and strategy. It also cannot be based on the certainty that any emerging proliferator will develop an ICBM-like capability to strike at the American homeland, although such a theater missile threat already exists to many of America’s friends and allies.

Barring a revolution in both arms control and limits on technology transfer, however, the US faces a future in which it must plan indefinitely for the risk that a missile threat may emerge to the American homeland. The preceding analysis also shows that the US still faces a significant risk that some hostile powers will deploy missiles capable of striking the US by 2010, or earlier. This timing confronts the US with the fact that there is no certain threat to use as a basis for deciding on the deployment of NMD, but that there is only a relatively limited time window for the development of a national missile defense system before such a threat could emerge.

This lack of confidence in strategic warning, and the long time window required to deploy an effective NMD system have been a key rationale behind the accelerated NMD deployment planning schedule used by the Department of Defense, and why the Congress sought
to force deployment by 2005. This schedule has slipped to 2006-2007 at the earliest as result of President Clinton’s decision to defer a deployment decision to the next President, and there has already been substantial previous slippage in the US NMD program. The US once considered deploying an NMD system as early as 2003.

The fact remains, however, that no one can legislate technical progress or mandate it by Presidential decree. As President Clinton’s decision to defer deployment also made clear, BMDO is still developing, testing, and integrating key components like the ground based interceptor (GBI), upgraded early warning radars (UEWRs), forward deployed and/or US-based X-Band radars, and battle management/command, control, and communications system (BMC3). As is discussed later, there is good reason to believe that BMDO is currently operating its test and evaluation program and deployment schedule under conditions which involve a very high degree of technical risk, as well as a substantial risk of delays and cost escalation.

It is also a historical reality that the US has never deployed any complex weapons system during the last quarter of a century that did not take years to make fully operational after its official deployment date, and that additional costs of 25% or more of the original purchase price are scarcely the exception. Slippage and cost-escalation tend to rise in proportion to innovation and system complexity, and the US track record in deploying systems involving complex air defense capabilities, sensor integration, and C4I/BM systems is particularly imperfect. As a result, the conclusion by BMDO that a mature system can only be available after 2010 seems realistic, particularly if such a system is to include the space-based infrared system (SBIRS) to provide low orbit sensor coverage.

Current US plans do not call for the deployment of SBIRS and many other sophisticated capabilities before 2010, and such capabilities could prove to be essential to allow an NMD system to acquire and track attacking missiles and provide the earliest possible trajectory estimate to the US NMD system. This “over-the-horizon” precision tracking capability is important both in dealing with the simultaneous launch of multiple missiles and warheads, and to permit interceptors to be launched before threats come within the range of the X-band radars. It
could also prove to be important in some cases where a hostile power launched missiles from ships nearer to US territory, and related increases in interceptor numbers and in counter-penetration aids and counter-decoy capabilities could be equally important.

**Other Types of Threats to the United States**

This latter point is of critical importance, and highlights the need to make any decisions regarding NMD a part of a balanced approach to all of the new threats that may be emerging to the American homeland. The same National Intelligence Council report that warns of the emerging long-range missile threat to the US warns that hostile powers may be developing two other kinds of threats to the US that would not normally be covered by currently contemplated NMD systems. This includes both shorter range ballistic and cruise missiles, and less orthodox delivery methods. Accordingly, there are important threats that NMD can not deal with, and alternative methods of attack which the deployment of NMD that may provoke hostile states to pursue. This, in turn, raises questions about the overall affordability of defense against the full spectrum of attacks, and whether any form of defense can be effective without strong US offensive deterrent and retaliatory capabilities.

**Forward-Based Air and Missile Threats**

There are reasons that hostile states may pursue the deployment of long-range missile threats to the US homeland in spite of their extraordinary cost and complexity, and weaknesses in other areas of US defense. Ballistic missile threats are a powerful symbol of international power and status. Unless the US deploys missile defenses of some sort, US territory will be defenseless and the US can be held hostage to attack. Even the very possession of a few systems would serve as a way of potentially intimidating the US, and would do so even if a hostile state made no overt threats. “Wars of intimidation” can be as important in strategic terms as physical conflicts, and it is probably true that the ability to attack the US will have an important impact in intimidating US allies and coalition partners as well. Certainly, faith in US willingness to act has to be affected by the knowledge that American territory and cities are clearly at hazard and can be struck with little or no warning. As Iraq demonstrated during the Gulf War, in deploying a
dispersed biological weapons threat against the Coalition, hostile states can also couple the deployment of long-range missile forces to plans to launch on warning or if they come under attack.

At the same time, there are good reasons to attack the US in other ways, and in ways that could deprive the current nominal NMD system of having any value. One key form of attack is to attack a US ally with either missiles or other forms of delivery systems. Given the theater-driven nature of most threats, the theater is in any case more likely to be the initial focus of hostility than the US homeland. While advocates of NMD argue that a vulnerable US would be subject to intimidation, the fact remains that many friends and allies of the US may be even more vulnerable.

Another form of attack would be to create forward-based threats that launch missiles from areas much nearer the US. In these cases, the attacks could come from vectors that would not be covered by a limited NMD system and might involve apogees too short and low to be intercepted. The NIC warns that:

“Several countries are technically capable of developing a missile-launch mechanism to use from forward-based ships or other platforms to launch SRBMs and MRBMs, or land-attack cruise missiles against the United States. Some countries may develop and deploy a forward-based system during the period of the next 15 years.

“A short- or medium-range ballistic missile could be launched at the United States from a forward-based sea platform positioned within a few hundred kilometers of US territory. If the attacking country were willing to accept significantly reduced accuracy for the missile, forward-basing on a sea-based platform would not be a major technical hurdle. The reduced accuracy in such a case, however, would probably be better than that of some early ICBMs. The simplest method for launching a ship-borne ballistic missile would be to place a secured TEL onboard the ship and launch the missile from its TEL. If accuracy were a major concern, the missile and launcher would be placed on a stabilization platform to compensate for wave movement of the ocean, or the country would need to add satellite-aided navigation to the missile.

A concept similar to a sea-based ballistic missile launch system would be to launch cruise missiles from forward-based platforms. This method would enable a country to use cruise missiles acquired for regional purposes to attack targets in the United States.

- A country could launch cruise missiles from fighter, bomber, or commercial transport aircraft outside US airspace. US capability to detect planes approaching the coast, and the limited range of fighter and bomber aircraft of most countries, probably would preclude the choice of military aircraft for the attack. Using a commercial aircraft, however, would be feasible for staging a covert cruise missile attack, but it still would be difficult.
• A commercial surface vessel, covertly equipped to launch cruise missiles, would be a plausible alternative for a forward-based launch platform. This method would provide a large and potentially inconspicuous platform to launch a cruise missile while providing at least some cover for launch deniability.

• A submarine would have the advantage of being relatively covert. The technical sophistication required to launch a cruise missile from a submarine torpedo or missile tube most likely would require detailed assistance from the defense industry of a major naval power.”

**Cruise Missiles and Drones**

Nations like North Korea, Iran, and Iraq have already shown that they can modify fighter planes as rocket-launched drones. Both Iran and Iraq have shown an interest in acquiring devices like the UAVs used as crop sprayers. These could be used as small delivery systems for biological weapons. Iran and North Korea could conceivably ferry a submarine to areas near the US using a ship like a supertanker as a cover, and there are a variety of existing cruise missiles that they might adapt to such purposes.

There are growing problems in controlling cruise missile technology - some of potentially hostile states already have cruise missile technology. While the SA-2 Guideline is now an obsolete surface-to-air missile, it weighs 2,360 kilograms and involves a fairly large system. The Soviet versions originally had nuclear warheads, and a 130-kilogram high explosive warhead. The slant range of the missile in the air intercept mode is about 50 kilometers, although the system would probably be accurate to over 100 kilometers in the surface-to-surface mode. It is not an ideal system for use against surface targets by any means, and would require substantial modification. It has been deployed in large numbers, however, and nations like Iraq have already developed major conversion programs to turn it into a surface-to-surface missile.  

The SSC-1B Sepal is a relatively modern cruise missile by Third World standards. It entered Soviet service in 1970. It has a range of 450 kilometers and a warhead of up to 1,000 kilograms. While it receives little attention, it is a large 5,400-kilogram missile with radio command midcourse guidance, a radio altimeter to control altitude, command guidance at long ranges, and terminal active radar guidance. It can fly at preset altitudes from surface skimming to 3,000-5,000 meters. It is designed for attack against ships and the Soviet version has a 100-200 kiloton nuclear warhead. Its guidance system and accuracy make it difficult to modify for attacks on land targets that are much smaller than a large military base or small town, but its large warhead lends itself to chemical use against such area targets. Syria has several SSC-1B...
units, which normally have 16-18 missiles per battalion.

The SS-C-3 is another coastal defense missile based on the Styx. It is a modern system that was first deployed in Soviet forces in 1985. It has a much shorter range than the SS-C-1B. Its maximum range is only 80-90 kilometers and its warhead is unlikely to exceed 500 kilograms, although Soviet versions with yields of 1 to 200 kilotons have been reported. It uses inertial midcourse guidance (a programmed auto-pilot with precision accelerometers), and uses a mobile launcher based on the Soviet MAZ-543 8X8 all-terrain vehicle. It is specifically designed for export and has not been deployed with Soviet forces. It is normally used as a sea skimmer against naval targets, but can evidently be set for a high altitude cruise phase with accuracy sufficient to hit a small town or large air base. While converting such a system to chemical warheads would not normally be cost-effective, the resulting system would be relatively mobile and easy to deploy. The possibility cannot be totally dismissed.

It is also increasingly possible that hostile states will be able to develop and deploy their own cruise missiles by the time the US can deploy any NMD system. For example, it is possible that Iran may develop a cruise missile that could be armed with weapons of mass destruction, using Chinese and other foreign assistance, although there is no current evidence that it is doing so. Iran has experience with similar systems and fired at least 10 Chinese-made, land-based anti-ship cruise missiles at targets along the Kuwaiti coast during 1987-1988 -- hitting targets like Kuwait’s sea island and a US-flagged oil tanker.

While nations like Iran currently lack the capability to develop and deploy a missile as sophisticated as the Tomahawk (TLAM) missile, US studies indicate that Third World nations like Iran and Iraq may be able to build a cruise missile about half the size of a small fighter aircraft and with a payload of about 500 kilograms by the years 2000 to 2005. Such missiles would cost only 10% to 25% as much as ballistic missiles of similar range, and both the HY-2 Seersucker and CS-802 could be modified relatively quickly for land attacks against area targets.

Iran reported in December, 1995 that it had already fired a domestically built anti-ship missile called the Saeqe-4 (Thunderbolt) during exercises in the Strait of Hormuz and Gulf of Oman. Other reports indicate that China is helping Iran build copies of the Chinese CS-
801/CS-802 and the Chinese FL-2 or F-7 anti-ship cruise missiles. These missiles have relatively limited range. The range of the CS-801 is 8-40 kilometers, the range of the CS-802 is 15-120 kilometers, the maximum range of the F-7 is 30 kilometers, and the maximum range of the FL-10 is 50 kilometers. Even a range of 120 kilometers would barely cover targets in the Southern Gulf from launch points on Iran’s Gulf coast. These missiles also have relatively small high explosive warheads. As a result, Iran may well be seeking anti-ship capabilities, rather than platforms for delivering weapons of mass destruction.155

A platform like the CS-802 might, however, provide enough design data to develop a scaled-up, longer-range cruise missile for other purposes, and the Gulf is a relatively small area where most urban areas and critical facilities are near the coast. Aircraft or ships could launch cruise missiles with chemical or biological warheads from outside the normal defense perimeter of the Southern Gulf states, and it is at least possible that Iran might modify anti-ship missiles with chemical weapons to attack tankers. The tankers are usually too large for most regular anti-ship missiles to be highly lethal.

Building an entire cruise missile would be more difficult. The technology for fusing CBW and cluster warheads would be within the grasp of any nation capable of building long-range ballistic missiles. Acquiring and modifying the necessary navigation systems and jet engines, however, would still be a major potential problem. Current inertial navigation systems (INS) would introduce errors of at least several kilometers at ranges of 1,000 kilometers and would carry a severe risk of total guidance failure -- probably exceeding two-thirds of the missiles fired. A differential global positioning system (GPS) integrated with the inertial navigation system (INS) and a radar altimeter, however, might produce an accuracy of 15 meters. Some existing remotely piloted vehicles (RPVs), such as the South African Skua claim such performance. Commercial technology is becoming available for differential global positioning system (GPS) guidance with accuracies of 2 to 5 meters.

There are commercially available reciprocating and gas turbine engines that Iran could adapt for use in a cruise missile, although finding a reliable and efficient turbofan engine for a
specific design application might be difficult. An extremely efficient engine would have to be matched to a specific airframe. It is doubtful that Iran could design and build such an engine, but there are over 20 other countries with the necessary design and manufacturing skills. While airframe-engine-warhead, integration and testing would still present a challenge and might be beyond Iran's manufacturing skills, it is inherently easier to integrate and test a cruise missile than a long-range ballistic missile. Further, such developments would be far less detectable than developing a ballistic system if the program used coded or low altitude directional telemetry. Iran could also bypass much of the problems inherent in developing its own cruise missile by modifying the HY-2 Seersucker for use as a land attack weapon and extending its range beyond 80 kilometers, or by modifying and improving the CS-801 (Ying Jai-1) anti-ship missile. In the case of Iran, there are reports that the Revolutionary Guards are working on such developments at a facility near Bandar Abbas.  

Cruise missiles offer a number of advantages in delivering weapons of mass destruction, particularly chemical and biological weapons. They fly relatively slowly at low-to-medium altitudes and can be developed at virtually any scale from small drones to fighter-sized systems. Most designs are likely to be much cheaper than ballistic missiles, and Gulf and other regional low-altitude air defenses are generally of relatively low quality and readiness. Cruise missiles can be tailored around the desired range-payload, the warhead can be relatively simple, and the missile can deliver a biological or chemical agent slowly in a line-source attack -- the optimal manner of delivering biological agents and one that can produce an order of magnitude more casualties than a bomb or anything other than the most advanced ballistic missile warhead. GPS guidance is more than accurate enough for most biological and chemical attacks, and a larger cruise missile could have precise guidance as to the altitude to be used during the attack phase. It is also possible that a specially designed cruise missile might be sent into a target area before a biologically or chemically armed missile to develop suitable weather and wind data, or be modified for target acquisition and battle damage assessment data. Alternatively, such data could easily be provided by on the scene observers using cellular phones or other commercial
communications.

Such cruise missile systems could reach a wide range of targets in both the US and the Gulf region. A longer-range cruise missile system with a 500-kilometer range could reach a large percentage of the population and industrial strength of the US from positions off either the Atlantic or Pacific costs. The same system deployed in the Gulf region could cover most of Iraq, eastern Turkey, all of Kuwait, the Gulf coast of Saudi Arabia, Bahrain, most of Qatar, the northern UAE, and northern Oman.

A system with a 1,200-kilometer range could reach nearly two-thirds of the population of the US and fifty percent of its economic base or offer such a substantial search areas for attacks on US coastal cities as to present massive detection problems. It could also reach Israel, the eastern two-thirds of Turkey, most of Saudi Arabia, and all of the other southern Gulf states including Oman. Such a system could also be programmed to avoid major air defense concentrations at a sacrifice of about 20% of its range. At the same time, the usual cautions apply to Iran’s probable success in developing effective systems. It is far easier to postulate technical success than it is to achieve it in the real-world, and even large cruise missiles and drones would present major systems integration, manufacturing, and test and evaluation problems. Obviously, North Korean, Iraqi, and other hostile nation deployments would offer a similar mix of benefits in striking against both the American homeland and regional targets.

Shorter-Range Ballistic Missiles

Long-range ballistic missiles based on national soil offer advantages that shorter-range systems do not. Nevertheless, shorter-range systems offer a number of advantages. They are relatively cheap and easy to develop, and they can be tested with considerable reliability on local soil or in local waters. A force developed for such a purpose has just as much value in terms of regional power and influence as it does as a threat against the US. Such developments are also ambiguous. Even if they are detected, the US has no clear way to distinguish between a regional and national threat.
The overt development of a shorter-range attack capability offers a number of advantages. The overt possession of long-range missiles may be the best way in which to intimidate the US or influence its behavior in a regional struggle. At the same time, the overt development of shorter range capabilities offers a less directly provocative form of intimidation covering both the US and its regional allies.

If shorter range strike programs are covert and are not detected, the US could be confronted by attacks where it could not clearly characterize the source – at least in terms totally convincing to the world community. Furthermore, it is at least possible that some regimes would ride out a crisis, accept near-term defeat, and then attack as a “bolt from the blue” in a post crisis period or that a second party would use a crisis or conflict between the US and another state as the cover for its attacks. In contrast, long-range missile attacks from national territory leave no ambiguity at all as to the source and intent of such attacks. So far, few rogue regimes have sought martyrdom, and launching an ICBM against the US borders on suicide.

Shorter-range attacks do a better job of meeting the peculiar criteria for success that apply to any rogue state attack on the US. A regime that actually carries out an attack on the US is confronted with the reality that it cannot defeat the US whether or not the US has the currently contemplated NMD system. The most a hostile power can hope for is to inflect sufficient damage to act as revenge or to “punish” the US. In this context, it does not particularly matter how many cities in the US such a power strikes, or what level of damage it achieves.

Shorter-range attack systems also offer complex economies in terms of both program costs and costs to defeat. For many threat nations, the cost and availability of nuclear and advanced biological warheads will be a substantial part of the cost of deploying either long or short-range attack systems. The ability to deploy the same device on a number of different delivery systems would greatly complicate every aspect of US defense and counterproliferation planning. Unlike long-range missiles, all key potential rogue states already possess shorter-range missiles that can be used to attack the US. The incremental cost of adapted such systems to ship or air delivery is relatively minor, particularly since only very limited numbers of systems are
required.

Equal incentives exist in terms of the cost of defeating US NMD systems. It costs a rogue state almost nothing to appear to deploy shorter-range threats that cannot be covered by the current NMD system, or to develop an overt or covert capability to suddenly deploy such systems. The reaction times involved are far shorter than those the US would need to react by radically increasing its defense system to cover shorter-range missiles, aircraft, and cruise missiles. As a result, rogue states can gain a major advantage in asymmetric warfare at little cost. To use a Cold War term, “countervailing strategy” favors the proliferator that deploys short-range threats either exclusively or in combination with a long-range missile system, possibly making the cost to defeat a US NMD system alarmingly low.

It is interesting in this light to consider the fact that experts in the Department of Defense do not give the threat from long-range missiles priority over the threat from shorter-range systems. Paul G. Kaminski, the Undersecretary of Defense for Acquisition and Technology, made this point in his testimony to the Senate Armed Services Committee, March 6, 1996

“The proliferation of short-range ballistic missiles in the world today poses a direct, immediate threat to many of our allies and to some U.S. forces deployed abroad in defense of our national interests. Over time, the proliferation of longer-range missiles will pose a greater threat to the U.S. itself.

… The theater threat to our allies and U.S. forces deployed abroad is real and growing. We saw it demonstrated in the Gulf War. Besides Iraq, we know there are many ballistic and cruise missiles in many countries. Many thousands of short-range missiles are deployed today with hundreds of launchers in as many as 30 different countries—some of these countries are quite hostile to the United States. This threat is here and now. It is widely dispersed, and it has to be taken very seriously.

In addition to the short-range missile threat, we see a medium-range threat emerging. Some nations are developing their own medium-range missiles; in particular, North Korea is developing the No Dong missile. Other nations, some of them rogue, are buying these missiles or trying to buy them. Iran is a case in point.

We do not see a near-term ballistic missile threat to U.S. territory from the so-called rogue nations, but we cannot be complacent about this assessment. However, the threat of long-range missiles from rogue nations could emerge in the future. The intelligence community estimates that this threat would take 15 years to develop, but could be accelerated if those nations acquired this capability from beyond their borders. This is why our counterproliferation programs are important and why the role of missile defense within this broader national strategy must be carefully integrated into U.S. defense planning.

…Our review reaffirmed the fundamental priorities in our missile defense program. The first priority is to defend against theater ballistic missiles and cruise missiles. Within the theater missile defense mission area,
the review broke some new ground on defining the underlying subpriorities. The first subpriority is to field systems to defend against the existing short- to medium-range missiles—our lower-tier TMD systems. The next subpriority is to proceed at a prudent pace to add wide area defenses and defenses against the longer-range theater missiles as that threat emerges—the upper-tier TMD systems.

Our second priority is to develop a capability to defend against intercontinental ballistic missiles—our national missile defense program—and the cruise missiles which may threaten the United States in the future.

Finally, our third priority is developing a robust technology base to underlie these two programs—both the TMD program and the NMD program—to be able to develop and deploy more advanced missile defense systems over time as the threat systems they must counter become more advanced.”

While this statement may not please those proponents of NMD that focus solely on the long-range ballistic missile threat, it seems to reflect a realistic picture of the threat posed by short and medium range missiles, and it is obvious that this threat is considerably greater if such systems are considered as potential threats to the US and not simply to its allies or forces overseas.

**Non-Missile WMD Threats to the US**

Cruise missiles, short-range missiles, and aircraft are only part of the problem. There are no rules that require an attacker to use missiles to attack the American homeland, or to openly attack in any form. Hostile powers can mount covert attacks on the US in which they use extremist or terrorist groups as proxies, or in which extremist and terrorist groups act upon their own. The US government has conducted a long series of studies that show that such attacks are fully feasible, and cheaper than either long or short range overt attacks on the US using missiles, aircraft, or ships firing weapons from a distance.

The NIC report referred to earlier warns that there are a wide range of threats that do not require a hostile power to use missiles to deliver weapons of mass destruction: 157

“Although non-missile means of delivering WMD do not provide the same prestige or degree of deterrence and coercive diplomacy associated with an ICBM, such options are of significant concern. Countries or non-state actors could pursue non-missile delivery options, most of which:

- Are less expensive than developing and producing ICBMs.
- Can be covertly developed and employed; the source of the weapon could be masked in an attempt to evade retaliation.
• Probably would be more reliable than ICBMs that have not completed rigorous testing and validation programs.

• Probably would be more accurate than emerging ICBMs over the next 15 years.

• Probably would be more effective for disseminating biological warfare agent than a ballistic missile.

• Would avoid missile defenses.

The requirements for missile delivery of WMD impose additional, stringent design requirements on the already difficult technical problem of designing such weapons. For example, initial indigenous nuclear weapon designs are likely to be too large and heavy for a modest-sized ballistic missile but still suitable for delivery by ship, truck, or even airplane. Furthermore, a country (or non-state actor) is likely to have only a few nuclear weapons, at least during the next 15 years. Reliability of delivery would be a critical factor; covert delivery methods could offer reliability advantages over a missile. Not only would a country want the warhead to reach its target, it would want to avoid an accident with a WMD warhead at the missile-launch area. On the other hand, a ship sailing into a port could provide secure delivery to limited locations, and a nuclear detonation, either in the ship or on the dock, could achieve the intended purpose. An airplane, either manned or unmanned, could also deliver a nuclear weapon before any local inspection, and perhaps before landing. Finally, a nuclear weapon might also be smuggled across a border or brought ashore covertly.

Foreign non-state actors, including some terrorist or extremist groups, have used, possessed, or are interested in weapons of mass destruction or the materials to build them. Most of these groups have threatened the United States or its interests. We cannot count on obtaining warning of all planned terrorist attacks, despite the high priority we assign to this goal.

Recent trends suggest the likelihood is increasing that a foreign group or individual will conduct a terrorist attack against US interests using chemical agents or toxic industrial chemicals in an attempt to produce a significant number of casualties, damage infrastructure, or create fear among a population. Past terrorist events, such as the World Trade Center bombing and the Aum Shinrikyo chemical attack on the Tokyo subway system, demonstrated the feasibility and willingness to undertake an attack capable of producing massive casualties.

It is extremely dangerous to assume that any hostile power will not take advantage of such forms of attack. Indeed, if the US does deploy an NMD system, the incentive to use such forms of attack will be sharply increased, and the cost to an attacker in using such methods to an NMD system will be very low.

**The Hierarchy of Missile Threats**

Proliferation poses a broad range of threats to the US homeland, as well as our allies and coalition partners. The proliferation of long-range missiles armed with weapons of mass destruction is one of these threats, and it has become obvious that nations like Iran and North Korea are acquiring the capabilities to build such missiles. While threats are now only potential threats, they can become real threats during the next few years and they do indicate that there
may be a need for national missile defense (NMD).

At the same time, such threats only part of the spectrum of threats the US must deal with. It is not possible to state that NMD is *currently* necessary to meet actual threats, or that the kind of limited threat postulated as the rationale for the limited NMD system the US now contemplates is certain to materialize. There also is no clear way to estimate the trade-offs that will take place in terms of Russian and Chinese reactions or to predict the potential growth of other threats targeted against the American Homeland.

It is important to remember that US national strategy clearly accepts the fact that NMD is not capable of providing effective defense of the US Homeland except as part of a broadly integrated Homeland defense program. Undersecretary Walter Slocombe made this point clear in his address to the CSIS on November 5, 1999: \(^{158}\)

Active defense can play a role, but a national missile defense is only a part of the effort to protect ourselves from these and other ballistic missile threats. The United States seeks to prevent and reduce the threat through a whole range of means: export control measures, such as the missile technology control regime; arms reduction agreements such as START I and II; international non-proliferation arrangements such as a the nonproliferation treaty; and cooperative nonproliferation efforts such as the Cooperative Threat Reduction Program. We also maintain an active program of bilateral and multilateral diplomacy to discourage the transfer and indeed the acquisition of missiles and capabilities that would threaten the United States or key allies.

We also deter the threat by maintaining powerful nuclear and conventional forces. Those who would threaten America or its allies should have no doubt any attack on us would meet an overwhelming response. There is no contradiction between defenses and deterrence. At the core of deterrence is convincing an adversary that the assured negative consequences of an action greatly outweigh any potential positive results of that action.

There are thus two sides to deterrence. The threat of retaliation drives home that the negative consequences would be huge. But it is also valuable for deterrence to reduce the chance that an attack would succeed in the first place -- that is, to reduce the prospect of positive results. And missile defenses can do that.

President Clinton made similar points in his speech of September 1, 2000, deferring a decision on deploying an NMD system: \(^{159}\)

None of the elements of our national security strategy can be pursued in isolation. Each is important and we have made progress in each area….diplomatic efforts to meet the threat of proliferation are backed by the strong and global reach of our armed forces. Today the United States enjoys overwhelming military superiority over any potential adversary. For example, in 1985, we spent about as much on defense as Russia, China and North Korea combined. Today we spend nearly three times as much, nearly $300 billion
a year, and our military technology clearly is well ahead of the rest of the world.

The principle of deterrence served us very well in the cold war and deterrence remains imperative. . . The question is, can deterrence protect us against all those who might wish us harm in the future? Can we make America even more secure? The effort to answer these questions is the impetus behind the search for N.M.D. The issue is whether we can do more not to meet today’s threat but to meet tomorrow’s threats to our security.

For example, there is the possibility that a hostile state with nuclear weapons and long-range missiles may simple disintegrate with command over missiles falling into unstable hands. Or that in a moment of desperation such a country might miscalculate, believing it could use nuclear weapons to intimidate us from defending our vital interests or from coming to the aid of our allies or others who are defenseless and clearly in need.

In the future, we cannot rule out that terrorists groups could gain the capability to strike us with nuclear weapons if they seized even temporary control of a state with an existing nuclear weapons establishment.

Now, no one suggests that N.M.D. would ever substitute for diplomacy or for deterrence. But such a system, if it worked properly, could give us an extra dimension of insurance in a world where proliferation has complicated the task of preserving the peace. Therefore, I believe we have an obligation to determine the feasibility, the effectiveness and the impact of our—of a national missile defense on the overall security of the United States.

In short, it may be prudent for the US to develop the capability to deploy an NMD system capable of deterring and defending against such threats, but only if such an NMD system can meet four key criteria:

- It is part of an integrated approach to homeland defense that provides balanced defense against other new threats like covert and terrorist CBRN attacks, air breathers and short-range missiles, and cyber warfare.
- It is linked to similar steps to protect America’s allies, US power projection forces, and strategic interests overseas.
- It does not provoke arms races which offset the protection the US gains, provoke changes in the very real missile threats the US already faces from Russia and China, and bloc progress in arms control, and
- It is technically feasible, cost-effective, and has the growth potential to deal with evolving threats.

This last criteria is as critical as any potential development in the threat, and any strategic considerations. The US does not face the kind of existential missile threat that justifies a crash effort in spite of other resource considerations and national priorities. It has other ways to deter missile attacks on the American homeland, and it has the time to make wise decisions and do the job right. No analysis of missile threats to the American homeland cannot be decoupled from the type of NMD program the US now contemplates and its potential impact in both
defending against new threats.

The History of the Modern US National Missile Defense Program

The present US NMD system is not a response to the full range of missile threats against the US, but there is little point in attempting a “zero-based” review of what US system is really required to deal with all of the threats the US faces. The current US program is the result of 17 years of effort to shape a political consensus around the program the US should fund, deploy, and sustain. This effort has had five major phases, which have been summarized in Table III.1.160

During this time the NMD program has evolved from the goal of providing a comprehensive shield against the largest scale of missile attacks on the American homeland to the far more limited defense described earlier. In the process, it has evolved from one oriented towards the Cold War threat by using extremely advanced space-based missile weapons to a one oriented towards defending against “rogue states” using land-based interceptors similar in concept to the defenses the US examined in the era before the ABM Treaty.

Equally important, the overall US investment in the ballistic missile defense program has evolved from one focused on the defense of US territory to one that invests more in theater missile defense than national missile defense. NMD is now only part of a far more comprehensive effort to develop a family of missile defenses.

The SDIO Era

The first phase of the US program took place during 1987-1989, and involved total Department of Defense expenditures of roughly $21.2 billion. It grew out of President Reagan’s original “star wars” speech in 1983 – a speech that led to the creation of the Strategic Defense Initiative Organization (SDIO) within the Department of Defense in April 1984. The new SDIO was devoted to developing the technologies needed to create a comprehensive land and space-based strategic defense against inter-continenental ballistic missiles (ICBM's) and similar
submarine-launched ballistic missiles. Its budget was structured to respond to “existing and emerging threats from missile warfare towards the United States, and its forward deployed forces, allies, and friends around the world.” In practice, however, its primary orientation was to defend against the Cold War threat from the Soviet Union.¹⁶¹

From the start, the program exposed deep divisions over the technical feasibility of such a program, its impact on the arms race, and its impact on arms control. There were those who argued that such a program could be deployed in the near-term and those who argued that the technology involved could never be cost-effective and would be relatively easy to defeat. There were also those who argued for a nearly leak-proof shield over the American homeland -- although the official rationale for the program evolved into one whose mission was described in much more modest terms and as to “enhance deterrence of a Soviet first strike,” although this still meant the future deployment of 1000’s of space-based interceptors. The Department of Defense history of the program states that, “At the inception of SDIO, the vision of BMD embraced by President Ronald Reagan of eliminating the threat of nuclear attack by use of space-and ground-based interceptors needed tremendous amounts of research to become a reality.”

As a result, SDIO devoted virtually all of its initial efforts and budget resources to developing the technologies necessary to deploy a comprehensive ballistic missile defense system. This effort focuses on three main technology programs: Surveillance, Acquisition, Tracking, and Kill Assessment (SATKA), Directed Energy Weapons Technology (DEW), and Kinetic Energy Weapons Technology (KEW). The SATKA programs pursued signal processing, ground and space-based sensors and surveillance systems, and microwave radar technology. The DEW programs included various laser programs and neutral particle beam technology. The KEW programs included Brilliant Pebbles, Space-based Interceptor, and interceptor integration technology. Systems Analysis/Battle Management (SA/BM) programs were concerned with systems engineering.

While SDIO examined a wide range of possible deployment concepts, it was not
concerned with the actual procurement and deployment of weapons, and the programs summarized in Table III.8 were devoted to developing the technologies necessary for missile defense.

Table III.8


<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SATKA</td>
<td>546</td>
<td>844</td>
<td>926</td>
<td>936</td>
<td>1083</td>
<td>1238</td>
<td>719</td>
</tr>
<tr>
<td>DEW</td>
<td>378</td>
<td>796</td>
<td>853</td>
<td>935</td>
<td>869</td>
<td>695</td>
<td>351</td>
</tr>
<tr>
<td>KEW</td>
<td>256</td>
<td>596</td>
<td>723</td>
<td>771</td>
<td>752</td>
<td>785</td>
<td>996</td>
</tr>
<tr>
<td>SA/BM</td>
<td>100</td>
<td>212</td>
<td>385</td>
<td>461</td>
<td>486</td>
<td>525</td>
<td>504</td>
</tr>
<tr>
<td>SLKT</td>
<td>108</td>
<td>214</td>
<td>375</td>
<td>430</td>
<td>414</td>
<td>328</td>
<td>292</td>
</tr>
<tr>
<td>Mgmt HQ</td>
<td>9</td>
<td>14</td>
<td>18</td>
<td>20</td>
<td>23</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TMDI</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>226</td>
</tr>
</tbody>
</table>


The second major phase of the NMD effort took place during 1989-1992, during the end of the Cold War. The focus of the US ballistic missile defense program changed from comprehensive defense to Global Protection Against Limited Strikes (GPALS). In 1991. This change led to a restructuring of the SDIO budget to reflect the new priorities. The US creased to focus on blunting a massive ICBM attack by the Soviet Union. Instead, it focused on defending against a limited missile strike launched by a rogue state or non-state actor. This meant that the efforts of SDIO toward TMD could be increased, although attention was maintained towards NMD Space Based Interceptors included funding for systems development of Brilliant Pebbles. Other Follow-on Systems included directed energy weapons such as the Chemical Laser.^{162}

This phase of the US NMD effort cost roughly $7.64 billion, and the cost of each major
program activity is shown in Table III.9 below. It is important to note that the basic program goal of Phase II was essentially the same goal the US is now pursuing with its current NMD architecture, although Phase II still involved significant research into space-based weapons, and now included a major dimension for theater defense.

**Table III.9**


(In millions of then year $US dollars)

<table>
<thead>
<tr>
<th>Program</th>
<th>1992</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited Defense System</td>
<td>1482</td>
<td>1675</td>
</tr>
<tr>
<td>Space Based Interceptors</td>
<td>434</td>
<td>211</td>
</tr>
<tr>
<td>Other Follow-on Systems</td>
<td>528</td>
<td>300</td>
</tr>
<tr>
<td>Research &amp; Support</td>
<td>666</td>
<td>418</td>
</tr>
<tr>
<td>Theater Missile Defense</td>
<td>797</td>
<td>1028</td>
</tr>
<tr>
<td>Procurement</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>3,932</td>
<td>3,707</td>
</tr>
</tbody>
</table>


**The Impact of BMDO**

The third phase of the NMD program, or “technology readiness” phase, took place during 1993-1995, and its goal was to reduce the deployment time for a ground based system. The scope of the NMD effort was further narrowed, and more emphasis was placed on theater missile defense which led to another reorganization of the management of the US missile defense effort in 1993. As a result, SDIO became the Ballistic Missile Defense Office (BMDO).

This reorganization led to a further major restructuring of the program. The missile defense effort now had three major areas of activity and objectives. The first was theater missile
defense and supporting the deployment of a robust TMD capability as soon as possible. This effort has addressed the widely dispersed theater ballistic missile threats with ranges under 1,200-kilometers that already existed, and involved development and flight testing of THAAD, PAC-3, and Navy systems. The second phase was national missile defense and to position the United States to be ready to defend against a limited ballistic missile threat. The third was Advanced Technology effort which supports both TMD and NMD in an effort to continue to advance US capabilities to counter future and possibly more complex threats. During this phase, the work in all three areas of program activity focused on research and development. This activity had a total cost of roughly $9.2 billion during 1993-1995. It also shifted resources from an NMD dominated program to one where about 70% of the costs went to theater missile defense.

In April 1996, the Department of Defense changed the purpose of the NMD program from a technology readiness program to a deployment readiness program and designated NMD as a major defense acquisition program and sought matured technologies for possible use in a NMD system. This fourth “deployment readiness” phase lasted during 1996-1999, and had a total cost of roughly $14.2 billion. It continued to put the bulk of its resources into theater missile defense, but focused on the NMD as a Major Defense Acquisition Program and Deployment Readiness Program. This program, also called “3+3,” sought to develop a NMD system capable of being deployed within three years after a deployment decision at a Deployment Readiness Review (DRR) in 2000. The initial goal of the NMD 3+3 program was to develop and demonstrate, by fiscal year 2000, an initial, limited capability that could be deployed by fiscal year 2003. The DRR criteria were stated to be the existence of the necessary threat and technological capability to proceed.

When the NMD program was changed to a deployment readiness program in April 1996, plans and requirements were not sufficiently defined to allow the development of a reliable cost estimate. The Fiscal year 1996 and 1997 budget requests were submitted to Congress before the program was changed to a deployment readiness program. In late 1995 and early 1996, DOD conducted a “Program Update Review” to determine how to proceed with the NMD program.
The review considered a number of options for NMD. The option selected included an integrated test in fiscal year 1999 and a possible deployment decision in fiscal year 2000. DOD estimated that research, development, and test and evaluation costs for this option would total about $2.3 billion for fiscal years 1998 through 2003. According to program office officials, this update review was based on a “rough order of magnitude” cost estimate derived from engineering judgment and field estimates. Detailed system requirements had not been established from which to make a formal, documented cost estimate.

Once NMD became a deployment readiness program in 1996, the focus changed from technology and component development to development and testing of a system that could be quickly deployed. One of the first steps was to define operational requirements for the system. U.S. Space Command defined broad requirements for an NMD system in August 1996. This was followed by NMD’s first system requirements review held in November 1996.

Once these requirements were known, they had to be defined in sufficient detail so that the contribution of each system component to the requirement could be determined. According to DOD officials, it was only after these detailed requirements were established that detailed cost estimates could be produced. The NMD program office used the requirements data to prepare a new, more rigorous cost estimate. DOD’s Office of Program Analysis and Evaluation also prepared an independent cost assessment. These estimates were not completed in time to affect the fiscal year 1998 President’s budget request.

The program office estimated that about $4.6 billion would be required for research, development, test and evaluation—about $2.3 billion higher than previous projections. The independent assessment confirmed the program office’s projection of research, development, test and evaluation costs. As a result of these estimates, it was apparent to DOD officials that the NMD program was significantly under funded. According to DOD officials, these were the first disciplined, system-level cost estimates based on requirements necessary to field an NMD system.\textsuperscript{163}
The Quadrennial Defense Review, which was underway at the time the estimates were prepared, examined three options for the NMD program:164

- The first option was to keep NMD within its current budget, which would mean that system deployment would be delayed by at least 3 years or that the program would once again become a technology readiness program.

- The second option was to increase program funding to the levels indicated by the new estimates—an increase of about $2 billion in fiscal years 1998 through 2003—in order to maintain the 3+3 program schedule. Even with the additional funding, however, schedule risks were predicted to remain high.

- The third option was to increase program funding by up to $1.5 billion but also extending the schedule by about 3 years.

The review recommended the second option—increased funding to maintain the option to make a deployment decision in 2000. The Secretary of Defense asked Congress to increase the fiscal year 1998 budget request for NMD by $474 million. Congress appropriated the requested additional funds. DOD estimated that an additional $1.8 billion would be needed for fiscal years 1999 through 2003, bringing the total increase to about $2.3 billion. The amount of increased funding was based on the Office of Program Analysis and Evaluation’s independent cost assessment.

As a result, BMDO shifted the initial deployment of NMD to 2005 rather than 2003 in order to reduce program risks. The GAO provides the following summary of these reasons for these decisions:165

DOD significantly increased its NMD funding requirements in May 1997 because more rigorous cost estimates, based on more detailed program requirements and plans, showed that the program could not be accomplished within previously projected funding levels...the 3+3 NMD program was not sufficiently defined for detailed cost estimating when it initially changed from a technology readiness program to a deployment readiness program, and was designated a major defense acquisition program in April 1996; (3) the May 1997 Quadrennial Defense Review included the first program estimate based on detailed system descriptions, requirements, and plans; (4) funding increases provided by Congress in fiscal years 1996 through 1998 were used for risk reduction activities, such as: (a) retaining competition in the development of the exoatmospheric kill vehicle, considered one of the most technically challenging components of the system; (b) increasing the number of planned tests; and © purchasing additional spare hardware; (5) Congress increased funding for NMD because of concerns about the adequacy of funding to support the program; (6) the Ballistic Missile Defense Organization (BMDO) Director acknowledged in an April 1996 testimony that an additional $350 million a year could be used to reduce program risks; (7) future NMD funding requirements will depend in large part on the system design and architecture, and when and where it is deployed; (8) details on the specific system and location are not expected for some time; (9) program life-cycle costs ranged from $18.4 billion by fiscal year 2003 to $28.3 billion by fiscal year 2006; (10)
since GAO’s December 1997 report, DOD has increased funding and revised NMD program plans to mitigate schedule and technical risks; (11)however, program officials told GAO that even with the mitigation actions resulting from the increased funding, schedule and technical risks associated with a 2003 deployment remain high; (12) according to a February 1998 report of a panel of former senior military, government , and industry officials, successful execution of the 3+3 program on the planned schedule is highly unlikely; and (13) this panel concluded that the program would benefit from the earliest possible restructuring to contain the risk.

The details of the program changes during this period provide a good picture of the real-world problems in developing such a complex system. A historical analysis by the GAO shows the allocations of Congressional authorization during FY 1996 through FY 1998. Over 80 percent of additional funding was allocated to six program areas—the ground-based interceptor; ground-based radar; system integration; battle management, command, control, and communications system; systems engineering; and test and evaluation. According to NMD officials, these funding increases were used for risk reduction activities and to execute the 3+3 program. Table III.10 shows how the funding increases for the 3-year period, fiscal year 1996 to 1998, were allocated.166

Table III.10

Allocations of Congressional Funding Increases for Fiscal Years 1996 Through 1998

<table>
<thead>
<tr>
<th>Funding increase by Program Area</th>
<th>Dollars in Millions</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground-based interceptor</td>
<td>$434</td>
<td>37</td>
</tr>
<tr>
<td>Systems integration</td>
<td>159</td>
<td>14</td>
</tr>
<tr>
<td>System test and evaluation</td>
<td>149</td>
<td>13</td>
</tr>
<tr>
<td>Ground-based radar</td>
<td>107</td>
<td>9</td>
</tr>
<tr>
<td>Battle management, command,</td>
<td>72</td>
<td>6</td>
</tr>
<tr>
<td>control, and communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems engineering</td>
<td>57</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>196</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>$1,174</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: totals may not add due to rounding.

The largest increase, $434 million (over one-third of the 3-year total), was allocated to the ground-based interceptor. Most of these funds were used to maintain competition in the design and development of the interceptor’s kill vehicle. The original plans were to select a
single kill vehicle design and contractor at the end of 1995 before either of the two competing
designs had been fully tested—even though the kill vehicle was one of the most complex parts of
the NMD system. The additional funding allowed the program to preserve the kill vehicle
competition through actual intercept tests in fiscal years 1998 and 1999. Some of the increased
funding was also needed to cover the costs of a schedule slippage due to the failure of a flight
test in January 1997, purchase a spare kill vehicle from one of the contractors, and upgrade
launch capabilities at the test range. Because of subsequent funding reductions, and a decision to
incorporate the ground-based interceptor into a lead system integration contract, program
officials decided not to begin development of a booster for the interceptor.

Increases totaling $159 million allocated to systems integration were used to obtain a
prime contractor for the system. BMDO decided in the summer of 1996 that a prime contractor
would be needed to manage the remaining design and development effort and to integrate and
test the complete NMD system. Two competitive concept development phase contracts were
awarded in fiscal year 1997. One of two concept development phase contractors, Boeing North
American Company, won the Lead System Integrator (LSI) contract on April 30, 1998. The LSI
serves as the prime contractor for NMD system development. The LSI contractor will be
responsible for integrating the elements of NMD (radar, interceptors, and the BMC3). In
addition, the LSI will demonstrate the system capability through integrated ground and flight
testing, and will serve as the key player in developing the necessary plans for fielding the system,
should the decision be made to do so.

In December 1998, Boeing selected Raytheon as the EKV contractor. A Boeing designed
EKV is to be held in abeyance, as a risk reduction activity, until completion of data reduction of
Integrated Flight Test-4. Plans for this kill vehicle are undefined at this time. The other major
team members included Raytheon (ground based interceptor kill vehicle and NMD radars), TRW
(BMC3), and Lockheed Martin (payload launch vehicle for initial tests).\textsuperscript{167}

An increase of $149 million in the system test and evaluation effort was used in part for
additional test targets. Some of the increased funding has also been used to develop an
integrated system test capability needed for ground tests of the various elements of the NMD system. The added funding also permitted increased testing such as using targets of opportunity to test ground-based system elements and a Midcourse Space Experiment designed to obtain information on viewing targets against earth and space backgrounds—a critical capability in identifying and tracking threatening warheads.

Funding increases amounting to $107 million allocated to the ground-based radar have been used to enhance realism in and to accelerate development of the radar that will be used in testing. Original plans were to conduct the tests with a radar technology demonstrator. However, with the increased funding, BMDO decided to construct a ground-based radar prototype to be used in the testing program. The prototype has a larger face than the demonstrator and more closely resembles the radar to be deployed. Additionally, the radar development was accelerated.

After NMD became a deployment readiness program, BMDO found that that a more extensive battle management, command, control, and communications effort was needed to support an NMD system. This effort sought to provide engagement planning and execution, allow human-in-control of the NMD system, and interface with external command, control, and communications systems. With $72 million in additional funding allocated to this element, BMDO was able to begin development of five capability increments of a prototype battle management, command, control, and communications system. The first three increments were completed by April 1998. BMDO also added a NMD communication network and a system that will be used to communicate with the NMD interceptor in-flight.

The originally planned funding levels for systems engineering were sufficient only to support a technology readiness program. Funding for this effort was increased by $57 million mostly in order to prepare and update documents required for a system deployment. BMDO reported that without the additional funding, it would not have been able to baseline the NMD system architecture, and, thus, there would not be a NMD system.
The remaining $196 million of the increases was allocated in smaller increments to a number of areas. The largest of these was an increase of about $50 million for program management support. The increase paid for personnel and contractor support for the joint program office as well as for systems analyses and small business innovative research. Personnel costs previously spread through all the projects were rolled up into one project management line item.

These changes in the program during 1996-1999 did not represent unusual cost escalation or delays for a program of the complexity of an NMD system. They also ensured that NMD research and defense activity was successful in a number of areas, and resolved many of the remaining development and systems integration issues affecting the deployment of a limited ground-based system. As a result, the Secretary of Defense announced in January 1999 that the threat criteria would soon be met, and funds were programmed to move NMD from the development phase to a deployment phase should BMD be directed to do so.

The NMD Acquisition Phase of NMD Activity

The fifth phase of the NMD program began in 2000, although the preliminary NMD system design underwent a successful System Preliminary Design Review (PDR) as early as July 1999. The US State Department announced for the first time in September 1999 that it had selected Alaska as the first interceptor site. This announcement was not picked up in the public literature provide on the system by BMDO, which still refers to a deployment near Grand Forks in North Dakota.

The fifth phase focuses on “NMD acquisition,” and its goal is to prepare for the initial deployment of a limited NMD system by 2005. The BMDO describes this phase as follows: “The current NMD Program is structured to develop, demonstrate and present at a Deployment Readiness Review in FY2000, an integrated system designed to meet the threat requirement. The Development Phase is currently underway and an Integrated System Test is planned for FY2000, prior to the Deployment Readiness Review. Subsequent to FY2000 Review, and if directed to do so, the Program will complete system development and field an initial capability, designed to
protect the 50 States from a limited attack, by FY2005. “

It is important to note, however, that this NMD system is ground-based only and currently budgets for only 20 interceptors. Furthermore, more BMDO resources were devoted to theater than national missile defense, and a major research effort remained underway to develop defenses considerably more advanced than the ones the US currently plans to deploy as part of its nominal NMD architecture.

The current theater missile defense effort focuses on the deployment of the US Army Theater High Altitude Area Defense (THAAD), the US Aegis Navy Area theater ballistic missile defense (TBMD), and Patriot Advanced Capability 3 (PAC-3) programs as part of a “new organizational focus concentrating on providing theater missile defense to troops stationed overseas and to any emerging threats to U.S. territory.” The Advanced Technology program is a “third priority,” which is “intended to provide technology options for improvements to planned and deployed defenses, operational support costs and command facilities. Survivability, Lethality, and Key Support Technologies (SLKT) involved countermeasures integration, lethality and target hardening, and new concepts development.” Recent BMDO spending on these efforts is shown in Table III.11.
Table III.11

Recent BMDO Spending on Missile Defense

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Appropriated</td>
<td>Appropriated</td>
<td>Requested</td>
</tr>
<tr>
<td>RDT&amp;E</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navy Area TBMD</td>
<td>290</td>
<td>245.8</td>
<td>268.4</td>
</tr>
<tr>
<td>Navy Theater Wide</td>
<td>410</td>
<td>368.4</td>
<td>328.8</td>
</tr>
<tr>
<td>PAC-3</td>
<td>206</td>
<td>322.3</td>
<td>29.1</td>
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<tr>
<td>THAAD System</td>
<td>406</td>
<td>445.3</td>
<td>611.6</td>
</tr>
<tr>
<td>NMD</td>
<td>978</td>
<td>1550.5</td>
<td>836.6</td>
</tr>
<tr>
<td>Other</td>
<td>1,095</td>
<td>972.2</td>
<td>868.9</td>
</tr>
<tr>
<td>Total</td>
<td>3,385</td>
<td>3,904.5</td>
<td>2944.4</td>
</tr>
<tr>
<td>Procurement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC-3</td>
<td>349</td>
<td>248.2</td>
<td>300.9</td>
</tr>
<tr>
<td>Navy Area TBMD</td>
<td>15</td>
<td>43.3</td>
<td>55.0</td>
</tr>
<tr>
<td>BMC3</td>
<td>20</td>
<td>22.8</td>
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<tr>
<td>Total</td>
<td>385</td>
<td>314.3</td>
<td>355.9</td>
</tr>
<tr>
<td>MILCON</td>
<td>3</td>
<td>10</td>
<td>1.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,773</td>
<td>4,228.8</td>
<td>3,301.7</td>
</tr>
<tr>
<td>% Directly on NMD</td>
<td>26%</td>
<td>23%</td>
<td>25.3%</td>
</tr>
</tbody>
</table>


Jacques S. Gansler, the Under Secretary of Defense for Acquisition and Technology provided the following additional details on the FY2000 missile defense program in his testimony to the House Armed Services Committee on February 25, 1999:

"Of the $6.6 billion in new funds programmed for national missile defense, $600 million will be provided using the FY 1999 Emergency Supplemental for Ballistic Missile Defense. These supplementary funds permit additional risk-reduction efforts, as well as activities needed to ensure a smooth transition to deployment should a decision be made in FY 2000 to begin deploying the system. Previous plans for testing national missile defense components and the system prior to the deployment decision remain unchanged. In June 1999, the performance of the exo-atmospheric kill vehicle will be demonstrated in the first national missile defense intercept attempt. Subsequent tests, to be conducted before the June 2000 decision point, will further evaluate the system's performance, culminating in an "end-to-end" systems test in the second quarter of FY 2000.

"To maximize the probability of programmatic success and be able to deploy a technologically capable system as quickly as possible, key national missile defense decisions will be phased to occur after critical integrated flight tests. As a result, instead of projecting a deployment date of 2003 with exceedingly high risk, the Department now projects a deployment date of 2005 with much more manageable, although still high, risk. The funds added to the national missile defense program in FY 2001-2005 support a deployment in FY 2005. The majority of national missile defense funding through FY 2000 is in the RDT&E..."
appropriation; procurement funding would begin in FY 2001. Military construction funds are programmed in FY 1999 for design, while construction is funded in FY 2001-2005.

“If testing goes flawlessly, and there is a willingness to accept higher program risk, we could seek to deploy sooner. But independent analysts have expressed concern that the Department’s fast-paced schedules for ballistic missile defense programs have sometimes represented a “rush to failure.” Given the reality of the threat, the national missile defense program cannot afford to fail.

“The Air Force’s Space Based Infrared System (SBIRS) system is an important element of our BMD program. Both components of the SBIRS program, SBIRS-High and -Low, have seen significant cost growth and technical challenges during the past year. The President’s Budget restructures both components of the SBIRS program to make optimum use of available Defense Support Program satellites, yet provide timely support to the ballistic missile defense mission.

In that regard, we are rescheduling the SBIRS-High program’s first launch of its geosynchronous satellite to FY 2004. We currently have five Defense Support Program satellites awaiting launch, and the Department, in executing its stewardship responsibilities, must make full use of those satellites before launching a replacement system. The new SBIRS-High schedule synchronizes well with the new national missile defense schedule in that the required number of SBIRS-High geosynchronous satellites (two) will have been launched in time to support a national missile defense deployment in 2005. It should be noted that, although SBIRS-High will provide improved performance compared to its predecessor in all mission areas, the Defense Support Program is adequate for the strategic warning mission. And the Defense Support Program can support the initial deployment of the national missile defense system, with only a very slightly reduced confidence level of successful defense.

“We are also restructuring the SBIRS-Low component, resulting in a planned first launch in FY 2006. This change is driven primarily by the technical challenges and complexities inherent in the system. As part of the SBIRS-Low restructure, after the formulation of the FY 2000 President’s Budget, we cancelled the two flight demonstration experiments that were part of our earlier-conceived risk reduction effort. Much has already been learned and significant risk has been mitigated through the design, fabrication, assembly, and integration accomplished to date. Continuation of the flight experiments is not critical to SBIRS-Low, and the remaining program risk is best addressed in the now more robust Program Definition studies that will constitute the next phase of the SBIRS-Low acquisition. We intend to pursue the SBIRS-Low program in a manner consistent with program risk and the need to support our BMD programs.

“Activities in the missile defense technology base are key to countering future, more difficult threats. The technology base program underpins the theater ballistic missile defense, cruise missile defense, NMD, and Space Based Laser programs. It will enable the Department to provide block upgrades to baseline systems, perform technology demonstrations, reduce program risk, accelerate the insertion of new technologies, and develop advanced technologies to provide a hedge against future surprises. Advanced technologies are also being exploited to reduce the cost of future missile defense systems.

“In the past, BMDO explored many potential solutions to ballistic missile defense, including exotic or leap-ahead technologies (X-ray lasers, neutral particle beams, Brilliant Pebbles). Today's thrust is to provide research and development in technical areas that support our missile defense programs. Three programs in particular illustrate BMDO's current thinking: 1) the Atmospheric Interceptor Technology program, which develops advanced missile technologies for PAC-3, THAAD, and Navy Theater Wide to address advanced threats and reduce cost, 2) the Exoatmospheric Interceptor Technology program, which is developing and demonstrating advanced seeker concepts, as well as advanced materials, to provide upgrades to both NMD and TMD interceptors, to counter the evolving threat and reduce cost, and 3) the Advanced Radar Technology program which improves signal processing capabilities and reduces key component costs. We
expect these programs to provide useful hardware and data to the TMD and NMD programs.

“Recently, BMDO and the Air Force had an Independent Review Team of laser, operational, and programmatic experts examine the Space Based Laser program. They proposed that any orbital flight experiment be preceded by extensive integrated ground demonstrations of key technologies and flight system elements. The subsequent orbital spacecraft experiment they envision would demonstrate large, lightweight deployable optics, a new concept in very large mirrors that could enable dramatic savings in vehicle weight and attendant cost.

“We have developed a laser technology program that balances long-term research and development goals with a nearer-term goal to demonstrate the basic feasibility of a system. The total outlay for the program will be $139 million in FY 1999 and $139 million per year through FY 2000-2005. The technology program, jointly funded by BMDO and the Air Force, will fund a ground demonstration and permit a subsequent decision to increase funding enroute to orbiting a spacecraft. Affordability--both of a demonstration flight and of an eventual operational system--is a key concern on which we intend to focus.”

The Clinton Administration’s 2000 budget request for the Ballistic Missile Defense Organization totalled $3.3 billion. This included $2.9 billion for RDT&E, $355.9 million for procurement, and $1.3 million for military construction activities. Combining these three budget categories, the Theater Air and Missile Defense programs accounted for $1.9 billion or roughly 60 percent of the budget. National Missile Defense represented $836.6 million or 25 percent of the budget. The Administration requested $65.3 million for Applied Research and $173.7 million for Advanced Technologies, together, these programs represented about 7 percent of the budget. BMD Technical Operations accounted for $192.0 million and is about 6 percent of the budget. The Administration requested $16.5 million for Threat and Countermeasures efforts and $36.6 million for International Cooperative Programs. Together, these programs represent 2 percent of our overall budget.

The Congress chose to appropriate more money for FY2000 than the Department of Defense requested. The Department requested $3,672,822,000 for all ballistic missile defense programs. The bill provided for a total of $3,899,543,000 for all ballistic missile defense programs. It included $3,669,543,000 in new appropriations and $230,000,000 to be derived from funds previously provided in Section 102 of division B, title I, chapter 1 of Public Law 105-277. A total of $2,970,009,000 was provided for research and development; $355,900,000 was provided for procurement within the Ballistic Missile Defense Organization (BMDO) budget; and, $343,634,000 was provided in Air Force research and development programs to
include $308,634,000 for the Airborne Laser and $35,000,000 for the Space-Based Laser. The bill provided the budgeted amount for the joint U.S.-Israel ARROW anti-tactical ballistic missile development program, and provides for $45,000,000 to support deployment of a third ARROW battery. The recommended amounts represented an increase of $226,721,000 over the budget request of $3,672,822,000 for these programs.

The FY2000 Authorization Act authorized a net increase of $403.0 million for ballistic missile defense programs, $169.5 million for military space programs and technologies, and $201.6 million for strategic nuclear delivery vehicle modernization. It authorized an increase of $212.0 million for the Patriot PAC-3 system, $90.0 million for the Navy Upper Tier (Theater Wide) and $92.0 million for the Space Based Infrared (High) program. It authorized an increase of $90.0 million for the Navy Upper Tier (Theater Wide) theater missile defense program, of which $50.0 million was for continuation of advanced radar technology development and $40.0 million is for program acceleration. It authorized an increase of $30.0 million for the Atmospheric Interceptor Technology program, an increase of $15.0 million for the Arrow Deployability Program, an increase of $10.0 million for the Tactical High Energy Laser Program, an increase of $10.0 million for the Space-Based Laser program and an increase of $92.0 for the Space Based Infrared (High) program.

The Congress also called for a report on the risks in the NMD deployment program and directed that with the submission of the Fiscal Year 2001 budget, the Secretary of Defense shall submit to the congressional defense committees a report that contains an assessment of the advantages or disadvantages of deploying a ground-based National Missile Defense system at more than one site. It include a version of the National Missile Defense Act of 1999 in the FY2000 Defense Authorization Bill which declares that it is U.S. policy to: (1) deploy as soon as technologically possible a National Missile Defense (NMD) system capable of defending U.S. territory against limited ballistic missile attack (whether accidental, unauthorized, or deliberate), with funding subject to the annual authorization of appropriations and the annual appropriation of funds for NMD; and (2) seek continued negotiated reductions in Russian nuclear force. The
“It is the sense of Congress that--

(1) because technology development provides the basis for future weapon systems, it is important to maintain a healthy balance between funding for the development of technology for ballistic missile defense systems and funding for the acquisition of ballistic missile defense systems;

(2) funding planned within the future-years defense program of the Department of Defense should be sufficient to support the development of technology for future and follow-on ballistic missile defense systems while simultaneously supporting the acquisition of ballistic missile defense systems; and

(3) the Secretary of Defense should seek to ensure that funding in the future-years defense program is adequate both for the development of technology for advanced ballistic missile defense systems and for the major existing programs for the acquisition of ballistic missile defense systems.

Not later than March 15, 2000, the Secretary of Defense shall submit to Congress the Secretary's assessment of the advantages or disadvantages of a two-site deployment of a ground-based National Missile Defense system, with special reference to considerations of the world-wide ballistic missile threat, defensive coverage, redundancy and survivability, and economies of scale.”

**The NMD Program Before President Clinton’s Decision to Defer Deployment**

The Department indicated in early 2000 that its strategy retained a two-phased approach: (1) development; and (2) possible deployment, based on the threat and the demonstrated technological feasibility of the system to defeat that threat. A decision to deploy, based on the recommendation of the Deployment Readiness Review (DRR), was planned for June 2000, to allow the program to plan for the fielding of a Capability 1 architecture by 2005 instead of 2003.

The specific decisions to be made at the DRR were the commitment to deployment, element site selection, and authorization to proceed to contract award for site construction. Two other key decision points were added on the path to the 2005 deployment. An FY2001 decision was to consider the building and/or upgrading of required ground radar systems and the integration of command and control software into the Cheyenne Mountain Operations Center. An FY2003 decision was to determine if the weapon system is ready for limited production and deployment. If no deployment decision is made, the program will still continue development with an eventual focus on a more capable NMD (Capability 2) system.
The Secretary Cohen also directed the Department to take no programmatic steps that would preclude the potential to deploy earlier than FY05. As part of the NMD redirection, more than $6 billion in additional funding was programmed to support development and initial deployment. The Department of Defense estimated that the life cycle cost of the program would be $26.6 billion as of February 2000. This estimate was based on deployment of the first interceptor site in Alaska, and an initial force of 20 interceptors – at a cost of $1.105 billion each. (Assuming an FY2005 deployment. The figure quoted includes the cost of operating the system for 20 years as well as development, production, and construction costs.)

Secretary Cohen described the NMDO program as follows in his FY2000 annual report to the President and Congress in February 2000,

“The submission of the FY 2000 budget request marks a major change in the Administration’s funding commitment to National Missile Defense. The addition of $6.6 billion in new funding brings total FY 1999-2005 resources for NMD to $10.5 billion, of which $9.5 billion is allocated in FY 2000-2005. The added funds include those that would be required through FY 2005 to deploy an NMD system. No decision for deployment has been made. However, a decision regarding deployment is planned for June 2000 that will be based primarily on the maturity of the technology as demonstrated by progress in development and testing.

The NMD program has been geared for some time to the possibility that a rogue nation could—perhaps sooner than intelligence has projected—come to possess intercontinental ballistic missiles that could threaten the United States. This possibility was underscored by the August 1998 North Korean attempt to launch a satellite on a Taepo Dong-1 (TD-1) missile. The test demonstrated that North Korea continues to be interested in developing long-range missile capabilities and that it has made considerable progress. That launch demonstrated some important aspects of ICBM development, most notably multiple-stage separation. While the intelligence community expected a TD-1 launch for some time, it did not anticipate that the missile would have a third stage or that it would be used to attempt to place a satellite in orbit.

The intelligence community’s current view is that North Korea would need to resolve problems with the third stage prior to being able to use the three-stage configuration as a ballistic missile to deliver small payloads to intercontinental ranges (that is, ranges in excess of 5,500 kilometers). Nonetheless, a three-stage variant of the TD-1, if successfully developed and deployed, could pose a threat to portions of the United States sooner than estimated previously. The TD-1 launch demonstrates the very type of potential near-term threat that led the Administration to propose the NMD deployment readiness program in 1996.

The NMD system being developed would have as its primary mission defense of the United States—all 50 states—against a small number of intercontinental ballistic missiles launched by a rogue nation. Such a system would also provide some capability against a small accidental or unauthorized launch of strategic ballistic missiles from China or Russia. It would not be capable of defending against a large-scale, deliberate attack.

Of the $6.6 billion in new funds programmed for NMD, $800 million will be provided from the FY 1999 Emergency Supplemental for Ballistic Missile Defense. These funds permit additional risk-reduction
efforts, as well as activities needed to ensure a smooth transition to deployment should a decision be made in FY 2000 to begin deploying the system. Previous plans for testing NMD components and the system prior to the deployment decision remain unchanged. In June 1999, the performance of the exoatmospheric kill vehicle will be demonstrated in the first NMD intercept attempt. Subsequent tests, to be conducted before the June 2000 decision point, will further evaluate the system’s performance, culminating in an end-to-end systems test in the second quarter of FY 2000. The FY 2000 request includes no procurement funding associated with deployment. The funds added to the NMD program in FY 2001-2005 support a deployment in FY 2005.

To maximize the probability of programmatic success and be able to deploy a technologically capable system as quickly as possible, key decisions will be phased to occur after critical integrated flight tests. As a result, instead of projecting a deployment date of 2003 with exceedingly high risk, the Department now projects a deployment date of 2005 with much more manageable risk. If testing goes flawlessly, the system might be ready for deployment sooner. But independent analysts have expressed concern that DoD’s fast-paced schedules for ballistic missile defense programs represent a rush to failure. Given the reality of the threat, the NMD program cannot afford to fail. The approach the Department has adopted is the optimal one to provide a capable NMD system as soon as possible.

The NMD development program will continue to be conducted in compliance with the Anti-Ballistic Missile Treaty. NMD deployment may require modifications of the treaty, and the Administration is working to determine the nature and scope of these modifications. Environmental surveys for potential basing sites in both Alaska and North Dakota have begun, and Russian officials have been briefed on these activities. If deployment requires an amendment to the treaty, the United States will negotiate with the Russians in good faith.”

The President’s FY2001 budget was submitted to Congress in February 2000. The Department of Defense summarized its request for missile defense funds as follows:

The FY 2001 budget continues the marshalling of the technology and funding needed to deploy a National Missile Defense (NMD) system to defend all 50 states against a limited ballistic missile attack. Later this year the President will decide whether to deploy such a system based on four criteria: threat, cost, technical feasibility, and overall security implications including arms control. The budget for FY 2001-2005 includes sufficient NMD funding to achieve a 2005 initial capability if deployment is ordered. FY 2001-2005 NMD funding totals $10.4 billion—reflecting the addition of $2.3 billion since last year’s request. The budget will allow DoD to upgrade early warning radar facilities, build a radar complex in Alaska, provide 100 ground based interceptors, and fund additional systems testing.

Also a top DoD priority is a strong theater air and missile defense program—aimed at meeting current regional threats. The budget continues to advance the goal of deploying systems that can protect forward-deployed U.S. forces, as well as allies and friends. To defeat shorter-range missiles, key lower-tier programs currently are the Patriot Advanced Capability-3 (PAC-3) and Navy Area Defense systems. Key upper-tier programs are the Theater High Altitude Area Defense (THAAD) and Navy Theater Wide systems. To defeat theater-range missiles during their boost phase, development of the Airborne Laser and Space-Based Laser is continuing.

Lt. General Ronald T. Kadish, the Director of BMDO, provided a detailed summary of the FY2001 program to the Senate Appropriations Committee, Defense Subcommittee, on April
The total Fiscal Year (FY) 2001 budget request for the Ballistic Missile Defense Organization is $4.5 billion. This includes $3.9 billion for research, development, test, and evaluation (RDT&E), $444 million for procurement, and $103.5 million for military construction (MILCON) activities. Combining these three budget categories, National Missile Defense represents $1.92 billion, or 43 percent of the budget. Theater Air and Missile Defense programs account for $1.95 billion, also roughly 43 percent of the budget. We request $37.7 million for Applied Research and $93.2 million for Advanced Technologies, which together represent about 2.9 percent of the budget. BMD Technical Operations accounts for $272.6 million and is about 6 percent of the budget. We request $22.6 million for Threat and Countermeasures efforts and $117 million for International Cooperative Programs, which together represent 3 percent of our overall budget. The following chart breaks out the Fiscal Year 2001 budget request by program element for BMDO-managed programs.

… Based on recent threat assessments, my program guidance is to be in a position, technologically, to support a decision later this year on whether to deploy a National Missile Defense (NMD) system capable of defending all 50 states against limited ballistic missile attack from states that threaten international peace and security. Recent intelligence estimates indicate that we must be concerned about the possibility that ballistic missile threats from states that threaten international peace and security will increase as they acquire a capability to launch more and longer range missiles with simple countermeasures in the 2005 to 2010 timeframe. As a result, we are enhancing the NMD program beyond the original Capability 1, or "C1," architecture by developing an "Expanded C1" architecture to meet this expanded threat. The Expanded C1 architecture will be capable of defending all 50 states against expected near-term threats larger than the initial C1 architecture was designed to handle.

The Expanded C1 deployment option builds on revised program guidance announced last year by the Secretary of Defense. For planning purposes, the Expanded C1 system will incorporate 100 ground-based interceptors based in Alaska and an advanced X-Band radar based at Shemya Island, also in Alaska. Our NMD architecture plans incorporate upgrades to the existing ballistic missile early warning radars and, for the purposes of initial launch detection, use the Space Based Infrared System (SBIRS) High, which eventually will replace the existing Defense Support Program satellite constellation. Initial Operational Capability (IOC) for the C1 architecture, consisting of 20 interceptors, still can take place in 2005. The full 100 can be deployed by Fiscal Year 2007. Since the President submitted the FY00 budget to Congress, the NMD program has been increased by $2.3 billion over FY01-05. Between Fiscal Years 2001 through 2005, we have programmed $10.375 billion (in then year dollars) for the NMD program.

In 1999, BMDO commissioned a second independent panel headed by retired General Larry Welch to review the National Missile Defense (NMD) program in light of the program's new structure. The panel's charter was to determine the effects of extending the NMD program by two years and to review the adequacy of the resulting test program. The panel concluded that, although the revised NMD program reduced program risk, it remains a high-risk program. The panel made 18 specific recommendations to reduce program risk further. I support the panel's recommendations and have added $285M across FY01-05 to augment the NMD testing program. This funding will pay for additional hardware for the NMD Kill Vehicle, additional test equipment and testing.

… We plan to conduct a Deployment Readiness Review (DRR) in July of this year. We recently adjusted the schedule for the DRR, delaying this technology readiness assessment of the NMD program by approximately one month. The DRR is a review internal to the Defense Department that will be led by the Under Secretary of Defense for Acquisition, Technology & Logistics. We think the delay is prudent given our rescheduling of Integrated Flight Test 5 (IFT-5) to take place on June 26 of this year. We do not believe moving the DRR to July will materially affect the current schedule which supports fielding an initial...
capability in Fiscal Year 2005.

Although the DRR starts a key decision process, it is the first of at least three decision milestones in the program over the next five years. The technological assessment of the NMD program will take place at the Defense acquisition executive level - with full participation from all Department of Defense stakeholders. The DRR will not constitute the actual decision to deploy the NMD system. Rather, it will assess the technological progress to support a deployment decision. The Administration's decision will be based on an assessment of four factors: (1) the nature of the threat; (2) the status of the technology based on an initial series of rigorous flight tests, and assessment of the proposed system's operational effectiveness; (3) system affordability; and (4) assessments of the impact of NMD deployment on the overall strategic environment and U.S. arms control objectives, including efforts to achieve further reductions in strategic nuclear arms under START II and START III.

If a decision is made to deploy, we will simultaneously seek approval for our recommended NMD site and award of the construction contract for that site. A decision to deploy would lead us to conduct a Defense Acquisition Board review to assess the status of the program in late Fiscal Year 2001. Based on program performance, we would seek approval to initiate upgrades to the current early warning radars, begin building the missile site, and start integrating the Battle Management/Command, Control and Communications (BM/C3). In Fiscal Year 2003, we would conduct a second Defense Acquisition Board review to seek approval to procure and deploy the ground-based interceptors as well as the necessary spares and test rounds. All of these decisions will depend on an assessment of our technical and programmatic progress.

...While we have been developing and testing the system elements, we also have been proceeding vigorously on deployment planning activities. We have conducted fact-finding and siting studies for two potential site locations - Alaska and North Dakota. We have initiated site designs for the X-band radar, weapon sites, and BM/C3 facilities. On October 1, 1999, we published in the Federal Register a Notice of Availability of the NMD Program's Deployment Draft Environmental Impact Statement (EIS), inviting the public to review and comment on that document. The public comment period ended on January 19, 2000. In October and November of last year, over 650 people attended public hearings on the draft EIS in Alaska, North Dakota, and Washington, D.C. We are considering the input received as we prepare the Program's Final Environmental Impact Statement, which we have scheduled for completion later this spring. As required by law, the results of the EIS will represent one of many inputs into the deployment decision process.

We initiated ground-based element facility planning and design in FY99 and have completed the 65% design for the weapon system and X-band radar facilities. We will start the design of the BM/C3 facilities later this year. For FY01, we are submitting a request for construction of the tactical and support facilities for an Expanded C1 capability. This will consist of an X-Band Radar Complex, a Ground-Based Interceptor Missile Launch Complex, and a series of dispersed facilities for Battle Management/Command, Control, and Communication. We request a FY01 MILCON appropriation of $101.6M to begin construction of the X-band radar, conduct site preparation of the interceptor site, and continue planning and design work.

In accordance with budget guidance, we will further define the facility and systems requirements associated with potential deployment of 100 interceptors in an Expanded C1 architecture by FY07, including the installation of 80 additional missile silos and non-tactical facilities. In order to remain on schedule for the deployment of the first 20 missiles in FY05, we plan to issue a Request for Proposal and award the contract(s) this fall, if approval for deployment is given.

We have made important technical progress in many areas in the National Missile Defense program. Nevertheless, this is an extremely complex program and we still have many significant challenges ahead of
The Senate voted on July 14, 2000 to authorize a total of $1.9 billion for NMD in FY2001. It approved the budget by a 52-48 vote. The defense authorization bill for fiscal 2001 passed by a 97-3 vote. The bill authorized $310 billion for defense, $4.5 billion more than President Clinton requested, and a 4.4 percent increase over last year's funding. The bill also included a 3.7 percent pay raise for military personnel, effective January 1, 2001, and by allowed veterans age 65 and older to buy prescription drugs at discount prices.174

The projected budget for all of BMDO and for the NMD program is shown in Table III.12 below:

Table III.12

| The BMDO Budget Request for FY2000 and FY2001 in Then Year $US Millions |
|-----------------------------|-----------------------------|
| NMD Dem/Val*                | 950.248 | 1,740.238 |
| NMD Procurement             | 0.000   | 74.530  |
| NMD Milcon                  | 15.000  | 101.595 |
| Theater Air and Missile Defense |       |        |
| PAC-3 EMD                   | 179.139 | 81.016  |
| PAC-3 Procurement           | 343.773 | 365.457 |
| Navy Area EMD               | 307.274 | 274.234 |
| Navy Area Procurement       | 18.143  | 0.000   |
| THAAD Dem/Val               | 523.525 | 0.000   |
| THAAD EMD                   | 79.462  | 549.945 |
| Navy Theater Wide Dem/Val   | 375.764 | 382.671 |
| TMD BMC/3 Procurement       | 0.000   | 3.975   |
| Joint TAMD Dem/Val          | 196.566 | 0.000   |
| FoS E&I                     | 145.657 | 231.248 |
| MEADS Dem/Val               | 48.594  | 63.175  |
| Support Technologies        |         |        |
| Applied Research            | 88.365  | 37.747  |
| Advanced Technology Dev.    | 212.837 | 93.249  |
| Boost Phase Intercept       | 4.961   | 0.000   |
| Space Based Laser**         | 0.000   | 74.537  |
| Organizational Costs        |         |        |
| BMD Technical Operations    |         |        |
| BMD Tech Ops                | 214.445 | 270.718 |
| BMD Tech Ops Milcon         | 1.372   | 1.923   |
| International Coop Programs | 81.560  | 116.992 |

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The Total Cost of the US Ballistic Missile Defense Program to Date

A full breakout of the costs of the first four phases of the US ballistic missile defense effort is shown in Figure III.2. The direct costs of the NMD program reached $16.9 billion during 1995-1999 – or roughly 30% of the total money the US spent on ballistic missile defense. The total cost of all SDIO and BMDO activity reached over $56 billion in direct costs to the Department of Defense, by the end of the fourth phase in 1999, plus several billion more in costs by other federal agencies.

Secretary Cohen’s January 20, 1999, announcement acknowledged and affirmed the emerging missile threat and announced the dedication of an additional $6.6 billion for NMD during fiscal years 1999 through 2005. He also noted that the Administration had begun a dialogue with Russia about the development related to our NMD program and the ABM Treaty. Finally, he recognized that the program was now structured to work towards a key requirement - developing and demonstrating the technological readiness of our system. A later budget statement indicated that the Department intended to allocate $10.504 billion (in then year dollars) for the NMD program between fiscal years 1999 through 2005. As has been noted earlier, the life cycle cost of the program over 20 years was estimated to be $26.6 billion over 20 years, assuming the interceptor force was initially deployed in Alaska and was kept at a force of 20 interceptors.

A White House fact sheet issued the day after President Clinton deferred an NMD deployment decision on September 1, 2000 stated that, “The Clinton Administration has spent approximately $5.7 billion on NMD, and budgeted an additional $10.4 billion in FY 2001-2005 to support possible deployment of the initial NMD architecture. Our current estimate for

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developing, procuring and deploying our initial system of 100 interceptors, an ABM radar, upgrades to 5 early warning radars, and command and control is around $25 billion (Fiscal Years 91-09). But to put that in perspective, it represents less than 1 percent of the defense budget over the coming six years.\textsuperscript{177}

Some politicized cost estimates designed to attack NMD include the total cost of all SDIO and BMDO programs in the cost of preparing for the deployment of the current NMD program. This is manifestly unfair, even if one ignores the validity of including the cost of the totally different NMD programs carried out during the Cold War. At the same time, the direct costs of NMD alone understates the fact that the bulk of “other” RDT&E costs are spent on NMD.

The key point is that the US is giving both TMD and NMD high priority and continues to invest in a future capability to deploy a very different kind of NMD program. This is a key point in terms of both program analysis and national priorities. Whatever one may think of the ballistic missile threat to the US homeland, the theater threat is already real. Similarly, it seems hard to deny the need for a robust technology program unless the world becomes a far safer place.
Figure III.2

BMD Historical Funding

The total program cost through 1999 was $48.527 billion. The total was $16.956 billion for NMD, $15.331 billion for TMD, and $16.179 billion for support technology.

The Current Nominal Architecture of the US National Missile Defense Program

The broad structure of the architecture of the present US NMD program has already been discussed in summary form. In broad terms, the system will use the U.S. Early Warning System, consisting of Defense Support Program (DSP) satellites, and its follow-on capability, the Space Based Infrared System (SBIRS) satellites, will detect the launch of enemy missiles and will subsequently track these missiles while also gathering information on them. After confirmation, this information will be passed to the Battle Management/Command, Control, and Communications (BM/C³) system while ground-based radars acquire and begin to track the missile.

After defense engagement authority is granted, one or more interceptors will be launched on command to engage the threat. The BM/C³ system will continue to process radar and other system data in order to provide more information to the interceptor so it, in turn, can better discriminate between debris, false objects (penetration aids) and real warheads. The interceptor will use its on-board sensor to acquire the threat, select the target warhead, and guide to a direct, high-speed collision using on-board computers and divert propulsion systems. During and after the engagement, the radars continue to collect data, and observe the intercept results in order to provide “kill assessment” information which evaluate the interceptor’s success or failure.

Walter Slocombe, the Under Secretary of Defense for Policy provided a broad outline of how the Department of Defense planned to translate the key elements of its NMD architecture into a deployed system in his testimony to the House Armed Services Committee on October 13, 1999:178

“….no deployment decision has yet been made: that will depend on the technological readiness of the system at the DRR in June 2000, the projected cost, the review of the threat as projected then (which we do not expect to change), and the substantial policy issues presented by a deployment decision. The President, based on the recommendation of his national security team, has decided on an architecture for planning purposes now -- for a system. The deployment, if approved, will proceed in phases. As an immediate goal to meet early threats, we would deploy by 2005/6 an initial NMD system that would be optimized for the most immediate threat (ii) that from North Korea. It would be capable of defending all 50 states against a launch of a few tens of warheads accompanied by simple penetration aids. For planning purposes, this

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NMD architecture would include:

- 100 ground-based interceptors based in Alaska.
- An X-Band radar at Shemya in Alaska.
- Upgrades to five existing ballistic missile early warning radars.
- It would use, for purposes of initial detection of missile launches aimed at the U.S., the SBIRS-High system, which is being developed to supplement and eventually replace the Defense Support Program (DSP) satellite system.

Such a system would also provide a 50-state defense against limited attack (a few warheads with simple penetration aids) launched from the Middle East. In order to achieve an initial operational capability in 2005, construction of this system would need to begin in 2001, following a decision to proceed during the summer of next year.

The President also identified as a longer-term goal to deploy (possibly in further phases), by the 2010/2011 time-frame, a limited NMD system with the capability to negate up to a few tens of ICBM warheads with complex penetration aids launched from either North Korea or the Middle East. The system architecture would include an additional interceptor site, additional interceptors, and several more X-Band radars, and the SBIRS-Low satellite constellation to provide an important tool in distinguishing enemy warheads from sophisticated penetration aids.”

It is clear from this outline that the Ballistic Missile Defense Organization (BMDO) is developing, testing, and integrating five major components or elements to deploy this system. These five elements include the Ground Based Interceptor (GBI); Upgraded Early Warning Radars (UEWR); Forward Deployed and/or U.S.-based X-Band Radars (XBR); and Battle Management/Command, Control, and Communications (BM/C3). The Space Based Infrared System (SBIRS) in low earth orbit is another component of the mature NMD system, likely to be available after 2010.179

**The Ground-Based Interceptor (GBI)**

The GBI and its associated components provide the “weapon” of the NMD system. The mission of the GBI is to strike high speed ballistic missile war-heads in the midcourse or exo-atmospheric phase of their trajectories and destroy them by force of impact. The GBI consists of:

- The missile payload or the kill vehicle, which has its own sensors, propulsion, communications, guidance, and computing functions all of which work together to
complete the intercept.

- A booster that will propel the EKV toward an approximate intercept location so that the EKV can perform terminal maneuvers to impact the incoming warhead.

- Ground command and launch equipment that is needed to launch the interceptor. This consists of the hardware and software for interface with the BM/C3 system, human-in-control interfaces (consoles), and interceptor storage sites (silos) in order to accomplish daily maintenance and readiness functions and to launch the interceptor upon command.

The GBI is a silo-based, three-stage, commercial-off-the-shelf, ICBM-class missile (using a Minuteman booster) that delivers a separating Exoatmospheric Kill Vehicle (EKV) to an "acquisition point" above the atmosphere en route to engage a threat target. At this point, in a manner similar to upper-tier theater missile defense systems, the EKV uses an infrared seeker to acquire and track the target, firing divert thrusters (for terminal guidance and control) to achieve a direct hit on the targeted reentry vehicle (RV). After the intercept, ground radar continues to collect data so that a kill assessment can be made to evaluate the success or failure of the engagement.

Only one interceptor site is currently planned. Its location was originally planned to be in South Dakota, near US ICBM sites, in order to be ABM Treaty compliant. Much of the official Department of Defense literature available to the public still mentions this site and states that the system will comply with the ABM Treaty. In practice, however, most planned now calls for it to be in Alaska, which provides better coverage of missiles launched directly from the territory of North Korea, Iran, and Iraq. Some references refer to the initial deployment of 20 interceptors, but some US officials refer to the initial deployment of 100 or hundreds. Many experts believe that the US will also need a minimum of two sites to provide the coverage it needs.

The Congressional Budget Office described the status of this aspect of the program as follows in its April 2000 report to Congress:180

Two different designs for the interceptor’s kill vehicle have flown on flight tests.181 The first test, in 1997,
used a kill vehicle designed by the Boeing Company. However, early the following year, NMD program managers selected a competing Raytheon kill vehicle as the primary design. It has flown on all subsequent flight tests. The first two flights were intentional flybys of an incoming target warhead and associated decoys to test the kill vehicle’s sensors and homing guidance; they were deemed highly successful.

In the third flight test, on October 2, 1999, the kill vehicle successfully intercepted the incoming target. That intercept was considered an important milestone for the project. However, DoD’s Director of Operational Test and Evaluation raised concerns that the large balloon that accompanied the target warhead as a decoy—to test the interceptor’s ability to distinguish countermeasures from warheads—actually helped the kill vehicle pick out the warhead from the blackness of space. Some analysts believe that a lack of sophisticated ground-test capabilities or of time to use existing facilities fully will prevent scientists and engineers from ever knowing whether the interceptor would have seen the incoming warhead without the large balloon.

A fourth flight test, on January 18, 2000, was designed to demonstrate the functionality of all of the NMD components. However, some of the supporting information that would normally have come from certain components—such as the X-band radar—was simulated by position data transmitted from the target warhead itself. That data was considerably more accurate than what the X-band radar would have generated. Nevertheless, in the fourth test flight, the kill vehicle failed to intercept the incoming warhead. DoD analysis indicates that the system used to cool the infrared sensors on the interceptor failed, and therefore the kill vehicle could not see the target to maneuver itself for the impact.

The booster rocket that DoD plans to use to launch the interceptor when the NMD system is actually deployed has not yet been used in a flight test. It is based on a commercially available rocket motor that is normally strapped to the side of Delta II rockets to give them additional thrust. As such, it has flown successfully a number of times. The second and third stages of the booster will use a different commercially available rocket motor. However, the booster’s nozzles for those stages must be modified for use in the NMD system to allow their thrust to be steered when the upper stages ignite. That modification will be tested during three booster-only flight tests scheduled for this year.

The Welch Panel has raised concerns that during launch, the planned booster will subject the interceptor to much greater high-frequency vibrations than the slower booster used in flight tests so far. The shock of those extra vibrations could possibly damage the interceptor. The first test flight using both the interceptor and the new booster is planned for early in fiscal year 2001, but that schedule could slip, as those for all of the recent flight tests did.

**The X-Band Radar(s)(XBR)**

These radars are forward deployed, ground-based, taskable, multi-function radars. In the NMD role, they perform acquisition, tracking, discrimination, and kill assessment of incoming warheads. XBRs use high frequency and advanced radar signal processing technology to improve target resolution, which permits the radar to per-form more effectively against closely-spaced warheads, debris and penetration aids.

The Congressional Budget Office described the status of this aspect of the program as
follows in its April 2000 report to Congress:\textsuperscript{184}

The high-resolution X-band radar is a primary sensor for national missile defense. In response to cues from other sensors (such as satellites), it will search for incoming warheads, try to discriminate between real warheads and decoys, and supply high-quality tracking information to the interceptor. After an intercept attempt, X-band radars will determine whether the warhead was successfully destroyed (so-called kill assessment).

A prototype X-band radar is functioning at Kwajalein Missile Range in the Marshall Islands and was used in the third and fourth flight tests. It has also been used in risk-reduction flights in which a Minuteman missile was launched from Vandenberg Air Force Base in California, as part of routine testing for Minuteman, but no interceptors were launched. During the third flight test and the risk-reduction flights, the prototype radar successfully picked out the incoming “warheads” from the other objects flying alongside and tracked them. In addition, it successfully performed its kill-assessment tasks during the fourth flight test (when the kill vehicle failed to hit the incoming warhead). Integrated ground tests conducted since April 1998 have also used versions of the signal and data processors from the X-band radar. (Other aspects of the radar’s performance were simulated.) Those ground tests demonstrated the integration of the X-band radars into the battle management system.

At least two X-band radars must be located on the soil of NATO allied countries, evidently Canada and Britain.\textsuperscript{185}

**Upgraded Early Warning Radars (UEWR)**

These radars are large, fixed, phased-array surveillance radars used to detect and track ballistic missiles directed into the United States. Upgrades to America’s Early Warning Radar network will provide the existing forward-based radars with the capability to support the NMD surveillance function. Prior to deployment of the SBIRS (Low) satellites, the UEWRs will be used to detect and track objects during their midcourse phase, primarily to cue the more precise X-Band Radars.

The Congressional Budget Office described this aspect of the program as follows in its April 2000 report to Congress:\textsuperscript{186}

Because they can see incoming missiles before the X-band radars do, upgraded early-warning radars will allow the national missile defense system to engage incoming warheads earlier in their flight, an important contribution to NMD’s capability. They will also assist the higher-resolution X-band radars in tracking and identifying incoming objects. Recent major ground tests appear to show steady improvement in integrating the upgraded early-warning radars into the NMD system as a whole. For example, the first time actual hardware for the radars’ computer was included in a major system ground test, it was overwhelmed by the number of instructions the battle management center gave it. Those problems were apparently resolved during the next major
The battle management system for national missile defense is designed to plan and assess engagements with incoming missiles, control and direct the operation of the various NMD components, and manage NMD’s communications network. That network (known as the In Flight Interceptor Communications System) consists of newly developed, high-bandwidth communications ground antennas used to send information up to the interceptor as it approaches the incoming warhead.

The Congressional Budget Office described the status of this aspect of the program as follows in its April 2000 report to Congress:

Included in this architecture are Ballistic Missile Early Warning System (BMEWS), PAVE Phased Array Warning System (PAVE PAWS), DSP, and SBIRS. Hardware and software upgrades for the BMEWS and PAVE PAWS radars, when operated in conjunction with DSP and SBIRS launch notification, will allow the Upgraded Early Warning Radars (UEWR) to detect and track re-entry vehicle sized objects close to the horizon. BMC3 could also use the threat missile data provided by the UEWRs to support the kill vehicle intercept and hit assessment.

The BMC3 at the Cheyenne Mountain Operations Center will perform engagement planning and situation assessment while keeping a "human-in-control," and serve to integrate the GBI and sensor operations through the In-Flight Interceptor Communications System (IFICS).

The Battle Management/ Command, Control and Communications (BM/C\(^3\))

This system is the “brains” of the NMD system. In the event of a launch against the United States, the Commander-in-Chief of the North America Aerospace Defense Command (NORAD) would control and operate the NMD system through the BM/C\(^3\). The BM/C\(^3\) element supports the Commander-in-Chief with extensive decision support systems, battle management displays, and situation awareness information. In this way, it supplies the means to plan, select, and adjust missions and courses of action; and it disseminates defense engagement authorization (DEA) and other Command decisions to the NMD system elements. The In-Flight Interceptor Communications System (IFICS) is the BM/C\(^3\) communications link to the interceptors during flyout.

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The prototype battle management system was used successfully in the third and fourth flight tests to manage tracking and some communications. Prototype hardware for communicating with the interceptor was also tested during the fourth flight test, though it was not actually used for communicating. In that flight, the battle management system successfully sent the interceptor in-flight target updates about the incoming objects. The major ground tests to date have used the same type of battle management computer that will be deployed in the NMD system. However, those ground tests did not include a direct communications link between the NMD system and the Commander in Chief at Cheyenne Mountain Air Force Base (who serves as the “human in control” for NMD). That link will not be tested before the deployment readiness review this summer.

Significant problems remain with the ground tests, however. Those problems are probably exacerbated by trying to get the entire NMD system working harmoniously while components—such as the upgraded early-warning radars—are still being developed. In the most recent ground test, the system failed to meet program managers’ expectations in five out of six scenarios. Most of those failures were caused by problems not with the system hardware or software actually being tested but with the computer models substituted for other components in the simulations. That situation appears to be directly attributable to the difficulties of developing the subsystems at the same time that they are being integrated into the NMD system as a whole.

The Space-Based Infrared System (SBIRS)

SBIRS is being developed by the Air Force as part of the Early Warning System upgrade which will replace the Defense Support Program (DSP) satellites with SBIRS (High) and SBIRS (Low). In its NMD mission, the SBIRS (Low) constellation of sensor satellites will acquire and track ballistic missiles throughout their trajectory. This information will provide the earliest possible trajectory estimate to the BM/C3 element. By providing this “over-the-horizon” precision tracking data to the NMD system, the effective NMD battle space is expanded to permit interceptors to be launched before the threats come within range of the XBRs, which is critical for effective National Missile Defense.

SBIRS has an estimated system cost of roughly $20 billion, and is intended to provide new and improved warning and sensing capabilities well into the century, allowing the accomplishment of a greater number of missions from space. It is also intended to help in filtering out decoys as well as supporting both national and theater missile defense and warning.188

The system comprises a modernization effort to provide greatly improved Tactical Warning and Attack Assessment capabilities to replace those provided by DSP since the early 1970’s, and adds new capabilities for Technical Intelligence and Battlespace Characterization. In
the interim, the US will sustain the DSP program, which currently has 5 replacement satellites awaiting launch, to ensure continuous global surveillance during the transition period.

The completed SBIRS will consist of constellations of geosynchronous earth orbit (GEO), highly elliptical orbit (HEO), and low earth orbit (LEO) spacecraft as well as a supporting ground infrastructure. SBIRS-High will be composed of 4 GEO spacecraft to provide hemispherical coverage and 2 HEO sensors to provide polar coverage. SBIRS-Low will be composed of approximately 24 LEO satellites, with the actual number to be determined during the program definition phase. The SBIRS ground segment consists of a consolidated ground station, overseas-based Relay Ground Stations, and Mobile Multi-Mission Processors.

SBIRS will provide the BMC3 used in the NMD system with initial launch detection and missile trajectory information. The global coverage of SBIRS-High, with improved sensitivity and revisit rates over DSP, will allow better launch point determination and impact point prediction. SBIRS-Low will support NMD by providing critical mid-course track and discrimination data to the Battle Manager to allow accurate targeting and engagement of hostile threats.

Jacques S. Gansler, the Under Secretary of Defense for Acquisition and Technology provided the following additional detailed SBIRS in his testimony to the House Armed Services Committee on February 25, 1999:

“The Air Force’s Space Based Infrared System (SBIRS) system is an important element of our BMD program. Both components of the SBIRS program, SBIRS-High and -Low, have seen significant cost growth and technical challenges during the past year. The President’s Budget restructures both components of the SBIRS program to make optimum use of available Defense Support Program satellites, yet provide timely support to the ballistic missile defense mission.

In that regard, we are rescheduling the SBIRS-High program’s first launch of its geosynchronous satellite to FY 2004. We currently have five Defense Support Program satellites awaiting launch, and the Department, in executing its stewardship responsibilities, must make full use of those satellites before launching a replacement system. The new SBIRS-High schedule synchronizes well with the new national missile defense schedule in that the required number of SBIRS-High geosynchronous satellites (two) will have been launched in time to support a national missile defense deployment in 2005. It should be noted that, although SBIRS-High will provide improved performance compared to its predecessor in all mission areas, the Defense Support Program is adequate for the strategic warning mission. And the Defense Support Program can support the initial deployment of the national missile defense system, with only a very slightly
reduced confidence level of successful defense.

“We are also restructuring the SBIRS-Low component, resulting in a planned first launch in FY 2006. This change is driven primarily by the technical challenges and complexities inherent in the system. As part of the SBIRS-Low restructure, after the formulation of the FY 2000 President’s Budget, we cancelled the two flight demonstration experiments that were part of our earlier-conceived risk reduction effort. Much has already been learned and significant risk has been mitigated through the design, fabrication, assembly, and integration accomplished to date. Continuation of the flight experiments is not critical to SBIRS-Low, and the remaining program risk is best addressed in the now more robust Program Definition studies that will constitute the next phase of the SBIRS-Low acquisition. We intend to pursue the SBIRS-Low program in a manner consistent with program risk and the need to support our BMD programs.

The Air Force recently announced a restructuring of the SBIRS program. This restructuring was only implemented after careful consideration to mission risk and our overall BMD efforts.

The SBIRS-High first GEO launch was delayed by 2 years until FY04. In the short term this slip freed up much needed FY00 funds for higher priority programs and readiness. Supporting this decision was the longer than expected availability of DSP. This slip supports the BMDO NMD C1 schedule with a SBIRS-High IOC in FY06.

The SBIRS-Low first launch was delayed 2 years to FY06. This decision was driven by technical and schedule challenges. Updated assessments concluded a FY04 launch was extremely risky and impractical. A SBIRS-Low launch in FY06 supports the NMD schedule for C2 in FY10.

A decision to also eliminate two on-orbit demonstrations from the SBIRS-Low program, after formulation of the FY00 budget, was driven by rapidly diminishing returns on investment. Significant risk reductions have been achieved by these efforts to date. However, continued cost growth was consuming program funds at a rate that made the demonstration program unexecutable. The Air Force developed an alternative strategy to ensure SBIRS-Low remained executable and on schedule for an FY06 launch. By terminating the two demonstrations, the Air Force was able to redirect funds toward a more timely risk reduction focused directly on the objective SBIRS-Low design. Meanwhile other on-orbit demonstrations have demonstrated much of the technology critical to SBIRS. These demonstrations were on-orbit experimental packages, not prototype SBIRS satellites. An expanded PDRR focuses more resources on the objective system and should result in a more mature system design when the EMD phase of the program is competed.

He provided the following additional data in a press briefing on June 20, 2000: 189

the space-based warning system, the system that picks up the fact that a booster has been launched… is already in space. The Defense Support Program, the DSP program, has been there for many years to detect launches, and that is being upgraded with so-called SBIRS-High. This is an infrared system, space-based system, that will improve the ability to project the trajectories. And that’s the only difference between the two—greater sensitivity, greater ability to predict trajectories.

Then when that detects something, it is passed on, through the command and control system, to the early warning radars. These are also in place today at a variety of places around the globe. And these then will track the targets as they come towards us, doing some preliminary track information so that we can determine where it’s going and it can give us information for the intercept.

That is then transferred to the so-called X-band radars, small frequency radars, that can do an excellent job of discrimination. That’s the reason that these are selected. This is primarily where you start to sort out the decoys and the warhead, or multiple warheads, if you have them. So that’s a key element, and I’ll come back and talk a lot more about it. This is the one we’re talking about putting on the end of the Aleutian
Islands in Shemya,....

, lastly, I should point out that we will be adding later, in order to do even more discrimination, a space-based infrared discrimination capability, the so-called SBIRS-Low...We have the detection from the satellite. You then have the transfer of that information over to the large radars that give you the predicted envelope so you know approximately where it’s going to be going. We can then commit the interceptor, based upon the projected trajectories, since this is basically a ballistic trajectory. You then can put the X-band radar on for refinement, and you can then use your interceptor—you can send data, by the way, from this X-band radar up to the interceptor to give it some corrections after it’s been launched. This, as General Kadish will point out, is one of the areas we’re adding for this next flight, that wasn’t in the prior flight.

And then, of course, the interceptor itself, the kill vehicle, goes on its own, does the final sorting among the decoys and the target, and then does a hit-to-kill direct intercept.

The Congressional Budget Office described SBIRS as follows in its April 2000 report to Congress:

- During the early stages of NMD deployment (before SBIRS-low becomes operational in 2010), space-based sensors will be able to supply launch-detection and tracking information only during the powered phases of an incoming missile’s flight. Initially, that information will be supplied by existing Defense Support Program satellites in geostationary orbits. By 2008, that function will be taken over by SBIRS-high satellites—some in geostationary orbits and others in highly elliptical orbits that cover the North Pole region. When the SBIRS-low satellites (in low-Earth orbit) become fully operational in 2010, they will be able to track incoming objects that are gliding through space as well as ones using powered flight.

- The DSP satellites, which have been operating for about 30 years, successfully detected launches during the third and fourth flight tests as well as the risk-reduction flights. Both SBIRS-high and -low satellites are still undergoing development; the Air Force made substantive programmatic changes to both during 1999. In addition, technical problems with some aspects of SBIRS development could affect ground tests for national missile defense. For instance, data from tests of the SBIRS-high sensors are being used to validate computer models that are employed in major ground tests essential for integrating the parts of the NMD system. But the validity of those data—and hence the models based on them—has been questioned because the data were obtained using uncalibrated equipment. If integration work on the NMD system has to be repeated as a result, that system may face delays.

- The programmatic changes to SBIRS-low may be even more significant for national missile defense than the technical problems might be. Early in 1999, the Air Force canceled the planned in-orbit tests of those satellites because of cost overruns. Instead, it introduced a more rigorous ground-testing program. However, at the request of DoD’s Director of Operational Test and Evaluation, the Air Force instituted a new flexible-design approach in which the first six SBIRS-low satellites would be subject to in-orbit experimentation and testing. That approach is intended to allow modifications in sensor designs and system capabilities at many levels. Although programmatic changes to SBIRS-low are likely to reduce the risks associated with deploying those satellites, they could have serious effects on ground testing and system integration for Capabilities 2 and 3 of NMD.

The FY2000 Defense Appropriations Act requires that the Secretary of Defense shall transfer the management and budgeting of funds for the SBIRS Low system from the Tactical Intelligence and Related Activities (TIARA) budget aggregation to a non-intelligence budget.
activity of the Air Force. It also sets the following program goals:

- The system level technical requirements for the SBIRS Low system shall be defined not later than July 1, 2000.
- A Milestone II decision on entry into engineering and manufacturing development to be made during fiscal year 2002;
- A critical design review to be conducted during fiscal year 2003; and
- A first launch of a SBIRS Low satellite to be made during fiscal year 2006.

**Is the System Truly National? Location, Range, and Coverage**

The Department of Defense took the decision in to shift the location of the system from a base near Grand Forks to one in Alaska in early 1999. According to a report in the New York Times, it did so because of the fear that the inability of a Grand Forks-based system to cover some islands in Western Aleutians in Alaska and uninhabited islands in Hawaii would be politically unacceptable to powerful members of Congress from those states. As a result, the system became far more non-compliant with the ABM treaty than would otherwise have been the case.\(^1\)

It should be noted, however, that the description of the current system as being national is still highly nominal and that BMDO and the Department of Defense have never discussed this aspect of the systems architecture. The probability of intercept is never binary. It is the product of the energy of maneuver required from the interceptor and kill vehicle, the coverage of the sensors and command and control system, the ability to transfer system simulation and test data into kill probabilities, the deployment of the sensors and interceptors, and the nature of the attack.

A deployment in Alaska is inherently designed more to deal with North Korea than any threats that may emerge from nations in the Middle East like Iraq and Iran, but none of the literature issued by the Department of Defense makes this clear. Similarly, no data has ever been issued showing the zones of maximum probability of intercept or how this probability varies over the US states. There is also no public data indicating the role that nations like Canada and
Britain would have to play in providing X-band radar coverage on their soil.

“Cookie cutter” approaches to “demonstrating” national coverage may be political convenient, but they are virtually absurd in terms of the laws of physics and complex system behavior. Unfortunately, it is not clear that anyone involved in the political debate over NMD is interested in the truth, and it is painfully clear that the Department of Defense has never issued any useful unclassified data in this area.

**Risk, Cost, and Benefits**

Even before President Clinton’s decision to defer the deployment of this system until the next Presidency, it was clear that the current NMD program is already a highly compromised system based on some seventeen years of research and development effort. The devolution of SDI into NMD has already sharply reduced many aspects of risk. At the same time, even a simplified NMD system represents the most complex problem in systems integration and C4I/BM design in US history, and creates serious questions about the limits of cost estimation, systems design and even test and evaluation. Ironically, the only way to accurately assess the cost-effectiveness of an NMD system may ultimately be to deploy one. Test and evaluation and simulation can accomplish a great deal in reducing uncertainty, but historically, only field deployment and extensive follow-on testing and modification based on user feedback have ever fully solved the problems involved in complex system development.

The NMD program also suffered from its friends as well as its enemies. Attempts to mandate deployment times and set artificial deadlines have their drawbacks as well as their advantages. The entire history of NMD is a history of a program whose artificial deadlines slip towards reality.

**Generalizations versus Program Specifics**

NMD is scarcely unique in that the full details of the Department of Defense’s cost and risk analyses are not public. At the same time, SDIO had a long history of using unique and
favorable development, test, and cost assumptions, and the limited data available from the GAO indicate that there is good reason to assume that BMDO’s cost estimates remain flawed. More generally, there are few indications that the NMD program has been priced using the higher range of cost-escalation resulting from regression analysis. The derived cost method used seems to be modeled on parametric engineering cost estimates of a kind that have a long history of underestimating real-world costs.

There also does not seem to be an official description of how the system is planned to evolve beyond 2005, or of exactly how it might going to costs. In June 2000, the Department of Defense gave a briefing stating its cost estimates were under review. It said that it had said in the president’s budget request for FY2001 that it would be around a $14 billion acquisition cost for the entire system of 100 interceptors. It also stated that the costs were under review, because of the Welch Panel recommendations but that the previous figure covered 100 interceptors.192

These broad statements only cover incremental procurement costs with no RDT&E costs, and are so general as to have little value. They do not include the life cycle costs of operating the program, and discussing an “entire system of 100 interceptors does not define the specific system being costed. BMDO does not describe the probable timing and growth of the NMD system in its testimony or fact sheets.

Department of Defense sources do indicate, however, that the “best case” for a 2005 deployment would be a system of 20 interceptors, 1 high resolution radar, 5 upgrade early warning radars, with a capability to intercept a maximum of five warheads. This system would grow to 100 interceptors by 2007, under best case conditions, and would then have a maximum intercept capability of 20 warheads. Presumably, this is the system that BMDO is discussing in its cost estimates. The US might have deployed the first six SBIRS warhead tracking satellites, however, and this does acquisition cost does not seem to be in the $14 billion figure.

By 2010, this concept of the evolution of the NMD system would add 3 more high resolution warheads, and 24 warhead tracking satellites as part of SBIRS, a much more
expensive system. This system would then potentially grow to two sites, with a total of 250 interceptors, 9 high resolution radars, 6 upgraded high resolution warning radars, and the ability to intercept a maximum of 50 warheads, a system costs far more than twice the total estimated by BMDO.

Unfortunately, this picture of system growth is so unofficial that it makes detailed costing and risk analysis moot, and many experts feel that the actual spend out time for the system to be deployed in 2005-2007 would take 12-16 years, greatly reducing the cost burden in any given year.\textsuperscript{193} As for risk, it is important to note that a lack of access to classified data and to comprehensive technical expertise make such assessments suspect in an case. There have been many attempts outside government to discuss the risks, costs, and benefits inherent in the current architecture for the NMD system.

As the previous history of the US NMD program has shown, providing an objective independent analysis of risk and effectiveness requires far more detail on the program than is currently public. It requires detailed access to BMDO and contractor program plans and risk analysis. It requires review of the detailed cost analyses made of each component and the system, and separate analysis of the systems integration phase.

It also requires a detailed picture of the test and evaluation methodology and of the technical results to date. Without such data, each successful test tends to produce claims by the advocates of NMD that the system can be deployed quickly and with limited risk. Each failure tends to produce the opposite result and claims that the program and technology is hopelessly flawed. The end result has much of the intellectual merit of the scholastic debate during the Middle Ages over how many angels can dance on the head of a pin. The reasoning is fascinating, the empirical evidence is limited.

Barring such access, judgments have to be speculative, and there are two major and conflicting trends that have shaped the history of the development and deployment of complex weapons systems in the US.
• First, the US has consistently failed to accurately predict the cost of similar complex systems, estimate their initial effectiveness and deployment schedule, and develop test and evaluation methods that can be relied on to predict their performance in the field. It seems fair to state that US cost analysis methods based on derived costs and engineering data almost invariably underestimate deployment and life-cycle costs and often by several hundred percent. It seems equally fair to say that the US has not deployed a major weapons system in the last quarter of a century that did not require at least half a decade of modification in the field after its initial “combat-ready” deployment date, and that there are no examples of a test and evaluation program adequate to avoid the need for such a post-deployment modification effort.

• Second, the currently contemplated NMD system has relatively mature components that do not involve major technological leaps or breakthroughs, and the US has rarely failed to develop highly effective systems out of the initial systems it has deployed. If the US tends to rely on a set of management and planning myths in deciding when a system is deployment ready, it corrects its mistakes with unmatched success. The same neo-Luddites who are almost always right in challenging the pre-deployment details of US plans are almost always wrong about overall US success in fielding new systems.

Independent US Government Efforts to Assess Risk, Cost, and Benefits: The GAO Study

The current NMD architecture is the product of so many changes that there are only limited cost and risk assessment data available from independent US government sources like the General Accounting Office (GAO) and Congressional Budget Office (CBO) that apply to the current NMD program. Outside US agencies also have a poor history of assessing technical risk, a problem that has been compounded by the fact the US Congress abolished the Office of Technology Assessment (OTA). To paraphrase Oscar Wilde, the US Congress is organized to deal with technology in ways that allow it to assess the cost of everything and the value of nothing.

At the same time, some of these outside critiques of BMDO by US government agencies are still useful. The most recent comprehensive public GAO report on the technical, cost, and schedule risks of NMD program dates back to February 1998, but many of the broad conclusions in this report still seem to apply to the present NMD program.194

Cost Uncertainties: Future NMD funding requirements depend in large part on how the system is designed and when and where it will be deployed. These factors may not be known for some time. For example, the government and prime contractor have not yet agreed on a final system design. The deployment schedule and location will not be known until at least the fiscal year 2000 deployment review. To provide a basis for estimating near-term funding requirements and to help determine how these differences will impact future funding needs, the program office prepared four different life-cycle cost estimates, based on two locations—one at Grand Forks, North Dakota, and the other in Alaska—and two capability levels—one available in fiscal year 2003 and the other in fiscal year 2006.

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The life-cycle cost estimates show the total costs to develop and produce system components, construct facilities, deploy the system, and operate it for 20 years. Because specific designs have not yet been determined for system components, life cycle cost estimates are based on assumptions about which designs will be chosen. The cost estimates could change based on decisions made by the prime contractor, or evolution of the threat. The higher cost for a deployment in Alaska by 2003 is due, in large part, to the fact that less infrastructure currently exists there, transportation costs are higher, the construction season is shorter, and the environment is harsher. Procurement and operation and support costs are primarily dependent on the type and amount of hardware included in the deployment. Research and development costs would be slightly higher for an Alaska deployment primarily because of the need for additional site survey studies.

The 3+3 program is designed to enable a system to be deployed as early as fiscal year 2003, but a more capable system could be operational in fiscal year 2006, according to BMDO. The primary differences between the two capability levels used in the cost estimates are in the type and amount of hardware included. For example, the more capable system would have significantly more interceptors, fewer ground-based radars, but would also include a space-based sensor system. After the space-based sensor system is deployed, fewer ground-based radars will be needed for an Alaskan deployment because of Alaska’s location relative to potential threats. The requirement for fewer radars is the primary reason an Alaskan deployment by fiscal year 2006 is estimated to have a life-cycle cost slightly less than a deployment at Grand Forks in that same timeframe. With fewer radars, operating costs would also be lower in Alaska.

**Schedule Risk:** In December 1997, we reported that DOD faces significant challenges in the NMD program because of high schedule and technical risk. We pointed out that schedule risk was high because the schedule requires a large number of activities to be completed in a relatively short amount of time. Some development activities are not able to proceed in earnest until the government and prime contractor agree on a final system design. Furthermore, developing and deploying an NMD system in the 6 years allotted under the 3+3 program will be a significant challenge for DOD given its past history with other weapon systems. For example, NMD’s acquisition schedule is about one-half as long as that of the Safeguard system, the only U.S.-based ballistic missile defense system developed so far. The program’s technical risk is high because the compressed development schedule only allows limited testing. The NMD acquisition strategy called for conducting (1) one system test prior to the initial deployment decision—a test that would not include all system elements or involve stressing conditions such as multiple targets—and (2) one test of the integrated ground-based interceptor before production of the interceptor’s booster element must begin. If subsequent tests reveal problems, costly redesign or modification of already produced hardware may be required.

Since our December report, DOD has revised program plans to mitigate schedule and technical risk to some extent. Changes include procuring additional spare hardware to protect against further schedule slips and increasing the amount of planned testing. DOD officials told us, however, that overall schedule and technical risk associated with a 2003 deployment will remain high, despite these actions.

... According to the study panel, which was established by BMDO; the Director of Operational Test and Evaluation; and the Director of Test, Systems Engineering and Evaluation; schedule pressures on NMD have created a planning environment at least as optimistic as that which led to test failures and delays in other missile defense programs. Schedule Risk: Even with the additional funding, the program’s schedule risk will remain high, according to DOD officials. Accomplishing all of the required contracting, development, integration, and testing planned before the initial decision point in fiscal year 2000 is, and will continue to be, high risk. According to the program manager, additional funding cannot be used to reduce schedule risk because “we simply cannot buy back time.”

**Technical Risk:** Technical risks remain high for a fiscal year 2003 deployment even though the program has made some technical progress and has revised plans to increase the amount of testing prior to
deployment. The amount of flight testing is still limited compared to other programs. Other outside
reviewers have also commented on the limited amount of flight testing planned for the program.

Since our December 1997 report, the program has made some technical progress. In January 1998, BMDO
conducted its second kill vehicle sensor test. An earlier test in June 1997 included a sensor built by a
competing company. The purpose of both tests was to analyze the ability of the respective sensors to
identify and track objects in space. According to DOD, both sensor tests were successful. The sensors
successfully tracked and obtained data needed to identify simulated threat targets and decoys. The two
competing contractors are scheduled to test the ability of their kill vehicle designs to actually intercept
targets in space during fiscal year 1999. This data will be used to select a single kill vehicle design and
contractor.

As a result of added funding, BMDO has also increased the number of tests planned. For example, BMDO
almost doubled the number of planned integrated ground tests,
added one integrated flight test prior to
the fiscal year 2000 deployment readiness review, and increased the number of flight tests planned between
the readiness review and the system’s initial operational capability date. The number of flight tests to be
conducted after the readiness review depends on whether or not a decision is made to deploy. Without a
deployment decision, there will be two integrated flight tests per year. If a deployment decision is made in
fiscal year 2000, with a target deployment of fiscal year 2003, there would be three flight tests in fiscal year
2000, and four a year in fiscal years 2001 through 2003.

Overall technical risk associated with a fiscal year 2003 deployment remains high because the amount of
testing, although increased, is still limited compared to other programs. Even after the increase in the
number of tests, the program manager told us that in his view, the planned flight test program is anemic.
The program plans a maximum of 16-system level flight tests through the end of fiscal year 2003, the
earliest planned deployment date. By contrast, the Safeguard program included 111 flight tests before
the system became operational. Of these 111 tests, 70 were intercept tests, 58 of which were successful.
The panel on reducing risk in ballistic missile defense programs also concluded that plans for the 3+3
program are based on inadequate test assets and testing. The panel recommended increasing the number of
tests (both ground and flight tests) and that the flight test program be restructured to allow more time
between tests to ensure that problems are corrected and the corrections are tested.

Technical risk in the NMD program is also of concern to DOD’s testing organization. According to the
Director of Operational Test and Evaluation’s Annual Report for fiscal year 1997, the planned NMD test
program will provide only a limited basis for evaluating system performance. The limitations cited in the
report include (1) the limited amount of testing planned prior to the deployment readiness review; (2) the
fact that the booster to be used in the ground-based interceptor will not be tested prior to the readiness
review; (3) the interface between the system’s battle management, command, communications, and control
element and the national command authority will not be tested before the decision review; (4) the system’s
performance against multiple targets will not be tested; and (5)models and simulations used to support the
review will have minimal validation by real flight data. NMD program officials told us that they are in the
process of redefining the program’s risk. The new risk assessment is scheduled to be completed and
documented by early June 1998. They also pointed out that the prime contractor’s system design and
program plans may impact risk. According to the program’s test and evaluation master plan, the amount of
testing is unlikely to change as a result of prime contractor selection.

Many of the GAO’s conclusions are similar to those in the Report of the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs. This panel was chaired by General Larry Welch and was sponsored by the Director, Operational Test and Evaluation (DOT&E) of the Department of Defense, the Director, Test, Systems Engineering and Evaluation (DTSE&E) and the Director of BMDO.

The Welch Panel released one key report on February 27, 1998, and has been noted earlier, this report was a key factor that led to a significant restructuring of the NMD program. Even so, many of its conclusions also still seem valid, and were raised again in the Panel’s report in June 2000.¹⁹⁶

Programs have been characterized by pressures for higher risk approaches to meet an “urgent need” for early capability [e.g., THAAD User Operational Evaluation System (UOES), but this capability is inconsistent with the technical challenge

- Program “urgency” is reflected in less-than-minimal or highly compressed planned flight testing
- THAAD: 20 night tests in 24 months
- Now 13 flight tests, with the schedule continuing to slip
- 1 intercept required to exercise the 40-missile DOES buy
- NTW: 9 flight tests in 48 months
- Patriot PAC-3: 16 tests in 2+ years (11 BMD)
- NMD: 6 tests in 2+ years before readiness-to-deploy review
- Peacekeeper program planned 20 night tests in 4+ years (flew 19)

The “early capability” approach demands operational capability before system design is completed through the Engineering Manufacturing Development (EMD) phase. This approach is inconsistent with the complexity of the task and has, thus far, not accelerated operational capability. Instead, the added risk has produced little discernible benefit and has actually delayed operational capability.

The most convincing evidence of the risk pressures from this approach is found in the test planning. This planning is characterized by either less-than-minimal testing or highly compressed testing or both.
For THAAD, the original plan was 2 years to the first test flight and then almost a test flight per month for the next 2 years. Thus far, the response to failures has been to reduce the testing in an attempt to maintain the schedule. The NTW test schedule is not compressed, but the number of planned tests is not consistent with the task. The Patriot program, which, in most respects, is carefully planned and is building on a legacy of well-developed processes, also has been forced into the less-than-minimum test mode.

Current planning for the NMD test program is even more optimistic than the theater HTK programs.

As noted here, as a benchmark, the Peacekeeper program certainly no more technically challenging than HTK responded to intense schedule pressure with a clearly adequate and well-paced test program and delivered the required capability on schedule.

…The strategy of accepting a high level of risk to shorten schedule time has been counterproductive. THAAD is 4 years behind schedule, NTW has just delayed its deployment date and has begun a risk-reduction program (ALI). The path to NMD operational capability is largely undefined. Historically, the most likely cause of program slips has been high technical risk.

The study group was not surprised to find that accepting higher risk is not accelerating fielded capability. The virtually universal experience of the study group members has been that high technical risk is not likely to accelerate fielded capability. It is far more likely to cause program slips, increased costs, and even program failure.

…Schedule and cost pressures on NMD have created a pleading environment at least as optimistic as that which teas lead to test failures and delays in TMD programs.

The NMD program consists of a series of very difficult challenges. Although NMD activity has been ongoing for a long time, there has not been a coherent, consistent path and a realistic plan leading to a deployed system.

There are high schedule risks and inadequate test assets and testing planned in the 3 + 3 formulation. In the judgment of the study group, successful execution of the 3 + 3 formulation on the planned schedule is highly unlikely. The program will benefit from the earliest possible restructuring to contain the risk.

For NMD, the schedule and cost pressures inherent in the 3 + 3 formulation and the system requirements are inherently even more severe than those for the TMD programs that have experienced excessive flight test failures.

To succeed, the NMD program must meet a series of formidable challenges. The effort to meet these challenges must emanate from a clear set of requirements, consistent resource support (which includes an adequate number of test assets), well-defined milestones, and a rigorous test plan. The study group believes that current NMD program is not characterized by these features and is on a high-risk vector. It will benefit from the earliest possible restructuring to a more achievable set of goals.

One key conclusion of the 1998 report of the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs was a warning that the currently contemplated NMD system can only be made to work if the test program is extended to the level of a trial deployment of at least one interceptor unit and an operational command and control and sensor system. 197

The mind set that risky “key demonstration” tests can prove readiness for early deployment has permeated
some BMD DT programs and is a key departure from the test paradigm that has proven to be successful in other complex programs.

BMD programs need to pay more attention to ground testing, simulation, and analyses to reduce known areas of uncertainty to be resolved in flight tests to only those issues that cannot be investigated with ground testing. The more limited the flight testing program, the more essential it is to reduce uncertainty.

The philosophy appears to be to plan for a single test in each “regime” (e.g., exo, endo, long-range, short-range) and then move on. There is a need to hold the test vehicle configuration as constant as possible for a needed series of tests.

“The rush to failure in flight testing has been partially caused by a fundamental misunderstanding of the purpose of developmental testing. Some of these tests were treated as demonstrations of known capabilities where “fly to verify” was the purpose. In practice, the unknowns made them “fly to learn” experiences. The “demonstration mindset” was evident in flight tests conducted without complete component qualification and ground testing. One program office espoused the concept of “test a little, learn a lot.” The drive for early capability based on minimum capability demonstration has been a factor in this “key demonstration” mentality that is, a single success is regarded as a large step forward and becomes the criteria for a key program decision, such as exercising an option to buy operational missiles. This approach and mindset are sharp departures from experience on successful flight test programs that have followed the practice of “learn a lot” and then “test to verify.”

BMD programs need to pay more attention to reducing the uncertainties to only those issues that cannot be tested on the ground or adequately simulated. One example is that none of the infrared (IR) HTK programs (THAAD, ALI, and NMD) have exploited or plan to exploit existing high-fidelity scene generation capabilities to exercise their hardware to the maximum advantage.

Test planning needs to be very explicit in identifying the ground test and flight test needs for each key issue.

In general, the test programs are designed to provide a single shot in each operating regime. While back-up hardware is available in most cases to repeat tests, the single-shot planning produces unrealistic test schedules and pressures to move on despite failures to achieve test objectives.”

**Problems in the Past Test Effort**

As the Welch Panel points out, the test effort to date has had very mixed results. A test on January 17, 1997 was a failure because the booster carrying the kill vehicle failed to launch because of a communication malfunction. The test on July 7, 1997 repeated the test of January 17 and demonstrated the kill vehicle’s ability to identify and track objects in space, using infrared sensor. A test on January 15, 1998, again tested the kill vehicle’s ability to identify and track objects in space but only under very limited conditions. A test on October 2, 1999 resulted in an interceptor hit on target warhead, but there was a failure in the star tracker. On January 18, 2000, the interceptor missed its target because the kill vehicle missed the mock warhead by...
between 300 to 400 feet after a cooling line clogged and shut down its heat-seeking sensors. A test on July 7, 2000 failed because the kill vehicle did not separate from its booster in the second stage, and the decoy balloon accompanying the mock warhead did not inflate.\textsuperscript{198}

There have also been reports that indicated that an accelerated schedule and impossible expectations may have had an impact on contractor performance. An investigative report in the \textit{New York Times} indicates that TRW, a key software contractor, may have taken the risk of pushing inadequate software to distinguish between incoming warheads and decoys. Although the Raytheon interceptor was later selected over the TRW candidate, this even may be a warning of broader problems. At least some reports indicate that an over-ambitious schedule was also a factor in limiting the number and type of decoys the interceptor must be able to discriminate against.\textsuperscript{199}

**The June 2000 Welch Panel Report and the Department of Defense Response**

A new report of the Panel on Reducing Risk in Ballistic Missile Defense Flight Test Programs, issued in the spring of 2000, was somewhat more optimistic. The Panel again concluded that there were serious developmental problems. These included problems with the booster, and the ability of the interceptor to distinguish warheads from decoys. The new report indicated that much more sophisticated testing and development might be needed to deal with decoys and that the construction schedule for the deployment of an X-band radar on Shemya Island in Alaska was unrealistic.\textsuperscript{200}

The key findings identified three major program issues. First, continuing schedule compression and its effect on schedule and performance risk; second, the need to expand the test envelope beyond the one available with the current Kwajalein test range impeded by restrictions on the conduct of tests; and third, the need to move beyond the design capabilities needed to meet the C-1 threat with a well-defined, funded program to match target-decoy discrimination capability to fund likely countermeasures.
At the same time, the report concluded that the overall system of targeting radars, high speed computers and interceptor missiles would work, even if the system could not be made operational by 2005. The report stated, “the technical capability to develop and field the limited system to meet the defined CI threat is available…there is substantial schedule risk, but not particularly high technical risk. It is like remodeling a kitchen. It may not get done by the date the builder promised, but it will get done.” It noted that the schedule had already slipped 6-8 months, but that this slippage was not critical, although the development of a new booster would almost certainly slip beyond the scheduled date of 2001. It also estimated that the test of a production configuration of the interceptor might slip beyond the test deadline scheduled for 2003, although shifting the test from the 13th to the 12th major system test might allow the schedule for EKV testing to be met.

More generally, it concluded that the present test range and restrictions on its use meant that the current test program would not provide a realistic test of the system throughout its operating area because of restrictions on overflight, impact area, and debris in space. The Welch Panel found that fixing these problems required significant new policy decisions and funding.

The Welch Panel also concluded that “

...more advanced decoy suites are likely to escalate the discrimination challenge. The mid-course phase BMD concept used in the current NMD program has important architectural advantages. At the same time, that concept requires critical attention to potential countermeasure challenges. There is an extensive potential in the system to grow discrimination capabilities. The program to more fully understand needs and to exploit and expand this growth potential to meet future threats needs to be well-defined, clearly assigned, and funded now.”

Finally, the Welch Panel concluded that there were continuing key risk areas in:

- Technical – Completing the design, testing, and production of the EKV to include manufacturing and quality control to meet the high reliability requirements remains a high risk.
- Requirements – There is an urgent need to complete the definition of all environmental conditions and accompanying design and test requirements.
- Schedule – As already discussed, stressing challenges remain to demonstrate the required performance, and reliability of the Ground Based Interceptor for a 2005 IOC.
- Integration – There are still high-risk software and hardware challenges in moving from legacy or
prototype program elements to production configurations and converging them into an integrated system.

- Special area – Providing confidence in performance to the specified level across the operating envelope depends to an unprecedented degree on confidence in system simulations. Confidence will be heavily dependent on the degree to which the simulations are anchored in physical testing.

- Threat evolution: A parallel, continuing development program is needed for the deployed system to deal with future countermeasures.

These conclusions won almost immediate acceptance within the Department of Defense. Jacques S. Gansler, the Under Secretary of Defense for Acquisition and Technology, discussed the June 2000 report of the Welch Panel during a Defense Department briefing on June 20, 2000:

We had a series of reports from General Welch’s task force earlier on, and many of you realized that in fact they been used by the critics of the system because they were quite critical of the way we were going about doing it.

In fact, he had basically three criticisms that he highlighted in his earlier report. In fact, one of them, the so-called “rush to failure” criticism, was the fact that we were being too schedule-driven and not enough event-driven. And so in fact we modified the overall program. Remember, we had a three-plus-three, and as a result of that earlier report that General Welch put out, the schedule was modified from 2003 to 2005, giving us more time. And then we made a major change philosophically, namely to be event-driven rather than schedule-driven. And those milestones that I showed you on that prior chart where we have certain things we want to do before we make commitments were these events that would then drive our activities.

The second thing that General Welch had in his earlier reports was that we were trying too hard to do too much too soon, that we should have more of an evolutionary approach: start out with simpler decoys and start out with—and evolving the system over time. That’s exactly what, as I showed you, we are now doing.

And thirdly, he felt that we didn’t have enough testing being done and we should add additional tests. And we added a significant amount of testing as a result of that.

Now, more recently, Secretary Cohen asked General Welch to reconvene that whole group, all the scientists and the people with experience, and come back and do another independent assessment of where we were. And that’s the one that we just passed out to you in an unclassified version. Of course, there’s the classified version that he did that has the back-up for all of those findings.

We were very pleased with that report. As you notice in his transmittal letter to the secretary, General Welch stated—and I’ll read you this from his report. It said the independent review team believes that with the adjustments to the schedule and the phased decision approach that was implemented in January 1999 and, quote, “the program is on track to achieve the earliest capability to meet the defined limited threat.” Now—that’s the end of the quote. He also told us in the briefing that he did with it that that was the unanimous finding of the task force.

Now, he had specifically four recommendations that he felt were very important for us to recognize. One—
and this is the one that I basically was quoting about—namely, that the technical capability to develop and field the limited system to meet the defined threat—the C-1 is the threat that’s been defined initially. This is the relatively limited threat—is available. It’s the available technical capability that he’s commenting on here.

Secondly, he says that it’s a high-risk schedule. Well, as we have been saying for a number of years now, it’s a high-risk schedule. Secretary Cohen has said that, General Kadish has said it, we’ve all said it, it’s a high-risk schedule. And he continues to state that, which we agree with. The important part of this is that, however, no technical reason at this point to change the schedule. So we are continuing with the schedule that we have now, based on both his assessment and our own, that we have the ability to meet the 2005, if things go according to plan.

The third thing he said is that there are inherent restrictions in our flight testing that will be very limiting in terms of this program. And that’s true. For example, you know, objects falling onto fisherman in the South Pacific. So we have range limitations. There’s a law about putting objects in space, and you can see we’re doing our intercept at mid-course and putting objects into space, because we shatter this booster, is a serious violation. So we have limitations of debris in space, we have limitation on impact area. Our intent is to try to come up with some ways that either through changes in those restrictions or other things, we can in fact satisfy what he is looking for, because it’s clear that you’d like to have the ability to have longer-range flights, higher-speed intercepts, and that’s what his objective is, and it’s our objective as well. So we’re doing to look into trying to do that. It will obviously add some cost because it will add some additional flights and probably even additional launch points for the targets.

And then, he has also addressed, as we have, the discrimination capability that has to evolve with this system. As people develop more and more sophisticated decoys, we have to develop more and more discrimination capability. What was really encouraging about the findings that he’s had in this area was the fact that he felt we have the inherent capability in our design, should we choose to add the additional sophistication, to be able to handle those sophisticated decoys. And that’s a question then again, about money and time, spending the extra effort, adding the extra discrimination capability to the systems, and then later, adding on to the SBIRS-Low in order to get that additional discrimination from the infrared capability. No question in our minds, or his, that more advanced decoy suits are likely to escalate the problem and escalate the demand on us to do something about them, but with the inherent capability in the system to be able to handle those.

...He’s highlighted the risks associated with these three decision points that I mentioned to you earlier, associated with the flight that we have coming up, and then the one that’s scheduled in the fall; the flight that we have coming up with the new booster, and of course, this is the booster development, but then this is the booster with the intercept, with the kill vehicle; and then the production kill vehicle. And these are the gating items in terms of schedules, and so these events are, in a sense—are the things—these events are the ones that drive these decision points. He labeled these decisions a feasibility assessment for the first one, a decision to purchase for the second one, and a decision to deploy for the third one. That was the terminology that he used, and that’s consistent with the way I described to you what those decisions are going to do.

Given this response, it is clear that the Department of Defense still regards the current program as an acceptable mid to long-term risk, but recognizes the fact that its current test program is too limited, and that the program is underfunded and the schedule is unrealistic. As a result, the subtext in the Department’s response to the Welch Panel seems to be that it would
benefit from either a delay in a deployment decision, or from the kind of deployment decision that would defer key arms control and expenditure decisions until President Clinton’s successor took office and then move forward in phases dictated by the success of a more demanding test program and the evolution of the threat.


Other reviews of the NMD test program raise equally serious issues. The Department of Defense’s test and evaluation plan as of early is shown in Table III.13, and it is clearly a bare bones program.\textsuperscript{203}
Table III.13

CURRENT SCHEDULE OF MAJOR FLIGHT TEST MILESTONES

<table>
<thead>
<tr>
<th>Capability Level</th>
<th>Event</th>
<th>Planned Date</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability 1</td>
<td>IFT-3</td>
<td>October 1999</td>
<td>First intercept of a target in the exoatmosphere using range instrumentation and EKV guidance-achieved an intercept.</td>
</tr>
<tr>
<td>Capability 1</td>
<td>IFT-4</td>
<td>January 2000</td>
<td>First intercept attempt using NMD system prototype elements or surrogates, <em>except</em> the In Flight Interceptor Communications System and objective booster-failed to achieve an intercept.</td>
</tr>
<tr>
<td>Capability 1</td>
<td>IFT-5</td>
<td>3QFY00</td>
<td>First intercept attempt with all NMD prototype or surrogate elements integrated together <em>except</em> the objective booster.</td>
</tr>
<tr>
<td>Capability 1</td>
<td>IFT-7</td>
<td>2QFY01</td>
<td>First intercept attempt with objective, off-the-shelf booster.</td>
</tr>
<tr>
<td>Capability 1</td>
<td>IFT-14</td>
<td>2QFY03</td>
<td>First flight test against dedicated LFT&amp;E target (Uses production representative EKV).</td>
</tr>
<tr>
<td>Capability 1</td>
<td>IFT-19</td>
<td>1QFY05</td>
<td>First IOT&amp;E flight test.</td>
</tr>
<tr>
<td>Capability 2</td>
<td>TBD</td>
<td>TBD after FY05</td>
<td>First intercept at enhanced deployed capability on path to User's objective operational requirements.</td>
</tr>
<tr>
<td>Capability 3</td>
<td>TBD</td>
<td>TBD after 2007</td>
<td>Demonstrate intercept at objective Capability 3 performance level.</td>
</tr>
</tbody>
</table>


As the Welch Panel makes clear, it is not clear that either success or failure in the test program summarized in Table III.13 would be enough to establish system capability, as distinguished from proof of principle. The success in September 1999 involved a “hit” of two missiles aimed at each other without any link to the proposed NMD C4I and sensor system. The failure on January 2000 involved a leak in the coolant for the infrared guidance system typical of systems failures in the final development phase of virtually every complex weapons system the US now has in service.²⁰⁴

Even if every aspect of each component in a series of such limited tests was successful,
the results could not be representative of system behavior in a complex system. The “law of large numbers” is simply statistical shorthand for the historical lesson that small tests and statistical samples cannot be reliably scaled up to predict the behavior of a large number of complex systems interacting in more complex ways.

The January 2000 test, for example, did not involve the full use of the X-band radar in a mode similar to a full-scale operational system. At the same time, it came close to hitting its target in spite of the failure of the leak in the coolant for the warhead’s IR guidance. It did test the possible use of two decoys, but only came near the “real” warhead by accident. The test came closer to simulating a real intercept than any prior test, but scarcely simulated what might happen in a defense against even one real incoming warhead. As a result, it simultaneously succeeded in being a success, a failure, and unrepresentative of the kind of test needed to realistically validate full-scale system deployment.

These issues may help explain why the FY1999 annual report of the Director of Operational Test and Evaluation, Phillip E. Coyle III, which was issued in February 2000, concluded that the present NMD program was driven by its artificial deadlines and not by its scientific requirements, and “to meet an artificial decision point in the development process…This pattern has historically resulted in a negative effect on virtually every troubled D.O.D development program…Unrealistic pressure has been placed on the program to meet an artificial decision point.”

The report provides the following detailed description of the NMD test and evaluation program, and its strengths and weaknesses:

The system is currently in the Initial Development phase. It is during this phase that an initial NMD capability will be developed and its technological maturity demonstrated. This period will culminate in the DRR, which will determine whether the NMD Capability 1 system is technologically ready, if warranted by the emerging threat, to proceed to deployment. The previous TEMP is being revised. The purpose of the new TEMP is to define the specific progression of the T&E program from the present to an IOC in 2005. The revision will be accomplished in two phases. Phase I addresses the changes to pre-DRR ground and flight testing, brought on by the advent of the LSI and the down-select to a single EKV contractor. The Phase I TEMP was approved by OSD on December 21, 1999. The Phase II edition will provide a detailed T&E roadmap, to include modeling and simulation, for the evolution of the NMD system to the Capability 1 deployment. The Phase II document is expected at OSD in 3QFY00.
Near-term NMD T&E planning focuses on the ability to provide accurate test information and data in support of the DRR, and the ability of the system to achieve the following objectives:

- Demonstrate end-to-end integrated system performance, including the ability to prepare, launch, and fly-out a designated weapon; and kill a threat-representative target through body-on-body impact.
- Demonstrate end-to-end target detection, acquisition, tracking, correlation, and handover performance.
- Demonstrate real-time discrimination performance.
- Demonstrate NMD system kill assessment capability.
- Demonstrate the ability of the NMD battle management software to develop and coordinate battle engagement plans; prepare, launch, and fly out a designated weapon, and kill a threat representative target.
- Demonstrate integration, interface compatibility, and performance of system and sub-system hardware and software.
- Demonstrate human-in-control operations of the NMD system.
- Demonstrate system lethality.

Capability 1 system elements are derived from previous technology programs and will be integrated and tested in a series of Integrated Flight Tests (IFTs). Initially using surrogates to approximate NMD elements (as needed), then progressing to prototypes, IFTs are designed to collect data that address system issues and key technical parameters, verify the performance of NMD elements, and demonstrate overall system effectiveness. IFT-5, the final test to demonstrate overall system performance before the DRR, is scheduled for 3QFY00, and will play a key role in demonstrating that overall system objectives are met. The following table shows the major milestones in the flight testing program.

The initial flight test, IFT-1, was attempted in January 1997, but the Payload Launch Vehicle, the surrogate for the missile booster, failed to launch and the test was aborted. Since then, the NMD T&E program has performed two integrated flight tests: IFT-1A and IFT-2. IFT-1A, executed in June 1997, and IFT-2, executed in January 1998, were deemed highly successful. Both IFT-1A and IFT-2 were non-intercept, fly-by tests, designed to assess EKV seeker discrimination and homing algorithm design. Boeing and Raytheon built the EKVs for IFT-1A and IFT-2, respectively. IFT-3 and IFT-4 were previously planned to be intercept attempts by Boeing and Raytheon in support of an EKV contractor down-select prior to IFT-5. At the recommendation of the LSI, the NMD Joint Program Office (JPO) opted to down-select to a single EKV design prior to IFT-3. This approach has the advantage of three possible intercept flights with the selected EKV prior to the DRR, but added the risk of no attempts prior to down-select.

IFT-3 was conducted on October 2, 1999. It was the first attempt at intercepting a threat-like ICBM test target. The target complex, which consisted of an RV and a large balloon decoy, was launched by a Minuteman based Multi-Service Launch System from Vandenberg AFB, CA. The GBI surrogate, the Payload Launch Vehicle (PLV), was launched about twenty minutes later from Meck Island in the Kwajalein Atoll, about 4,200 miles west of Vandenberg. While the test examined all aspects of the NMD system design to some degree, its principal focus was the EKV. The EKV was boosted to its deployment location by the PLV and guided to its initial acquisition position by range instrumentation and Global Positioning System data downloaded from the target RV. After separation from the PLV, the EKV oriented itself to look at known star configurations to correct for any altitude bias. Errors induced in the inertial
navigation system during this orientation process, coupled with incorrect star data that was loaded into the system pre-flight, subsequently induced additional aiming errors into the EKV. Given these errors, when the EKV aimed itself toward the expected target location, nothing appeared in the field of view. After executing its search routine, it acquired the large balloon and subsequently the rest of the target complex. From that point, the EKV discriminated the RV from the other objects and diverted to an intercept. The large balloon aided in acquisition of the target. It is uncertain whether the EKV could have achieved an intercept in the absence of the balloon, although analysis of the data indicates that achievement of the intercept cannot be discounted.

IFT-4 was conducted on January 18, 2000. It was the first flight test for which the LSI assumed complete responsibility. Previous flight tests were run by the Government. IFT-4 attempted to demonstrate the functionality of all of the NMD elements, although the PLV was again used to launch the EKV and the In Flight Interceptor Communications System was not fully exercised. Additionally, mid-range target tracking was accomplished using beacon tracking or GPS data from the target RV. The interceptor Weapon Task Plan initial targeting coordinates and In Flight Target Updates were created using the GPS data, which is significantly more accurate than similar data from the Early Warning X-Band Radar. IFT-4 failed to achieve an intercept. Forensic analysis of the test data is ongoing to understand the cause(s) of the missed intercept.

Integrated Ground Tests (IGTs) will be conducted utilizing the Integrated System Test Capability (ISTC), a computer-based hardware/software-in-the-loop test tool that uses actual NMD element data processors and software in an integrated configuration. Unlike the range-constrained IFTs, IGTs will look at the total engagement space in a tactical environment. They will also: (1) validate the functional interfaces between the elements; (2) subject those interfaces to stressing environments and tactical scenarios; and (3) evaluate target-intercept boundary conditions. In short, IGTs will enable identification of “unknown unknowns” in an interactive system context, and verify the interoperability of NMD elements.

Prior to the formalization of the NMD program, IGTs-1 and 2 were informally conducted to verify the development of the ISTC and assess preliminary functional interactions and interfaces among NMD element representations. IGT-1A was the first formal ground test designed to demonstrate successful exchange of messages between the BMC3 and the prototype XBR, (the Ground Based Radar Prototype (GBR-P)). IGT-1A was conducted from April to May 1998, using ISTC Configuration Build 4.0.2, which incorporated BMC3 Capability Increment-2 and GBR-P Increment-1 processors. The IGT-1A threat scenarios were representative of IFT scenarios, derived from measurements by range sensor data recorded during IFT-1A. All IGT-1A objectives were successfully accomplished. IGT-3 added a UEWR processor to the GBR-P and BMC3 network and exchanged information using the Capability Increment-3 message set. There were 75 good run-for-record test runs conducted from February 1-18, 1999. All objectives were achieved, although the UEWR was sometimes overwhelmed by the number of cues it received from the BMC3. Also, the UEWR did not always track all of the objects that it should have. In addition, during six control tests, significant unexpected variability was exhibited in system performance.

There were 50 acceptable runs-for-record for IGT-4, conducted during August 9-18, 1999. IGT-4 was not intended to assess the performance of the C1 architecture. The test successfully demonstrated integration of the BMC3, GBR-P/XBR, and UEWR. There was no direct communication between the BMC3 and the EKV. The UEWR was more successful in maintaining connections to the BMC3 than it had been in IGT-3. The run-to-run variability was significantly smaller in IGT-4 than it had been in IGT-3.

There were 55 acceptable runs-for-record for IGT-5, conducted during October 12-19, 1999. The test continued to successfully demonstrate integration of the BMC3, GBR-P/XBR, and UEWR. In addition, IGT-5 provided a preliminary assessment of the NMD performance against a subset of C-1 requirements. Of the six different types of scenario examined in IGT-5, only one scenario type had nominal performance. Most of the problems in the other scenarios were due to the lack of maturity of the NMD system.
Computer models and simulations will provide representations of elements that are not mature enough for the test program. The principal simulation tool providing DRR support is the LSI Integration Distributed Simulation (LIDS). Modeling and simulation will be employed to effectively repeat hypothetical experiments in order to improve the statistical sample or determine the values of key technical parameters possibly overlooked or unmeasured.

All NMD flight testing will be in compliance with the Anti-Ballistic Missile (ABM) Treaty and other applicable treaties at the time of testing. Kwajalein Missile Range (KMR) and White Sands Missile Range are authorized to launch interceptors under the ABM treaty, but only KMR is configured to accept incoming strategically representative target flights. Accordingly, flight tests will use target suites launched from Vandenberg and directed towards KMR.

The LFT&E Working Group, a subgroup of the NMD Lethality IPT, has developed the LFT&E strategy for NMD. LFT&E activities include flight testing, sub-scale light-gas-gun testing, and simulation analyses. Sled tests are also being considered for low-end intercept velocities. Three dedicated LFT&E flight tests are planned to be conducted.

The NMD T&E program also includes a number of pre-DRR lethality test and analysis activities to support the development and accreditation of first-principles physics codes, commonly known as hydrocodes, for application to NMD. This testing will also support the development and accreditation of the lethality simulation known as Parametric Endoatmospheric/Exoatmospheric Lethality System. These simulation tools will be used for analyses in both pre- and post-DRR timeframes. The activities include: (1) target aerothermal shield damage analyses; (2) hydrocode analyses that define kill criteria for the respective EKV designs proposed by Boeing and Raytheon; (3) light-gas-gun impact testing for hydrocode validation; (4) kill-enhancement device testing; and (5) light-gas-gun testing to develop and validate material equations of state at high velocities. The analysis activities are currently ongoing. Twenty light-gas-gun tests planned for hydrocode validation were successfully completed in FY99. Testing to develop equations-of-state (the characterization of the physical phenomena that occurs during impact) is in its initial stages.

NMD Y2K vulnerability assessment addressed all aspects of the program, including the system elements (especially the BMC3 system), the flight and ground testing supporting systems, and the models and simulations used to predict performance. All NMD mission critical deployable systems, as well as science and technology support systems, were declared Y2K Compliant by the Ballistic Missile Defense Organization Y2K Compliance Review Board in July, 1999. The process of Y2K compliance includes assessment, renovation, validation, and implementation phases. The NMD program office will continue to work with the LSI to ensure Y2K compliance of the deployable systems through a configuration management process as hardware/software development continues. The program also conducted a Y2K Operational Evaluation Test of system prototypes to preclude a Y2K anomaly during any flight testing after January 1, 2000. Associated elements for conduct of IFTs and IGTs also underwent extensive Y2K testing. Two Y2K Operational Evaluation tests were conducted within the flight and ground test schedules. The first occurred at the ISTC prior to pre-mission testing for IFT-4. The second was conducted at KMR in early January 2000 during the pre-mission checkout for IFT-4. During the pre-mission dry runs and readiness tests, participating elements and the mission control support tested Y2K dates. This testing verified: (1) interface hardware and software; (2) sub-system functions; and (3) that the adequacy of operator training and procedures are not affected by Y2K dates. Testing through IFT-4 has not identified any Y2K problems.

TEST & EVALUATION ASSESSMENT

Despite the revised program, the aggressive schedule established for the NMD Program presents a major
The NMD program has to compress the work of 10 to 12 years into 8 or less years. As a result, many design and T&E activities will be performed concurrently. Program delays also caused the conduct of IFT-3 to slip to October 1999. This represents almost a 20-month slip over the last two years and demonstrates an extremely high-risk schedule. Additionally, the failure of IFT-4 to achieve an intercept may result in a further setback to the NMD schedule. The revised program has alleviated some long-term risk by deferring and staging the decision process as described earlier. However, since the DRR date has not been deferred, undue pressure has been placed on the program to meet an artificial decision point in the development process. The DRR will be "come as you are" type of review which will examine the maturity and potential of the program at that point. This is driving the program to be "schedule" rather than "event" driven. This pattern has historically resulted in a negative effect on virtually every troubled DoD development program. In spite of this intense pressure, the program manager is doing an excellent job in trying to efficiently and effectively manage the preparation for the DRR and ultimately the deployment.

The complex operating characteristics and environments of the NMD T&E Program make it necessary to plan and conduct IFTs that are restricted in scope. DRR information based on a few flight tests with immature elements will be limited. Although IFT-3 was an important test in ballistic missile defense and demonstrated a new technology, it had significant limitations to operational realism, as noted throughout this report.

Due to the restrictions on realistic operational flight testing, the T&E program will rely heavily on ground testing and the execution of simulations for assessing the maturity and performance of the NMD system concept. The LIDS model development is proceeding much slower than planned. It is extremely doubtful that the model will be completed in time to allow for a rigorous system analysis for the DRR, resulting in limited analysis. A "beta" version of the software is promised to be ready by the end of February 2000. Service Operational Test Agencies may have to rely on alternative low fidelity models to assess the potential system effectiveness.

The FY98 DOT&E Annual Report identified a number of risks that could have significant impact on the NMD T&E program's ability to test, analyze, and evaluate system performance. The degree to which those risk areas have changed from the last reporting cycle are addressed below:

- **Limited Pre-DRR system-level testing**: Only three intercept flight tests are planned before the DRR. Furthermore, the IFT-5 configuration will differ from the Capability-1 system; it uses prototype and surrogate sensors and a surrogate GBI booster stack. Nothing in the program alleviates this system maturity or schedule issues. Since IFT-3 was not conducted until October 2, 1999 and IFT-4 failed to achieve intercept, the schedule risk is increasing. On a positive note, while stretching out the program does not increase or decrease the number of pre- or post-DRR flight tests, it does allow more opportunity for operational testing a more mature system prior to fielding.

- **Limited engagement conditions**: Flight test launches from California and interceptors from Kwajalein Missile Range, along with safety constraints, place significant limitations on achieving realistic geometry and closing velocities. This area is unchanged. The geometry of an intercept of a missile launched from Vandenberg AFB, CA, presents an easily detectable, large, then decreasing radar return signal to the surrogate early warning radar used to support the flight tests. The mid-range tracking coordinates of the target RV are provided by a beacon transmitter on the RV or through a GPS receiver on the RV relayed to the ground. Pre-launch Weapon Task Plans for the interceptor are created using these data sources. This approach is acceptable for early developmental testing, but it does not suitably stress the NMD system in a realistic enough manner to support acquisition decisions. Additionally, the intercept velocities that are safely permitted during testing are on the low end of what might occur in a real ICBM attack. This limits the
operational realism and engagement conditions.

- GBI booster testing: The NMD T&E program makes use of a surrogate launch vehicle, the Payload Launch Vehicle, for all flight tests until IFT-7. The program restructure has not affected this limitation. The objective booster contract was awarded in July 1998, and first delivery will not occur until after the FY00 DRR. Lack of IFT data without the objective GBI capability (e.g., larger burnout velocity than the Payload Launch Vehicle) before the DRR will limit the GBI evaluation. Since the date of the DRR is not being changed, the evaluation will not have the benefit of data from intercept flight tests using the new booster. However, the risk of limited GBI booster testing has been mitigated somewhat by the scheduling of two Boost Vehicle Tests before the DRR. These tests will evaluate the performance of the booster with an emulated EKV package added to the front end of the missile. However, IFT-7 is the first integrated system test against a target that makes use of the objective booster. The mitigating factor in this risk area is that the weapon decision will not be made until 2003.

- Limitations of ground testing: The ISTC will be the major source of data generated from ground testing. This area has been improved somewhat through the incorporation of common scenarios from one IGT to the next. This will allow the tracking of progress in the ISTC development. However, test articles used to represent NMD elements in the testbed will still have minimal verification or validation in time for the DRR. Additionally, the validation process is not linked directly to flight test scenarios, since the IGTs use actual Element processors versus the surrogate Elements that currently support flight testing. The risk in this area should be reduced in the post-DRR timeframe, as the program embarks on an aggressive, comprehensive end-to-end hardware-in-the-loop effort. However, it is imperative that the hardware-in-the-loop program focus its initial efforts on the EKV.

- Target suite: The NMD T&E program is building a target suite that, while an adequate representation of one or two RVs, may not be representative of threat penetration aids, booster, or post-boost vehicles. Use of the large balloon in the target complex has some value, but continued use should be reevaluated for future flight tests. Test targets of the current program do not represent the complete "design-to" threat space and are not representative of the full sensor requirements spectrum (e.g., discrimination requirements). Much of this limitation, however, is attributable to the lack of information surrounding the real threat. As the knowledge of the threat evolves, the risk in this area should decrease slightly. However, specific details on threat characteristics are rarely readily accessible.

- Multiple target testing: NMD system performance against multiple targets is still not currently planned for demonstration in the flight test program. There are, however, plans to begin construction on two silos at KMR, which can be employed to do flight testing against multiple targets. The focus in this area is to use validated simulations to evaluate multiple simultaneous target engagement.

- BMC3 interoperability testing: The BMC3 to Commander-In-Chief interface inside Cheyenne Mountain will not be tested prior to the DRR. Little has changed in the pre-DRR timeframe under the current program. Build Increment-1, the first significant BMC3 release, will not be available until 2QFY00, providing very little time to be fully evaluated by the June 2000 DRR. The revised deployment schedule does reduce risk in this area, however, by providing more time for post-DRR BMC3/Cheyenne Mountain Operations Center integration and testing. Additionally, the decision on whether to initiate the integration has been deferred to the 2QFY01 Defense Acquisition Board.

- Spare test articles: The previous TEMP identified a lack of spare test articles due to a resource allocation trade-off. Current program planning uses a rolling spare concept in which the test target
for the immediate future test flight serves as the backup for the current flight test. This approach will mitigate the spare target problem; however, the spare test article issue also applies to the interceptor and EKV, where test failures have major schedule impacts.

- Limitations of ground lethality testing: Currently, there is no ground test facility capable of propelling EKVs or their full-scale replicas against targets at the closing velocities expected for NMD intercepts. These closing velocities will exceed 7 kilometers per second (KPS) and in some cases will even exceed 10 KPS. Existing full-scale sled track facilities have only approached 3 KPS. Additionally, propelling a non-aerodynamic structure, such as the EKV, down a sled track through an atmosphere at the operational velocities involves special considerations. Holloman High Speed Sled Track is working on measures to achieve much higher velocities approaching Mach 10 (approx. 3.5 KPS), still much lower than tactical intercepts. If this work is successful, the lethality test data to support DRR will still have to be collected from light-gas-gun tests of reduced-scale replicas of EKV surrogates and targets at the lower-end (six kilometers per second or less) of the intercept velocity spectrum, with hydrocode simulations for the higher velocities.

- Programmatic Issues: The LSI contractor has taken time to overcome the inertia of bringing the program up to full speed. The Government's System Evaluation Plan was supposed to be replaced by a LSI generated System Verification Plan (SVP). The LSI has now determined that the SVP is not sufficient to evaluate the program for the DRR, and is developing a System Analysis Plan that will provide the roadmap for DRR assessment. The High Fidelity System Simulation, which was to be the fast running, system performance, digital simulation for assessing many scenarios throughout the threat space, has been abandoned in favor of Boeing's LIDS model. It now appears that LIDS is at high risk of being delivered in time to allow for a robust system evaluation for the DRR or will have a reduced functionality and only allow for minimal evaluation.

- Logistics Support (New concern): Mathematical predictions for the Element reliability and availability goals that are needed to satisfy operational requirements are extraordinarily high. These requirements may be either unachievable or necessitate extensive spare parts supplies or intense maintenance efforts.

VALUE ADDED

DOT&E has been a significant contributor through the IPT process to formulate the NMD T&E program on practically a daily basis. We have been one of the principal stimuli to the JPO's plan to develop a comprehensive integrated HWIL effort. This will enable an effective and efficient ground testing capability, which will significantly reduce the risk of successful flight testing.

At DOT&E's recommendation, the JPO is proposing to alter the 2003 weapon decision to seek low rate rather than full-rate production authorization. It will permit dedicated LFT&E flight tests to be performed with production representative EKVs and allow the IOT&E to be conducted prior to full-rate production. This will reduce the risk of prematurely committing to the production in large quantities of interceptors that may not have sufficient lethality to defeat threat RVs.

Many of DOT&E's concerns and recommendations have likewise been independently captured in the second Welsh panel report.

RECOMMENDATIONS

The DRR is currently firmly scheduled in June 2000 rather than after completion of the analysis of IFT-5. This is a strongly "schedule driven" (vice "event driven") approach, thereby placing unrealistic pressure on the JPO. IFT-5 will be the first intercept attempt with all NMD elements integrated except the booster.
DOT&E is recommending that preparations for the DRR allow time for a thorough analysis of the IFT-5 test data in order to inform the DRR decision, especially in light of the failure of IFT-4 to intercept the target. This would provide a clear technical understanding of the results and avoid forcing the DRR before the analysis is complete.

Several factors drive the need for an improved hardware-in-the-loop approach. They include the failed IFT-4 intercept, the role of the large balloon in supporting an intercept and speculation on the EKV’s ability to discriminate countermeasures. DOT&E strongly recommends an intensive effort to develop a flexible, comprehensive hardware-in-the-loop facility that presents a high fidelity representation of the threat target for designing and testing of the EKV.

**BMDO Defenses and Warnings About the Test and Evaluation Program**

These technical issues are not an argument against the near-term deployment of a basic single-site NMD system per se, but they indicate that there is little meaningful prospect that the present NMD system will be technically ready for deployment as a full-scale combat system under the present schedule.

**The BMDO Overview of the Test Program**

These conclusions have been reinforced in testimony and reports by BMDO. For example, Lt. General Ronald Kadish, the head of BMDO, sent a letter to Congress in February 2000 stating that the program could use some $300 million in additional development funding to reduce the risks in the current test program in the coming fiscal year alone. BMDO has also had to postpone the systems test originally planned for April 27, 2000 to late-June 2000 at the earliest.²⁰⁸

At the same time, Lt. Gen. Ronald Kadish, the Director of BMDO, has stated that major progress was made during these tests. He provided the following explanation to the Year 2000 Multinational BMD Conference on June 5, 2000.²⁰⁹

Some are proposing that we wait until we get the results of "real-world" tests against real-world countermeasures in order to reduce our risks before we make our decision to deploy. Delay the decision to proceed with deployment, in other words, to sometime in the middle of the coming decade before we begin the multi-year process of constructing the system. A decision to delay on these grounds, of course, will not allow us to achieve initial operational capability until well after the 2005 date, probably around 2010. This risk-averse acquisition approach is not one that is tailored very well to our current national security requirements. It ignores the one factor that is driving us to consider a decision to proceed this year—the threat. As I said earlier, North Korea is capable of testing its Taepo-Dong 2 missile at any time. The more
pressing and relevant question, therefore, is this: can the United States afford to wait?

Our flight test last January, when we missed the target warhead, has received a great deal of attention. But that test was a partial success, because hitting the warhead was only one of our objectives. In the context of testing, it was a successful developmental test that proved we could integrate the far-flung and separate major elements and make them work together as one system. The interception phase of the NMD mission is clearly the most visible phase and it is key to our success. Yet we must not lose sight of the fact that the successful integration of the highly interdependent system elements is no less critical. The integration and support aspects of our testing events are transparent to most people, and we could not do this mission without them.

In the final six seconds of that January test, we had a malfunction in our interceptor sensor system that prevented us from colliding with the target. (We missed by 76 meters.) We’ve since taken the necessary corrective actions, both on the equipment and in our processes, to mitigate against a recurrence. As a result of the fixes we have had to make, we postponed by two months the next integrated flight test. But we should remember that the one thing that failed in January’s test worked last October. At this point in time, we’ve no reason to conclude that the overall design of the NMD system is flawed.

By the DRR this summer, we’ll have tested some 45-50 percent of the functionality of the system, almost 90% of the elements, and we’ll have gained enough data to be able to support a decision by the President. Remember, we’ve been testing and doing simulations to prove the elements of the NMD system for many years now. There has been significant ground testing as well as flight testing against the radars, and we use the data from these tests to validate the results we derive from our extensive modeling and simulations exercises. So, while we view the upcoming flight test to be very important to the progress of the program and the decision to proceed, we will not be developing a recommendation for the President based only on this one flight test. Our entire testing program has given us a lot of good and very valuable data upon which we can base our decisions.

I’d like to close by leaving you with what I think ought to be in the headlines today.

• First, the threat is real, and growing.

• Second, we are making significant technological advances, making a limited missile defense of the United States possible. We can hit a bullet with a bullet. Indeed, we’ve already demonstrated it.

Third, the upcoming decisions on whether and how to proceed with the NMD program will influence U.S. defense thinking, shape our offensive and defensive strategic forces, and impact foreign policy for many years to come. The debate over the U.S. NMD program is perhaps one of the most important national security discussions to be held in the United States in the last twenty-five years.

Lt. General Ronald T. Kadish has also put the current test program in the following perspective.210

A great deal of attention has been given to the integrated flight test that occurred on January 18 of this year. It was one in a long-line of testing events we have planned through 2005. While many have called IFT-4 a failed test, I take exception to this characterization of this very important and valuable test event.

Viewed in a mission context, IFT-4 was a failure - we missed the RV. The miss speaks for itself. However, in the context of testing, IFT-4 was a successful developmental test that proved under very stressful conditions the X-Band Radar, the Upgraded Early Warning Radar, and the BM/C3 capability of our
proposed architecture. The NMD system is one of the most complex systems our country ever has attempted to develop and produce. The interception part of the NMD mission is clearly the most visible and most highly regarded phase, yet we must not lose sight of the fact that the successful integration of the system elements is no less critical. The integration and support aspects of our testing events are transparent to most people, but I assure you that we could not do the job without them.

We will continue to test our national missile defense system based upon strict, proven scientific methods learned over more than four decades of missile development, deployment, and operations. Our tests are designed to weed out flaws. While we strive for success on every test, we do not expect that we will always have it. Very often problems occur and elements of our tests fail. Indeed, we should expect failure from time to time, sometimes spectacular failure, as the price of ultimate success in this highly challenging endeavor. We learn a lot from our testing successes and failures. We gain knowledge and pick up important information from problems and mistakes discovered during testing and incorporate the necessary changes into our systems before they go into our deployed weapon systems. We must ensure that the NMD system we eventually deploy will work with a very high level of confidence - our testing program is designed to do just that.

One more Integrated Flight Test, our third attempt at a successful intercept, is scheduled before the DRR in July. IFT-5, now scheduled for June 26, will meet the requirements of an integrated system test in which all the elements of the NMD system will participate together in the engagement and destruction of the target. We decided to delay this test by two months in order to deal satisfactorily with the problem we encountered with the krypton cooling system in IFT-4. In the two months that followed this anomaly, which caused the EKV to lose track of the target cluster six seconds prior to impact, we examined the failure options comprehensively. In the end, we decided that our EKV systems did not require design changes, but nevertheless we wanted to ensure that we thoroughly reviewed all test hardware and processes prior to proceeding with the IFT-5. A testing delay at this point in our program was prudent from a technical standpoint. We believe that we will have enough technical data from this test in order to move forward with the DRR in July.

From FY01 through FY05, we will conduct three intercept flight tests each year. This will allow us to demonstrate the increasing sophistication of the kill vehicle and integrated system. Flight Test 7, scheduled to take place in Fiscal Year 2001, will be the first flight test to incorporate both the exo-atmospheric kill vehicle and the proposed operational booster. Flight Test 13, scheduled for Fiscal Year 2003, will fly the production-configuration ground-based interceptor - including the kill vehicle and booster.

The NMD Flight Test Program follows a very specific path to allow an initial operational capability (IOC) in Fiscal Year 2005. This path includes a number of milestones that, in effect, postpone the need to freeze the interceptor design until the latest possible time dictated by lead-time to the 2005 deployment date. The interceptor remains the element with the highest risk within the NMD architecture. Therefore, by waiting to lock in the interceptor design until after we have tested the production-configuration "round," we can be more confident in the system we will deploy.

The NMD program has been executed along a high-risk schedule. High-risk has a very specific meaning -- we are executing this program at such an accelerated pace, that significant failure in any of the program elements may well cause us to slip our development timelines. Our recommended approach, however, is designed to handle this schedule risk by phasing our decisions based on test and programmatic performance, allowing more time to develop, demonstrate and, ultimately, deploy the system elements in a prudent manner. We have a demanding challenge and we are managing aggressively to meet it.

...While we have been developing and testing the system elements, we also have been proceeding vigorously on deployment planning activities. We have conducted fact-finding and siting studies for two potential site locations - Alaska and North Dakota. We have initiated site designs for the X-band radar,
weapon sites, and BM/C3 facilities. On October 1, 1999, we published in the Federal Register a Notice of Availability of the NMD Program's Deployment Draft Environmental Impact Statement (EIS), inviting the public to review and comment on that document. The public comment period ended on January 19, 2000. In October and November of last year, over 650 people attended public hearings on the draft EIS in Alaska, North Dakota, and Washington, D.C. We are considering the input received as we prepare the Program's Final Environmental Impact Statement, which we have scheduled for completion later this spring. As required by law, the results of the EIS will represent one of many inputs into the deployment decision process.

We initiated ground-based element facility planning and design in FY99 and have completed the 65% design for the weapon system and X-band radar facilities. We will start the design of the BM/C3 facilities later this year. For FY01, we are submitting a request for construction of the tactical and support facilities for an Expanded C1 capability. This will consist of an X-Band Radar Complex, a Ground-Based Interceptor Missile Launch Complex, and a series of dispersed facilities for Battle Management/Command, Control, and Communication. We request a FY01 MILCON appropriation of $101.6M to begin construction of the X-band radar, conduct site preparation of the interceptor site, and continue planning and design work.

In accordance with budget guidance, we will further define the facility and systems requirements associated with potential deployment of 100 interceptors in an Expanded C1 architecture by FY07, including the installation of 80 additional missile silos and non-tactical facilities. In order to remain on schedule for the deployment of the first 20 missiles in FY05, we plan to issue a Request for Proposal and award the contract(s) this fall, if approval for deployment is given.

We have made important technical progress in many areas in the National Missile Defense program. Nevertheless, this is an extremely complex program and we still have many significant challenges ahead of us.

The Year 2000 Test Program

In June 2000, Lt. General Ronald T. Kadish addressed a growing controversy over Flight Test 5 in the year 2000 phase of the test schedule in light of reservations raised earlier by BMDO, the Director of Test and Evaluation, and the Welch Panel. While the issues involved are complex, they also highlight the near-term limits of what is being tested and the ability of the test program to adapt to failures:\textsuperscript{211}

The objectives of this flight test are basically the same as we have had for our previous two flight tests. But we have an important element of emphasis where we want to actually put the integrated system together, we have a complex system of ground-based radars and kill vehicle and interceptors hooked together by a communications and computer system that controls it all.

So this test is important in that we want all these elements to work together in an integrated whole so we can accomplish the intercept. And the way the intercept is accomplished is basically having all the ground-based elements with the computers controlling, getting this kill vehicle right here, that is half-scale, into a point in space at which it could go autonomous and intercept the incoming warhead. And I’ll talk more about that a little bit later.

The last flight test we had had a lot of these elements already operating with the exception of the in-flight
communications system. And this system is important to us because it’s the system that actually tells the kill vehicle what the other radars in the system are finding out from the target complex through the battle management system. So this is a very important element.

Now, the kill vehicle, as you know, had a problem in the last flight test. And I think I’d just take a minute to recap what we have done in order to get ready for this flight test to correct that particular anomaly.

This kill vehicle is, as I said, half-scale, and it weighs about 130 pounds, and it goes very fast to do its job. There are no explosives on that kill vehicle. There are no other kill mechanisms other than a collision at very high speed with the target vehicle. But what there is an awful lot of complex electronic sensor and the associated cooling mechanisms to make the infrared spectrum work. This telescope here has an infrared detector set—two of them—that require nitrogen and krypton cooling—very low temperatures—in order to sense the target arrays in the backdrop of space. Heat sensors, in other words. What we had was some moisture in this krypton system that prevented the proper cooling at the time. We went back and spent about two months fixing that problem, understanding it, analyzing the data, and we believe we have fixed that problem by adding a number of things into the system. And that took us about two months. We originally were going to do this flight test in April, and now we’re at 7 July, about 11 days off of where we thought we would be a few months ago.

So we’re ready from a kill vehicle standpoint. Now, let me take a minute and describe this test and its complexity in some detail, and then … put it in perspective as to how we’re actually going to do this test.

It’s an intercontinental range test. This will cover about 5,000 statute miles, from Vandenburg Air Force Base to the Marshall Islands in the South Pacific. We will launch a target vehicle out of Vandenburg that will include a re-entry vehicle, a balloon decoy, a decoy that we call a balloon, and its associated carrying vehicle. At the time that this is launched, our satellite in orbit, that has been there for some time and that we will use in the operational system, will detect the launch and send messages to our battle management capability in Colorado Springs, where the Command Section will analyze the data and authorize release of the weapons and the execution of our battle management software. That data will go over a satellite communication and into a battle management node in Kwajalein. As these target complexes are flying over Hawaii, we will have test assets tracking these things to make sure that they’re on track for range safety purposes. We don’t want that target vehicle going anywhere except where we want it to go.

About the time that we need to, the battle management system will direct the launch of the interceptor and also tell the X-band radar where to look for this kill vehicle—for the kill vehicle intercept point and find this target complex. It will do a discrimination on that target complex and tell the battle manager where the reentry vehicle is headed, and it will update the in-flight booster to get that kill vehicle in the proper position.

As the kill vehicle separates, the kill vehicle will do two navigation star shots—and I’ll describe those in a little bit of detail here shortly—to orient itself in a position in space. It will get two separate communications from the battle management center—that’s the new part of this test—where that communication will use the X-band radar and early warning radars to update the kill vehicle as to where that target is and what is in that target complex in terms of what to hit. … This radar is at Kwajalein. But it will operate with the battle management system that we are developing. And this is a prototype X-band radar.

Once the kill vehicle gets a second communication from the ground, it is totally autonomous and uses its on-board electronics and computer system to discriminate the target vehicle from the decoy and its associated debris, and home in, in the last hundred seconds, for the intercept. And as I said before, the intercept is hit-to-kill kinetic energy, which essentially ionizes the warhead in space.
So that’s the test setup. And what I’d like to do now is to kind of visualize this in a cartoon film to give you a perspective of the complexity, as well as the technical challenge, we have ahead of us.

As I said, this is an intercontinental type of flight…we launch a Minute Man II rocket that’s 37 years old right now, into space. And this starts the process of the test. As it rises from Vandenberg, it will do its first-stage burn and head out into the South Pacific. About this time the space sensors are detecting the launch because of the brightness of the plume. Here is a satellite in orbit, and it will be detecting the launch as it stands and looks for launches as it does every day.

It reports that launch to our Battle Management in Colorado Springs, and that begins the process of weapons task planning to plan the mission to launch the interceptor. And there is also a human in the loop to authorize the weapon to be released. As the target flies on, it will do second-stage burn and gain into altitude for an insertion of the warhead.

the bus…contains decoys and maneuver capability. It orients itself in space, releases the reentry vehicle. The reentry vehicle spins up in order to reenter the atmosphere adequately, and then we release the decoy, which happens to be a large balloon that is representative of a threat that we expect to see. And all three of those objects are now traveling through space towards the South Pacific to present a threat complex and a challenge to the system.

Now, about that time, the Battle Management is telling our X-band radar at Kwajalein to start searching for that target complex, and it does so. It puts intense beam, it can measure things very accurately, and we expect it to discover that target and to tell the battle manager where it’s going. It will release the weapon; the weapon will launch from Kwajalein Island. There will be a first-stage burn. All this time the Battle Management is working to precision it. This is what we call an energy dissipation maneuver, because in order to stay on the range, we have to dissipate energy for that booster because it has a lot more than is required. Very stressful.

It releases the kill vehicle, and the kill vehicle immediately goes into a navigation mode; it looks for stars—two of them—and it does an upgrade of its inertial navigation system, as well as its pointing accuracy. And then it orients its antenna in the rear towards the ground to get its first communication of upgrade from the radars and what they’re seeing. It does an adjustment of its flight path and then goes into a second maneuver to again look for stars to confirm where it is in space and its pointing accuracy, and readies itself for a second update as to where that target complex is.

As it approaches the acquisition phase, it will open its sensors eyes, as depicted here, to spot where that target complex is. And if everything goes right from the ground, we should see in the center of the complex the warhead that is the target. And that’s depicted here. If it doesn’t go right, it has the capability of searching a volume of space to find these threat objects. It’ll do onboard discrimination. At this point, it’s totally autonomous, doesn’t talk to anybody. It will discriminate. Hopefully we will have the balloon pass by and other debris, and it will lock on to the warhead and collide at a closing velocity of 4.6 miles per second. And at that speed there won’t be anything left of that target reentry vehicle—if everything goes right. (Laughter.)

… we have a very complex test: many launches. A lot of things have to happen. And when it gets to the end game and actually goes against that warhead, it will look to hit that five-foot-long warhead in a space about this big. And that’s what happened on Flight Test 3, when we did a successful intercept. So we have a complex test ahead of us and a big challenge to make this work.

… in the Welch report, and one of the things he’s been very—his group has been very helpful to us on is to understand this unprecedented nature that we have of our test challenge in how to do intercontinental-level testing on a magnitude of this scale and do it in as good a way as we can from a national standpoint. The
constraints that we have I think I ought to point out at this point in time based on the nature of this test and the way we conduct it.

We are limited, as Dr. Gansler said, because of policy and rules about space debris and making sure that we have range safety, and that whatever we put up in the air, we know where it’s going to come down, and that it doesn’t contaminate the environment. So the first thing that I’d like to point out is that because of the position of these radars that we have, our expanded Kwajalein and our early warning radar in California, they are out of position to do the testing the way we would like to do them. It’s a fact of life. So we have to use surrogates in the process. But we’re using them as minimally as possible. For instance, there’ll be a radar at Hawaii that we call the FTQ-14 radar that’s been there for some time that monitors the overall test progress and will be a surrogate for our early warning radar, because since we’re shooting this way, the early warning radar is out of position to actually looking at things going away from it instead of coming towards it. We get good data out of it and we analyze it, and it’s part of the system, and we’ll get a cue from it—properly—but in order to do the mid-course-type of early warning we need a surrogate.

Now, that radar out there is not powerful enough to see that small 5-foot long reentry vehicle, so the reentry vehicle has an acquisition aid on it for that radar. And it’s called a C-band beacon, and it helps that radar acquire the activity.

Now, because we have a beacon on the warhead, I want to make it clear what that beacon does not do. That beacon does not help the kill vehicle in the acquisition phase of that requirement. It is only for this radar here. And this radar is a surrogate, using the same type of data we will get from this into our battle manager. So it’s a very complex arrangement. But we have to do that because of the out-of-position nature of our radar.

The other thing we do is we have global positioning capability on here, as well. And the reason why we do a lot of this location of the target warhead is because we need to have a range safety; we need to know where that warhead’s going, over Hawaii and into the South Pacific. And the other thing we need to know is that, when the test is over, we need to post-process this data so we know what truth was, in terms of where these positions actually were. So when we do very intense analysis of our test, we can compare it to what actually happened, as opposed to what we thought happened. And that type of global positioning does not enter this situation at all, unless we have an anomaly where something breaks down, and we don’t expect that to happen.

So there are a lot of constraints on our test program. It’s very complex. The tests cost about $100 million to accomplish, so we want to make every single one of those things count in the process. And as a result, we do a lot of things to back things up here, to make sure that we can accomplish the test and get the most out of it, even though we have the possibility of something not working right during the test process.

Dr Gansler provided the following additional risk data:

…there are many things that could go wrong, including with the target or with one of the radars on the range or with the communications system or with the interceptor, and so forth. And recognize that this is the third intercept flight and this is early in a development program. You look back at a typical missile development program, not as complex as this, and we had lots of failures before we had lots of successes. Remember the THAAD is the most recent example of it. But we’ve made lots of efforts here to address the quality, partly because of the high cost of each flight, as General Kadish mentioned, but partly because of the very fact that we won’t have a lot of them, and so we have to spend a lot of time on each one of them. But I would say… it’s clearly a high risk overall program, and it’s not a high probability of being able to precisely get everything to work on this flight.

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Q: would you say fifty-fifty?

Mr. Gansler: I don’t want to play that game. I just don’t know what the numbers—

These remarks again made it clear that there are no binary events in the NMD schedule, and no one make or break test. At the same time, they also made it clear that Department of Defense would probably purse a different test and program schedule if it was given all of the funding its needs and was allowed to let success drive development and deployment, rather than a legislative mandate.

The July 2000 Test Failure

It is hardly surprising under these conditions that a critical test on July 7, 2000 was a failure. While this test was scarcely a make or break test of any critical aspect of the technology, it was important because it was the test that was supposed to give President Clinton a milestone on which he could make his legal mandated decision whether or not to proceed with deployment, although senior US officials attempted to limit the public impact of the test. White House spokesman P.J. Crowley briefed reporters on July 7, and stated that the outcome of the test would only have a limited impact on Clinton’s decision, “I would say a hit doesn’t automatically suggest success, nor does a failure automatically come with a miss tonight,” Crowley said. “I think everyone needs to understand that this is going to be a process that unfolds over many weeks...” He also stated that “the election is not a factor in the president’s decision-making process.”

Secretary of Defense William Cohen stated in an interview on National Public Radio on the night before the test that,

“...(the test) is an important part of the analysis that needs to be done. As I’ve indicated before, the test itself is not dispositive of a recommendation to go forward, and a failure would not be dispositive of a recommendation not to go forward. What we have to do is analyze the totality of the information that we have gathered to date, and then put that through a very critical analysis before a recommendation is made. So I would suspect that following the test this evening that there will be at least three or even four weeks before a recommendation to the President will be made...with the understanding that we have at least another dozen or more tests coming before a system would actually be deployed. So there are plenty of checks and balances against deploying a system that would be ineffective. Frankly, I have no interest in recommending to the President that he deploy or make preparations for the deployment of a system that would be ineffective to protect the American people. That is not something I would advocate, and certainly the President wouldn’t support it.”
Cohen responded to other questions during the interview as follows:

Q: Given that the system that’s being talked about and tested has critics on both sides—those who say it’s too small a system to be effective, and other who say there shouldn’t be any kind of national missile defense system at all. Do you think the most sensible thing here is to keep testing and push off big decisions about what to develop for another year or two and perhaps into another administration?

Secretary Cohen: We are responding to a law that was passed by Congress and signed by the President. It had strong bipartisan support—Republicans and Democrats in the House and the Senate, mandating that we deploy a national missile defense system as soon as technologically feasible, and that’s precisely why we have been conducting the research and development to achieve that goal. This is not something that is suddenly being rushed into judgment by President Clinton for any legacy purposes. He has been trying to respond to, number one, the nature of the threat; and number two, complying with congressional demands.

Q: But there seems to be something circular about saying when technologically feasible. As you’ve said, the test that you’re putting the system through tonight is designed to be easy. Not to show that it’s technologically feasible. You can continue taking new steps and advance this process for years with such tests, making them harder and harder.

Secretary Cohen: The question really is whether or not we can deploy a system that would be capable of intercepting a limited type of an attack, and that is something we believe we are on track—we will determine that ultimately after this test and more as to whether or not that is technologically feasible.

But again, I point to General Welsh who indicated that there is nothing that would preclude, from a technological point of view, the deployment of a system to achieve this goal—although he questioned whether or not we could reach that goal by 2005.

The Nature of the July 2000 Test

The test involved launching a Minuteman intercontinental missile with a dummy warhead from Vandenberg Air Force Base, California, toward the Pacific Marshall Islands. The 63-foot long rocket was to carry a mock warhead and a deflated Mylar balloon to act as a decoy. Five minutes after launch, the rocket was to release its fake warhead, and the balloon decoy was supposed to inflate to more than six feet in diameter. A U.S. “hit-to-kill” weapon was then to be fired atop its own rocket from Kwajalein Atoll 4,300 miles (6,919 kilometers) away about 15-20 minutes after the Vandenberg launch in an attempt to maneuver, intercept and smash into the “enemy” warhead at an altitude of around 144 miles. The 54-inch exoatmospheric, 121-pound, hit-to-kill weapon was designed to hit and smash the target into space dust at a speed of 15,000 mph in a flash that would be captured by long-range cameras – essentially hitting a bullet with a bullet.
The test sequence was supposed to work as follows:

- Target missile with mock warhead and decoy balloon launches from Vandenberg Air Force base in California.
- Satellite sensor detects plume from launch of target missile and notifies the US battle management center in Colorado Springs.
- The center analyzes the data on the target missile launch and provides targeting and launch authorization data to battle management node in Kwajalein to launch kill vehicle.
- Kwajalein launches interceptor missile and activates the X-band radar for tracking.
- The exoatmospheric hit-to-kill vehicle separates from booster, takes star sightings to determine its coordinates, and receives updated information on the target’s location from the X-band and early warning radars.
- Kill vehicle becomes autonomous and uses on-board electronics to distinguish the target from a decoy and debris and homes in.

**The Department of Defense Explanation of the Failure**

The test proved to be a failure, but for reasons than had nothing to do with the technology of the NMD system per se. The Department of Defense statement on the test described the failure as follows:

…preliminary analysis from the planned intercept of a ballistic missile target early this morning over the central Pacific Ocean concluded that no separation occurred between the Payload Launch Vehicle (PLV) booster rocket, and the Exoatmospheric Kill Vehicle (EKV). Reports from program officials indicate that while the first and second stages of the booster separated successfully, the PLV started to tumble slowly after it made an energy management maneuver designed to keep it safely within the confines of the missile test range. The second anomaly was that the EKV never received a message from the PLV indicating that the second stage rocket motor had completed its propellant burn. Receipt of this signal is required for the EKV to separate and perform its intercept function. Initial cooldown of the EKV’s infrared sensors and all other functions of the EKV were performing as designed up to the point where separation was to occur.

All other elements, including the sensors, the in-flight interceptor communications system (IFICS) and the battle management, command and control and communication systems performed as expected. Preliminary indications are that the prototype X-band radar at Kwajalein Atoll performed well and discriminated the mock warhead from all other objects, including the debris from an improperly inflated decoy balloon.

The fact that separation did not occur is scarcely a test of principle since hundreds of separation tests have occurred in the past, and this failure precluded a meaningful test of NMD system performance. At the same time, the failure illustrated the risk of an accelerated and limited test program – a risk that Lieutenant General Ronald Kadish, the Director of BMDO,
and Dr. Jack Gansler, the Under Secretary of Defense, Acquisition, Technology and Logistics) made clear during a briefing on the test:215

General Kadish: We did not intercept the warhead that we expected to have tonight. We’re disappointed with that, but let me explain what I think happened, and I’ll have some visual aids here to properly put it in context. We had the launch of the target out of Vandenberg and that operation appeared to be fairly successful. We had an initial delay to the launch because of some battery problems that we worked out on the target. We had, as far as I know, only one anomaly with the target launch in that we did not get the decoy balloon to inflate, so it was an uninflated decoy.

Everything appeared to be on track with the launch in the battle manager type systems, the integrated part of the system, to work right. We launched the interceptor. But we failed to have the kill vehicle separate from the booster second stage.

All we know based on telemetry now, and of course we will get more data as time goes on, is that the kill vehicle was waiting for a signal that we had second stage separation. We did not receive that signal. Therefore, the timeline shut down and the kill vehicle did not separate, and therefore, we did not attempt or have any activity in the intercept phase.

So we had a failure of the booster kill vehicle separation. …So what we know today, or as of this hour, is that we did not get to this point on the flight. So none of this occurred. The failure was in the boost phase here.

I would point out that, as you know, those who have followed the program, that the booster we are using is not the booster we intend to use in the operational system. It is a surrogate. A payload launch vehicle, which is second stage Minuteman booster that we have had high reliability with. So somewhere in this area we failed to get the proper sequence, and therefore the kill vehicle never separated to do its job.

… The EKV separation is about 157 seconds…It was looking for a second stage separation signal. It did not get that. So the timeline shut down….It’s a part of the integrated system on the booster/kill vehicle combination. There’s a series, and I need to caveat this, is that we are very early, we’re only an hour or some minutes away from the event. All I can give you is what we have initially from our look at the telemetry. There is a lot I might say here that could turn out to be wrong, so please bear with me as we go through our investigation. So I would not like to speculate on a lot of this. But the way the normal sequence works, as I understand it, is that as the booster separates stages there are signals given to the computers on the kill vehicle and to other computers on board, and all those signals are supposed to line up and as a part of the sequence of events to make things happen.

Q: General, with many experts claiming that this is a possible $60 billion boondoggle, a system that won’t work, you now have two failures and one success. Doesn’t that weaken your position considerably?

Kadish: What it tells me is we have more engineering work to do. And as we’ve said all along, this is a very difficult, challenging job. This is rocket science, so there’s a lot of things that can happen in this process. In this particular case it appears it happened in an area that has little to do with the functionality of the key component of the system that we’re testing.

Q: With the Pentagon supposed to make its decision, the review decision in the coming weeks, can they decide at this point to move forward with this?

Dr. Gansler: Let me just make a couple of observations first on this. …I should point out that this is only
the fifth time that that particular booster which was configured for this particular flight has been used. In other words, we used it on the first four flights. They’re standard boosters, but the configuration is different and therefore the staging is somewhat different. It is planned to be used only another three times, and then after that we use the real booster. So it’s a special arrangement that was set up in order to have a surrogate early on until we could get the operational booster.

So the focus therefore of the booster portion of it is an important one. We do need to develop the booster. Unfortunately, what we’ll learn from this one isn’t what’s wrong with the operational one and we’ll have to go through the normal check out of what one would do on developing a Minuteman or developing an MX or so forth. It’s that same kind of a booster development program.

The thing we were hoping to get out of this was much more information on the interceptor portion of it, which is really the part that is unique and different about this particular flight versus, say, a normal booster development or a missile development. This is closer to, say, a development that we’ve gone through in the past of anti-aircraft missiles, something like that. You want to see what the end game looks like. In that we normally have development problems, and that’s the kind of thing that this represents as far as I can see.

Q: But do you still think it’s possible for the Pentagon to go ahead with a deployment decision in the coming weeks after what happened tonight?

Gansler: The secretary and then the president are going to be evaluating a variety of things. As the president in fact said, there were four measures that he was going to be using—important inputs for that decision will be threat information that we’ll get from intelligence inputs, also impacts on what it would likely mean in terms of the arms control agreements, other considerations that the Secretary first and then the President will be evaluating. I would say the Secretary certainly over the next month, and the President over the months shortly thereafter, trying to assess, based upon what we’ve learned from these three flights in terms of design information, what we have on other threat information. He’ll have to make an assessment of whether or not it is still critical to try to make the 2005 date. That was the thing that was driving us.

That’s the thing that the decision now relative to trying to build a site at Shemya for the X-band radar—which, by the way, the X-band radar part of it was working. That was something we were able to determine from the X-band radar that the balloon didn’t inflate.

Others have said how easy it is to put up decoys, by the way. This is the proof that one decoy we were trying to put up didn’t go up.

Q: The Secretary has already said he thinks the threat is there, and he thinks the cost is such that we should go forward. But as far as technical feasibility, do you think that it’s still possible to give thumbs up for?

Gansler: That’s something we’re going to be evaluating. To be honest with you, I think it’s fair to say that had we not had a kill in that third flight, that you would probably have very low confidence. The fact that the system, which we tested tonight again, and we tested in the second flight with the battle management system, the thing that was added tonight that was different was the link from the ground up to the intercept vehicle while it was in its boost phase. That was really the only new item. But checking out the whole system...

This is an extremely complex system. So you check out the satellites that detect the boost, that part of it worked. You check out the target vehicle. You’re checking out the battle management system. You’re checking out the X-band radar link. You’re checking out the communication link up to the interceptor booster, and then the final part. The part we didn’t get and what we were hoping to get was much more
information on the terminal phase.

So the question is whether we have enough information on the terminal phase in order to be able to make an assessment that says we should go ahead and try to build that site at Shemya. That’s one that the Secretary and the President are going to have to call, not...

Q: Is there any chance there would be another test before that decision?

Gansler: The next test that’s scheduled right now is in the October/November time period. As you remember in the last flight when we had a failure, we spent quite a bit of time trying to analyze and then fix before we go ahead. If this requires major analysis and fix, that even could be delayed. But otherwise it’s probably in the October/November time period.

Because of the construction time cycle at Shemya and the fact that we have the engineering work to be done for that site and then the construction to start in the spring, it seems to me that that’s trying to push the decision pretty far down. We’d like to have a decision made by November rather than a flight by November.

Q: It seems pretty clear that you didn’t get the data from this test that you’d hoped to have and that you needed to have in order to provide that recommendation to go ahead.

Gansler: I would say we didn’t get the data we had hoped to have. The question of whether it’s an absolute need or not is the one that the Secretary and the President will be deciding.

Q: General Kadish, of all the things that could have gone wrong with this flight, was this at the very bottom of your concern list?

Kadish: It wasn’t even on my list. We had good confidence in the reliability of this. It’s worked very well before. And to have the kill vehicle not separate was not something we worried about.

Q: You had a glazed look in your eye from the pool coverage when you took the phone call saying it didn’t work. You seemed fairly shocked. Is that a good description?

Kadish: I was more disappointed than shocked. I’m never surprised by the things that can happen. This was not—again, this is rocket science and things do happen on this stuff that are unexpected. But of all the things we worried about and had risks associated with it, this was not something we thought would happen.

Q: Dr. Gansler, you say that the President and the Secretary will have to make a decision based on whether or not, will have to decide whether or not there’s enough data, and yet they are not physicists, they are not scientists, they will have to... It’s the scientists and the physicists who will have to decide if there’s enough data.

As someone who’s been testing for a long time, would it be your recommendation, is it your determination that there is enough data or not enough data? And would you go ahead with a project like this based on the data that you’ve got?

Gansler: The distinction I was making was the fact that the Secretary and President will be deciding not just on technical feasibility, but on other considerations as well.

In terms of the technical feasibility of it, in terms of is this design likely to work under the conditions that we assessed, I would personally say that I gained a great deal of confidence from that intercept that we had successfully in terms of the interceptor portion of it because it did work and it did actually do some...
discrimination.

On the rest of the system, which you can’t just say is the interceptor technically feasible. What about the rest of the system? The rest of the system now has successfully worked twice, the last two flights, although the interceptor didn’t. We didn’t get to the interceptor on this one, and the prior one we had a failure on it.

So in a sense we’ve tested the major elements of this system sufficiently to say that the design is probably the one that’s pretty solid. That is the same conclusion, by the way, that the Welch committee came to as well in terms of the technical feasibility.

We have always said, and they said they same thing, that in terms of making the schedule it is a high risk program, and you wouldn’t like, if you had the time, you wouldn’t like to make a go-ahead decision of any sort on the basis of what we’ve seen so far, just these three flights.

But because of the fact that we have a significant number of additional flights planned before the ‘03 decision to build the missiles, one could then decide that it’s a low enough risk to go ahead and build the radar at Shemya. That’s the decision that they’re going to be making, not on whether we’re ready to release the missiles.

Q: Just a followup. This was a booster that you’ve used before and you had a high amount of confidence in. The proposed booster, the one that you really want to use is eight months behind schedule already, I believe.

So doesn’t that say that as much confidence as you have in a tested booster, you can’t certainly have that much confidence at all in a booster that’s eight months behind schedule. Doesn’t that feed into this decision also?

Gansler: It does. In fact the booster is going to be the gating item for the second decision which is the one in ‘01, and that’s the decision whether you’re going to actually deploy and make a commitment to the radars. And you’re correct. That is a gating decision and if we don’t have some successful booster launches we probably would delay that decision.

The whole schedule is a tight schedule. It has been a tight schedule right from the beginning, and it’s been more threat driven in terms... But on the other hand, it’s still event driven because if we don’t have successful events, then we wouldn’t go ahead.

As I said, I wouldn’t personally feel, unless we had a successful intercept, that I had a lot of confidence in intercept design. If I didn’t have a successful booster test I wouldn’t have a lot of confidence in the booster, and so forth.

Q: General Kadish, I’d just like to ask you to respond to the same question. On the basis of the single time that the intercept phase of this system has been exercised, are you confident you have enough data to draw judgment on the feasibility of that part of the system?

Kadish: I don’t think we should draw conclusions from any one test that are irrevocable. What we have is a number of tests and legacy tests for all the elements of the system. When added together, it provides us a great body of evidence of the capability of the system.

Certainly on that test that we had the intercept, it gave us all a lot of confidence that the design we have of the kill vehicle, which is the key to the system, worked in a phase that we never had data on. So from that standpoint a key piece of the puzzle was put into place.

But just as we’ve been saying for a long time, no one test tends to tell you everything you need to know.
We have a body of tests even before this one that tells us an awful lot. And we have increasing confidence as a result of that.

Gansler: These flight tests are validations of a lot of the ground and simulation tests. That’s a huge body of data that we have. We need more flight tests.

Kadish: We need more flight tests.

Q: Let me put it to you the other way. You’ve known for some time you would have to make a DRR recommendation on technical feasibility this summer. You now lack data from two tests on the intercept phase.

What does the absence of that data do to your ability to produce this review? And the quality of the review that you’re going to produce.

Kadish: I guess the way I would put it is, we will summarize the data and the situation that we face as of the time we need to make that assessment which is in the coming weeks, to the best of our knowledge, and that data... The data that we have and the test data that backs it up will be a high quality evaluation of the situation we face today.

Would we like to have more data? Yes. But we are where we are, and this is a natural course of most programs that I’m associated with. If you go back in history to the ICBM development, to the Safeguard development, there were many successes but also many failures early in the program, and programs have to deal with the data that you have at any given time.

So to answer your question, we will do the best assessment we can given where we are today, after we’ve concluded the analysis of the...

Q: The bottom line is, despite what happened tonight, early this morning, you can still say this is technically feasible in a review, is that right?

…Q: Doesn’t this test also show that the schedule of 2005 is really unrealistic based on how things are going? You said at the last briefing that that schedule was based on essentially everything working the way you thought. Over the testing process you’ve had a setback. It just seems that the booster being behind schedule, with other complications...

Kadish: I think what we need to do now, just like we do after every test, whether a success or failure, is evaluate what we need to do from here on out and the viability of our schedules from that point, and see if there are mitigating factors.

Dr. Gansler pointed out there is another flight test we have available to us. Whether we can gather the data for that to effect the types of decision making we want in the fall timeframe is going to be a problem, and we have to decide what to do with that.

Q: On that next test, there’s no way that that test could be moved up, it might actually be later than it is now scheduled, but no way it could be moved up?

Kadish: That’s something we’re going to have to look at. But again, this is tough work, and we’ve got to make sure that we don’t do a very expensive test just to do the test.

The US test failure had no immediate impact on the NMD program. The senators voted
by 52 to 48 on July 13, 2000 -- largely on party lines -- to kill a measure requiring testing of the project against decoys and other countermeasures intended to foil the system. The proposal was offered as an amendment to the FY2001 defense authorization bill, and also called for an independent panel to evaluate missile defense testing, which has suffered several failures.216

The Bradley Graham Analysis of the July 8 Failure

An article by Bradley Graham of the Washington Post provides important insights as to both the reasons for this specific failure, and the risks inherent in the current test program.217 The failure in January led to a three-month delay during which found that some kind of obstruction-ice or debris had interrupted the flow of krypton gas used to help cool the infrared sensors in the kill vehicle. Raytheon, the contractor producing the kill vehicle, replaced pipes and valves, modified fittings and revised assembly procedures. It then found on June 3, 2000, that there was now a nitrogen leak Boeing ultimately responsible for some of the delays, notably in the new booster design, which was a year behind schedule, and in the delivery of a computer simulation system for running ground tests. Other problems emerged. Lockheed Martin found a loose power cable on the booster nozzle control unit. A critical communications facility called the IFICS, and used to transmit target information to the interceptor while in flight suffered a power outage.

Meetings before the test made it clear that the final full-scale simulation did not provide any reliable quantitative basis for estimating the probable success of the test, although estimates seem to have range from more than 50-50 to around 80 percent. Even the simulation had problems. A fire alarm came from the building housing the control room on Meck Island because of the failure of a 240-amp circuit breaker. The countdown had to be interrupted because a UHF transmitter used to send a destruct signal in the event of a misfire had faulty amplifier. The post simulation review cites about 30 remaining potential problems, but could not assign any cumulative probability for success or failure. The review also failed to address the problem that cause the failure of the July 8 test. The briefing did ask, "Will the kill vehicle separate from the payload launch vehicle?" Graham reports that the review presentation stated, "No issues."
Graham notes the reservations that Phillip Coyle, the Director of Operational Testing and Evaluation expressed over the test program, and that Coyle argued that both the test and overall test program would not provide information to determine the system's operational readiness, and had "significant limitations to operational realism." According the Graham, Coyle was highly critical of the use of a large Mylar balloon as the decoy, and described it as "not especially stressing" and "not a true decoy" because it might aid the interceptor by alerting it to proximity of the dummy target. This seems to have happened during the October test. Coyle said continued use of the balloon "only invites further criticism from the academic community," and that the program should now test "progressively more challenging countermeasures." Coyle is also quoted as raising the same concerns as many outside critics of the program over whether the technologies in the kill vehicle and the ground-based X-band radar could really determine the warhead targets using measurements of the differences in heat, motion and other physical characteristics of objects in space.

More broadly, Coyle was concerned that all major components of the system remained surrogates or prototypes, and many were not similar to the final versions. The deployed booster, for example, had to have a velocity much higher than the test booster and would put the KV under far greater stress. Coyle warned that the test was using the same flight geometry as previous Vandenberg-Kwajalein tests, rather than more operationally realistic tests from locations in Alaska and of intercepts at higher altitudes and involving multiple interceptors. Coyle also felt that the "deployment readiness review" in 1999 had been far too premature.

When the test finally did come on July 8, there were minor glitches and problems with the sudden appearance of Greenpeace protesters, but the actual failure had very different causes. The second and third stages functioned as designed, as failed to deploy, while debris broke loose from the container that carried the dummy warhead and decoy into space. The decision was still taken to fire the interceptor some 20 minutes after the launch of the dummy warhead, but telemetry from the interceptor missile became "noisy" with static, the ejection of the cover protecting the infrared sensors on the kill vehicle until the KV left the atmosphere was not confirmed, nor was a signal that kill vehicle separated from the booster. The cause seems to have...
been a faulty part in the avionics processor on the booster, which was a previously reliable part. As a result, the positive aspects of the test were limited to the fact the IFICS link and a prototype of the X-band functioned.

None of this history demonstrates that a ground-based interceptor cannot work. At the same time, they provide a detailed picture of why underfunding the test program, mandating a deployment schedule, and not conducting tests that stress every aspect of the final deployed configuration can be an expensive recipe for disaster. They also demonstrate the hollow nature of assertions that other less well-tested approaches to missile defense have been shown to be practical and/or nearly deployment ready. No test program could firmly establish the kill probability and reliability of a deployed complex system against a complex attack. Such an estimate is simply mathematically impossible and no model or simulation can provide a reliable way to scale-up elements of a test and evaluation effort into a valid prediction of kill probability and reliability.

This again is not a reason not to deploy. If it was, the US would not have deployed a major weapons system for the last quarter century. It is, however, a valid reason for a fully funded, large-scale, and success-oriented test program that is far more robust than current plans call for, and for not trying to legislate success. As Graham notes in his article on the July 8 test,

The Safeguard missile program conducted 165 flight tests, the Polaris program 125 tests, and the Minuteman program 101 tests. The national missile defense program has scheduled only 19 intercept trials so far. Of course, rocket science has progressed in the past three or four decades, allowing contractors to accomplish much more in a single test. And ground tests and computer simulations have come to play a bigger role in verifying a new system's readiness. Little wonder, too, given the sky-high price of a flight test.

Hit or miss, each test of the national missile defense system now burns about $90 million, according to the latest figures from the Ballistic Missile Defense Organization. The kill vehicle itself costs $24.1 million. The booster—a refurbished Minuteman rocket—runs $11.4 million. What BMDO refers to as "checkout, execution and post-test analysis" of the mated booster and kill vehicle totals $17 million. The target missile, which includes a mock warhead and decoy packed in a dispersing container, or "bus," comes to $19.1 million. There also are rental charges for use of Kwajalein and Vandenberg Air Force Base in California ($3.2 million) and payments for "radar and battle management support" ($9.6 million). Finally, $4.7 million goes for "system-level planning, analysis and reporting," which covers preflight mission scenarios and post-flight studies.

**Independent US Government Efforts to Assess Risk, Cost, and**

The most detailed report on the risks, costs, and benefits of the NMD program is provided in a report by the Congressional Budget Office (CBO) entitled on Budgetary Implications of National Missile Defense and which was issued in the April 2000.\textsuperscript{218}

The Administration’s plan for NMD gives policymakers the flexibility of deploying the system in three phases, each with different capabilities. The Administration could choose to deploy all three sequentially or halt deployment after any one of them. The first phase, known as Expanded Capability 1, would cost nearly $30 billion, the Congressional Budget Office (CBO) estimates. That figure includes one-time costs and operating costs through fiscal year 2015. (By comparison, the Administration’s estimate is nearly $26 billion.) Continuing on to the second stage, Capability 2, would cost an additional $6 billion, for a total of nearly $36 billion, CBO estimates. Achieving Capability 3, the most extensive and sophisticated stage of NMD deployment, would add more than $13 billion to the costs of Capability 2. Thus, costs for the entire system would total nearly $49 billion through 2015, in CBO’s view. (The Administration has not released estimates for Capabilities 2 and 3.) Those CBO estimates do not include the costs of space-based sensors for NMD because the sensors would be used for other missions as well and their costs are included in separate Air Force programs. CBO’s estimates attempt to strike a balance between overestimating and underestimating potential NMD costs.

The Administration’s current plan for national missile defense shows Expanded Capability 1 possibly being deployed at the end of fiscal year 2007, Capability 2 at the end of 2010, and Capability 3 at the end of 2011. However, the Administration’s current Future Years Defense Program, which runs through 2005, does not include significant funds for those later phases. To begin funding the Capability 2 system after 2005 and still meet the target deployment date of late 2010, CBO estimates would require annual spending that would surpass $3 billion in 2006 and 2007. Moreover, that estimate assumes that the Administration decides not to proceed with Capability 3. If it also attempted to acquire Capability 3 by late 2011—as well as Capability 2 along the way—annual spending would have to exceed $6 billion in 2007 and 2008.

The fact that a number of potentially hostile nations are reported to be developing long-range ballistic missiles has instilled a sense of urgency in the Administration, causing it to propose a very ambitious development schedule for NMD. That schedule is significantly shorter than those of previous missile and satellite programs that CBO examined. The abbreviated schedule raises questions in the minds of some analysts about whether enough tests would be conducted to ensure that the system under development actually worked.

CBO has compared the Administration’s flight-test program with those of other major missile development efforts to assess whether the number of proposed test flights is appropriate for a program of this complexity. Unfortunately, the record of past programs is ambiguous. One interpretation of that record—that technological advances in computers and ground tests allow more development to occur with fewer flight tests—suggests that the 21 flight tests proposed for NMD might be sufficient. Another interpretation—that missiles developed from existing systems need fewer flight tests but new concepts need more—suggests that NMD would need more flight tests than the Administration has planned. Those tests cost approximately $80 million each.

Another consequence of the shortened schedule for NMD is a large degree of overlap between developing the system, integrating its various components, and producing it. (For example, all of the interceptors for

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Expanded Capability 1 would be purchased before the first test flight of the initial operational test and evaluation stage of the development program.) Some overlap is not uncommon in missile development efforts. Program managers use concurrent development and production to quickly field weapon systems that are considered vital to the nation’s security— which supporters strongly believe NMD to be. However, such overlap can result in both growing costs and, ironically, significant delays in deployment if a system is produced before all of its design problems have been worked out.

Some problems have already occurred in NMD’s development. For instance, the system failed to intercept the incoming target during its most recent flight test because of a faulty cooling system in the interceptor. Does that result indicate a serious design problem or a failure in quality control? Both options are potential procurement issues, even if they are not problems with the basic science of the hit-to-kill approach.

The CBO report is the only unclassified US government report which explicitly examines the implications of the cost of an NMD program that goes beyond a limited introductory deployment and it is also certainly correct in warning that even the basic system would cost at least $30 billion, rather than the $26 billion the government budgets, and that a more adequate system would cost at least $50 billion. Given past cost escalations at this level of technical risk, the life cycle cost of a Capability 3 system might well rise to levels around $100 billion.

**The Details of the CBO Cost Estimate**

The details of the CBO estimate show that little parametric and regression analysis was applied to its cost estimates, and it is vital to understand that even the Capability 3 system still locates interceptors at only one site, and does not plan to deal with a large or extremely sophisticated threat. CBO estimates that costs for the Expanded Capability 1 stage of NMD would total $29.5 billion through 2015—$20.9 billion for one-time costs and about $8.5 billion for initial operations (see Table III.14). That total is $3.9 billion more than the Administration’s estimate. Total costs would increase by $6.1 billion if the system progressed to Capability 2 and by another $13.3 billion if it moved to Capability 3—for a total system cost of $48.8 billion. (The Administration has not estimated the additional costs of Capability 2 or 3.)

CBO’s estimates of total costs include one-time expenses for such things as design, procurement, and construction as well as operations costs through 2015. The estimates for operations costs cover different periods of time based on when parts of the system would be initially operational. The estimate for operations for Expanded Capability 1 covers 2005 through 2015; the added operations costs for Capability 2 occur in 2010 through 2015; and the additional costs for Capability 3 come in 2011 through 2015. Those estimates assume that the systems complete more rigorous operational test and evaluation programs than those planned by the Administration during their first five years of operation and reach a steady-state level of operations costs in their sixth year. In this paper, annual operations costs after 2015 are expressed in fiscal year 2000 dollars, and all other costs are expressed in the dollars of the relevant year (in other words, adjusted for expected inflation).
Table III.14.

Total Costs for National Missile Defense by Level of Capability:

(In billions of dollars)

<table>
<thead>
<tr>
<th>Type of Cost</th>
<th>Administration’s Estimate&lt;sup&gt;a&lt;/sup&gt;</th>
<th>CBO’s Estimates</th>
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<tr>
<td></td>
<td>Expanded Capability 1</td>
<td>Expanded Capability 1</td>
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<td>Interceptors</td>
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<td>X-band radars</td>
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<td>Early-warning radars</td>
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<td>1.3</td>
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<td>5.4</td>
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<td>Total</td>
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Memorandum:

Annual Cost for Operations After 2015 (In 2000 dollars)

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<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>0.6</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Costs of SBIRS-Low<sup>c</sup>

|                                      | 0                                     | 0               |

SOURCES: Congressional Budget Office; Department of Defense.

NOTE: The estimates do not include the costs associated with space-based sensors.
The Administration has not released estimates for Capability 2 or Capability 3. These estimates for operations show the costs that would be required through fiscal year 2015. They cover different periods of time based on when each level of capability would be initially operational. The estimate for operations for Expanded Capability 1 covers fiscal years 2005 through 2015; Capability 2, 2010 through 2015; and Capability 3, 2011 through 2015.

CBO does not include the costs of the low-Earth orbit satellites of the Space-Based Infrared System (SBIRS) in the costs of national missile defense (NMD) because it believes the satellite program will be deployed—even without NMD—to serve other important missions. Nevertheless, SBIRS-low is critical to the performance of Capability 2, especially in determining how that system is structured. Failure to deploy SBIRS-low would either increase the costs of NMD, reduce its effectiveness, or both.

CBO’s estimates for national missile defense do not include the costs of any of the SBIRS space-based sensors because, as noted earlier, those satellites will have other important missions besides supporting NMD. For example, SBIRS-high and SBIRS-low will replace some current aging systems and will contribute new capabilities for theater missile defense, intelligence, and possibly other programs. Those additional missions may be sufficient to ensure that SBIRS is funded and deployed even if a national missile defense is not. However, failure to deploy those space-based sensors would render NMD less effective and possibly lead to changes in the system that would increase its costs.

In determining the potential costs of national missile defense, CBO attempted to strike a balance between overestimating and underestimating. As with any new and complex program, NMD’s future costs are uncertain for several reasons, including the usual imprecision that accompanies cost estimates, the chance that the system as currently envisioned will not work as planned, and the likelihood that circumstances will change and call for a major redefinition of the program.

Estimates can and often do go awry for any program (such as development of a weapon system) that depends on technology. But programs that are at the cutting edge of technology (such as NMD) or that employ new methods of production introduce more risk than programs that are based on the use of proven technology and well-established production methods. CBO’s estimates of NMD costs have been adjusted to reflect those risks. For example, they include probable cost growth that is common to systems with many sophisticated components, such as interceptors and radars.

Changes in the threat that the national missile defense system is designed to counter may also lead to significant changes in the plans and consequent costs for NMD. If the planned system does not accomplish all of its objectives, engineering and other changes could add to its costs. For example, some defense analysts believe that certain countermeasures could render NMD less effective; should those concerns, or others, prove true, the NMD system will most likely need some design changes or equipment upgrades to improve its effectiveness. As a result, the potential for cost increases may be somewhat greater than the potential for declines in total costs. However, CBO does not yet have a sufficient basis to determine the likelihood of significant design or implementation changes or to estimate the corresponding increase in NMD costs.

**Expanded Capability 1**

Acquiring the Expanded Capability 1 system would cost about $20.9 billion, CBO estimates. Including operations through 2015—if the NMD system stayed at that capability level for that long—would bring total costs to $29.5 billion. Annual operating costs after 2015 would total $600 million (in 2000 dollars).

As Table III.15 outlines, CBO’s estimate for Expanded Capability 1 is $3.9 billion more than the Administration’s estimate for the same period because of different assumptions about procurement of NMD components, construction, and operations.

Differing estimates for procurement arise for two reasons. First, CBO believes that in addition to the 100 deployed interceptors, the system would need 82 additional interceptors to use in testing and to replace ones lost in accidents or engagements. The Administration puts the number of additional interceptors at 47.
However, CBO’s larger figure is more consistent with the experience of previous missile programs. It includes 20 additional interceptors for operational testing and evaluation because CBO assumes that the system will need a total of 30 tests over its first five years of operations. (The Peacekeeper missile program conducted about 20 tests during its initial five years of operations, and the Navy’s Trident missile program conducted about 40 tests in its first five years.) In addition, CBO projects that a greater number of spare interceptors (20 instead of five) will be necessary to replace ones that are destroyed during engagements or tests and to allow for unforeseen events such as damage during maintenance. CBO assumes that the NMD system is more like tactical air defenses than strategic missile systems in that after an attack, it would be restored to its former condition—a task that would require spare interceptors. In all, the 35 additional interceptors that CBO includes in Expanded Capability 1 would cost almost $0.6 billion, or about $18 million apiece.

Second, CBO’s estimates for procurement are higher because they assume that the Expanded Capability 1 system will experience cost growth comparable to that of both analogous strategic systems (such as the Air Force’s Minuteman and Peacekeeper missiles and the Navy’s Trident missile) and various tactical systems (such as the Air Force’s Advanced Medium-Range Air-to-Air Missile, the Navy’s Standard missile, and the Army’s Patriot missile). The average growth of production costs for those programs has been about 20 percent compared with projections made at a point in their acquisition cycle similar to where NMD is now. As a result, CBO estimates that such growth will add $0.4 billion to the production costs of interceptors and another $0.4 billion to the combined production costs of the X-band radar, the upgraded early-warning radars, and the command and communications facilities. (Because the Administration’s estimate includes about 5 percent for cost growth, CBO’s estimate reflects an increase of about 15 percentage points.)

### Table III.15

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<tr>
<td>Additions for Capability 2</td>
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### Homeland Defense and NMD

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| Subtotal                      | 4.7          | 3.1          |

| CBO’s Estimate | 17.2 | 12.9 | 5.5 | 35.6 |

### Capability 3

#### Additions for Capability 3

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| Subtotal                      | 10.2         | 3.1          |

| CBO’s Estimate | 17.2 | 23.1 | 8.6 | 48.8 |

### SOURCES:

Congressional Budget Office; Department of Defense.

### NOTES:

These estimates do not include costs associated with the low- or high-orbit versions of the Space-Based Infrared System.

* = less than $50 million.

In the area of construction, CBO estimates that building the necessary facilities would cost some $1.5 billion—or $1 billion more than the Administration estimates. Those construction costs cover the X-band radar site, command and communications facilities, 100 missile silos, access roads, housing for personnel, and other infrastructure support. CBO’s estimate is based primarily on the cost of constructing the Safeguard missile defense site at Grand Forks, North Dakota, in the early 1970s (about $1.5 billion in today’s dollars). It also takes into account similar expenses for land-based ICBMs and planning factors from DoD about relative construction costs in different areas of the country.

CBO expects that operating the Expanded Capability 1 system would cost a total of about $8.5 billion through 2015, which is some $1.5 billion more than the Administration estimates for the same period. All of the difference results from CBO’s assumption that 30 operational tests will have to be conducted over the first five years rather than the 10 tests that the Administration now plans.

Eventually, operations costs for Expanded Capability 1 will reach a steady-state level of about $600 million a year (in 2000 dollars). Steady-state operations have three main components: day-to-day costs to run the...
equipment and keep it ready and to staff the command and communications facilities (a total of about $100 million per year); costs for an operational integration program, which would continually upgrade the NMD system to incorporate new technologies ($300 million per year); and the cost to conduct operational tests (about $200 million per year). Those costs are based on information provided to CBO by the Ballistic Missile Defense Organization.

**Capability 2**

Although the Administration’s plan for NMD indicates possibly upgrading Expanded Capability 1 to a more sophisticated Capability 2 system by the end of 2010, the Administration has not estimated the costs associated with that stage of deployment. However, it has specified what the Capability 2 architecture would consist of as well as the areas in which most of the improvements would be made. Based on that information, CBO estimates that upgrading Expanded Capability 1 to Capability 2 would cost $6.1 billion—for a total cost of $35.6 billion for that level of national missile defense (see Tables 2 and 3).

Although the number of deployed interceptors would remain the same, improving the ability of the Expanded Capability 1 system to handle complex threats (specifically, ballistic missiles with sophisticated countermeasures) would add more than $2 billion to the cost of the interceptors. (The exact technical details of moving from Expanded Capability 1 to Capability 2 have not been announced, but CBO assumes that the budgetary impact would be comparable to that of upgrading the Standard missile to the Block IVA configuration or improving the Patriot missile to the PAC-3 configuration. When those upgrades are complete they will cost $2 billion and $3 billion, in 2000 dollars, respectively.) Moreover, a further 19 interceptors would be needed for integrated flight tests and operational tests, at a cost of slightly more than $0.3 billion, bringing the total increase in interceptor costs to about $2.4 billion.

DoD has indicated that the hardware for the high-resolution X-band radar and the upgraded early-warning radars would not need improvement for Capability 2. But buying three more X-band radars would cost about $1.3 billion, and constructing radar platforms and domes would cost another $0.3 billion ($100 million per radar).

Additional flights to test the upgrades made for Capability 2 would cost about $0.7 billion, CBO estimates. That figure includes seven additional integrated flight tests during 2008 or 2009 (at a cost of about $80 million each) and engineering support. In addition, CBO estimates, 12 more operational tests—which occur after a system has been deployed—would be needed between 2012 through 2014, at a total cost of about $1 billion. Those tests would allow for a rate of six operational tests per year during the first five years of Capability 2’s operations.

Finally, moving to Capability 2 would increase the day-to-day operations costs for national missile defense by nearly $100 million a year (to support the three additional X-band radars), or a total of about $0.5 billion. Annual operating costs after 2015 would total $0.7 billion (in 2000 dollars).

The effectiveness of the Capability 2 system depends on the deployment of the SBIRS-low satellites, which, according to the Air Force, will provide the NMD system with 24-hour coverage of global threats. As mentioned earlier, CBO’s estimates for national missile defense do not include the costs of those satellites, even though they are essential to Capability 2’s success. Those costs would total nearly $10.6 billion through 2015, CBO estimates—$4.2 billion for research and development, $2.7 billion for purchase of the initial 24 SBIRS-low satellites (about $100 million apiece), $1.1 billion for operations (about $5 million a year per satellite), and $2.7 billion for purchase of replacement satellites (assuming each satellite has an average mission life of about eight years). If SBIRS-low was unavailable for any reason, Capability 2 could be achieved by using faster interceptors, deploying more forward-based radars, and developing more capable “kill vehicles” (the part of the interceptor that hits the incoming warhead). None of those changes or additions are currently planned.

**Capability 3**

The Administration’s plan for Capability 3 of NMD calls for deploying 125 additional interceptors (with Capability 2 sophistication) by 2011, probably in Grand Forks, North Dakota. It also calls for adding 25
interceptors to the site in Alaska, for a combined deployment of 250 interceptors. CBO estimates that moving from Capability 2 to Capability 3 would cost more than $13.3 billion through 2015—or a total of $48.8 billion for that level of national missile defense.

The additional costs would come from several areas. CBO estimates that purchasing 150 more deployed interceptors and 30 more spares would cost about $3.3 billion (nearly $18 million each). Buying five additional X-band radars, stationed both in the United States and abroad, would cost a total of about $2.2 billion. Constructing the radars’ platforms and domes would cost another $0.5 billion. In addition, buying an upgraded early-warning radar and deploying it in Asia would cost about $0.4 billion, and building the command and communications facilities would cost about $1.4 billion. Other construction costs at Grand Forks would total about $1.6 billion (equivalent to the Alaskan site).

Adding a second site to the NMD system would increase the costs of both day-to-day operations and operational integration. CBO estimates that daily operations at Grand Forks would cost a total of about $1 billion through 2015, or an average of about $200 million a year. Operational integration at that site would start in 2008 and would total about $2.9 billion. Those estimates for day-to-day operations and operational integration are comparable to the costs at the Alaskan site. Annual operating costs after 2015 would total about $1.1 billion (in 2000 dollars).

The CBO Analysis of Technical Risks and Test and Evaluation

CBO has also provided an important supplement to the reporting by the Welch Panel and the Director of Operational Test and Evaluation of the Department of Defense. It again describes what seems to be a relatively high risk program.220

The Flight-Test Program

Past missile development programs do not provide a clear indication of how many developmental flight tests such a program should have. (Those tests are used to remove design flaws that might, for example, prevent the rockets from firing, the cooling system from pumping fluids, or the thrusters from maneuvering the interceptor.) On the whole, more recent programs appear to have conducted fewer developmental flight tests than earlier programs did (see Table III.16). One possible interpretation of that trend is that the increasing sophistication of ground tests and computer simulations has allowed those types of testing to be substituted for flight tests.

Alternatively, that trend might indicate that familiarity and increasing expertise have allowed DoD to reduce the number of flight tests it needs when it develops new versions of existing missile systems. For instance, Polaris A-2 had fewer flight tests than Polaris A-1, both of which were single-warhead ballistic missiles. Polaris A-3, however, was the first U.S. missile to have multiple warheads—a significant advance in sophistication—and its development included considerably more flight tests than even Polaris A-1 had. Intercontinental ballistic missiles deployed after 1960 also saw an increase in the number of flight tests for the first multiple-warhead missile (Minuteman III), but not as marked an increase as with the submarine-launched ballistic missiles.

Other missile programs had substantially more developmental flight tests than either ICBMs or submarine-launched missiles did. That fact is particularly striking given that many of those programs also flew “captive carry” tests, in which a number of the weapon’s functions can be tested in a realistic environment without the expense of destroying the missile. For example, the guidance and control system of an antiaircraft missile can be tested (the optical system can sense the target, the computer can decide what maneuvers to make, and the missile’s fins can be turned in the right direction) while the missile remains attached to an aircraft that flies toward the target.
If the increasing sophistication of ground-testing and computer capabilities is really the cause of recent declines, the 21 developmental test flights scheduled for NMD would appear to be adequate. If, by contrast, the number of test flights that a missile development program needs is mainly a function of the missile’s resemblance to previously developed systems, the 21 test flights might be insufficient. In that case, however, estimating how many test flights the NMD program would actually need on the basis of such simple historical precedents would be impossible.

<table>
<thead>
<tr>
<th>Missile Program</th>
<th>Number of Test Flights for Research and Development</th>
<th>Year of Initial Operational Capability</th>
<th>Single-Warhead Missiles</th>
<th>Multiple-Warhead Missiles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intercontinental Ballistic Missiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minuteman I</td>
<td></td>
<td>1961</td>
<td>56</td>
<td>n.a.</td>
</tr>
<tr>
<td>Minuteman II</td>
<td></td>
<td>1965</td>
<td>20</td>
<td>n.a.</td>
</tr>
<tr>
<td>Minuteman III</td>
<td></td>
<td>1970</td>
<td>n.a.</td>
<td>25</td>
</tr>
<tr>
<td>Peacekeeper</td>
<td></td>
<td>1986</td>
<td>n.a.</td>
<td>19</td>
</tr>
<tr>
<td><strong>Submarine-Launched Ballistic Missiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polaris (A-1)</td>
<td></td>
<td>1960</td>
<td>42</td>
<td>n.a.</td>
</tr>
<tr>
<td>Polaris (A-2)</td>
<td></td>
<td>1962</td>
<td>28</td>
<td>n.a.</td>
</tr>
<tr>
<td>Polaris (A-3)</td>
<td></td>
<td>1964</td>
<td>n.a.</td>
<td>55</td>
</tr>
<tr>
<td>Poseidon (C-3)</td>
<td></td>
<td>1971</td>
<td>n.a.</td>
<td>25</td>
</tr>
<tr>
<td>Trident I (C-4)</td>
<td></td>
<td>1979</td>
<td>n.a.</td>
<td>25</td>
</tr>
<tr>
<td>Trident II (D-5)</td>
<td></td>
<td>1990</td>
<td>n.a.</td>
<td>28</td>
</tr>
<tr>
<td><strong>Other Missiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safeguard Missile Defense</td>
<td></td>
<td>1975</td>
<td>165</td>
<td>n.a.</td>
</tr>
<tr>
<td>Standard Missile 2 Block I &amp; II</td>
<td></td>
<td>1981</td>
<td>88</td>
<td>n.a.</td>
</tr>
<tr>
<td>Patriot (Air-defense system)</td>
<td></td>
<td>1985</td>
<td>114</td>
<td>n.a.</td>
</tr>
<tr>
<td>Tomahawk (Navy)</td>
<td></td>
<td>1986</td>
<td>74</td>
<td>n.a.</td>
</tr>
<tr>
<td>Advanced Medium-Range Air-to-Air Missile</td>
<td></td>
<td>1991</td>
<td>111</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

**SOURCE:** Congressional Budget Office based on information from the Department of Defense and the Federation of American Scientists.

**NOTE:** n.a. = not applicable.

**System Development Time**

The historical record provides a more straightforward picture of the length of time needed to develop a new weapon system. Several missile and satellite development projects—the Welch Panel pointed to both types as good historical examples for NMD—that a 1997 report by the General Accounting Office listed had an average duration of nearly 13 years. The recent restructuring of the NMD program to deploy a threshold system in late 2005 gives an expected development time of about 10 years, three years shorter than what a “traditional” program might take. (DoD says the current national missile defense program...
began in 1996.) Of course, that difference does not indicate how changes in the system’s architecture, which have been made frequently during the NMD project, affect the schedule. Some analysts would argue that such changes either slow down the program further or add to costs.

Extending the acquisition schedule for the threshold deployment of Capability 1 to the more traditional 13 years—with deployment by the end of 2008—would have some advantages. Perhaps most important, the technology needed to discriminate between decoys and real warheads would have an additional three years to develop. Currently, the Defense Acquisition Board is scheduled to decide in the middle of 2003 whether to procure the interceptors. Moving that date back to 2006 would allow the board to have information from significantly more developmental test flights. Further, when flight-test failures occurred, the tests could be repeated. Some close observers have stressed the importance of repeating such flight tests, with exactly the same mission profiles, to ensure that changes made in response to failures actually worked.

Another significant advantage gained by extending the acquisition schedule would be improved ground tests and simulations, which are constantly evolving. Currently, system integration for NMD is taking place using computer models of important components. Although that situation is to some extent inevitable given the physical constraints of ground tests, the most recent major ground test (conducted between October 12 and 19, 1999) suffered problems because the computer models—not the components they represented—failed to perform up to expectations in the majority of scenarios tested. Extending the acquisition program would allow more time to improve those simulations and reduce the risk that future integrated ground tests would experience similar problems.

The most expensive aspect of switching to a more traditional acquisition schedule—if policymakers decided to do so—would be the additional test flights. Because of uncertainty about how many test flights a “traditional” NMD procurement path might entail, CBO cannot estimate how much such a path might cost. However, if the program was stretched out to 13 years, there would be at least two alternatives for a new flight-test program. One would be to keep the 21 tests currently planned but increase ground testing to make better use of the data gained. Another possibility would be to launch the maximum number of flight tests during the program extension. (Four per year is the current maximum launch rate at the Kwajalein Missile Range, although that number could increase once a second launch facility being built there is finished.) Conducting four flight tests a year for an additional three years might imply an increase in costs of roughly $1.8 billion (half for the tests and half for the added years of system integration). Of course, that number of additional flights is based on launch capacity rather than known need. But some analysts believe that the NMD program would benefit from more flight tests. However, other analysts believe that the recent restructuring of the NMD flight-test program—which increased the number of developmental flights to 21 from 19—is sufficient given the high cost of each test (roughly $80 million).

Parallel Development and Production

One way to meet an urgent defense need is to overlap the development and production of a weapon system. Building such parallel development and production into an acquisition program can have significant advantages in reducing the time required before deployment, lowering costs, and improving management efficiency. It can also cause significant problems, however.

Design problems that require major alterations can come to light after production has started. That was the case with the B-1B bomber. That aircraft was intended to quickly close a perceived “window of vulnerability” in U.S. strategic forces and was authorized to begin production about three years before its developmental testing was scheduled to be completed. However, serious problems were discovered with the bomber’s defensive avionics (a system designed to jam or confuse Soviet radars) several years after production began. Some analysts believe that the development and production overlap might have caused, or at least contributed to, those problems.

National missile defense is a highly concurrent acquisition program. The threshold system of 20 interceptors will become operational before the first of the initial operational test and evaluation (IOT&E) flights takes place in 2006. In fact, the Administration’s schedule for NMD would purchase all of the...
interceptors and boosters needed for Expanded Capability 1 before the first IOT&E flight.

Although national missile defense is an extreme example of production overlapping development, other major missile programs have had significant overlap. For instance, production of the Peacekeeper missile was approved a year and a half before IOT&E started. Furthermore, Peacekeeper became operational only 15 months after that first operational test. Initial deployment of Peacekeeper was followed by more than two years of further initial operational testing. The Trident II missile program was also highly concurrent, with a production decision almost two years before the first performance evaluation test flight. However, Trident II completed those test flights a month before reaching initial operational capability.

Although some analysts would argue that the threat of attack from ballistic missiles justifies such concurrent development and production of NMD, it does entail significant risks. For example, as noted earlier, the Welch Panel says that the booster planned for actual operations will subject the kill vehicle to 10 times more high-frequency vibrations than the rocket used on all of the test flights so far. The increased vibrations could conceivably distort or damage the kill vehicle’s optics or electronics, rendering the interceptor impotent.

If that occurred—and it is by no means certain—one possible solution might be to change the structure supporting the kill vehicle on the booster. That in turn could add so much weight that the booster would need to be redesigned. Following that worst-case scenario to a logical conclusion, the silos meant to house the system might also need to be enlarged. However, silo construction would begin in the spring of 2002 to be ready for threshold deployment by the end of 2005. A decision about silo construction in turn is tied to the deployment readiness review scheduled for July.

Technical Risks and Test and Evaluation: The Problem of Countermeasures

Unfortunately, none of the government reports fully the technical risks identified by the Welch Panel and by opponents of NMD. These risks include the argument that countermeasures like submunitions with reentry capability and hiding balloons in warheads will be available to proliferating states by the time even advanced capability versions of an NMD system are deployable.\textsuperscript{222}

The Union of Concerned Scientists and MIT Security Studies Program View of Countermeasures

A report by the Union of Concerned Scientists and MIT Security Studies Program makes the following charges:\textsuperscript{223}

There are numerous tactics that an attacker could use to counter the planned NMD system. None of these countermeasures is new; indeed, most of these ideas are as old as ballistic missiles themselves. All countries that have deployed long-range ballistic missiles (Britain, China, France, Russia, and the United States) have developed, produced, and in some cases deployed, countermeasures for their missiles. There is no reason to believe that emerging missile states would behave differently, especially when US missile defense development is front-page news. Many highly effective countermeasures require a lower level of technology than that required to build a long-range ballistic missile (or nuclear weapon). The United States
must anticipate that any potentially hostile country developing or acquiring ballistic missiles would have a parallel program to develop or acquire countermeasures to make those missiles effective in the face of US missile defenses. Countermeasure programs could be concealed from US intelligence much more easily than missile programs, and the United States should not assume that a lack of intelligence evidence is evidence that countermeasure programs do not exist. Many countermeasures are based on basic physical principles and well-understood technologies. As a consequence, a vast amount of technical information relevant to building and deploying countermeasures is publicly available. Any country capable of building a long-range ballistic missile would have the scientific and technical expertise, including people who have worked on missiles for many years, to exploit the available technologies. Moreover, a great deal of technical information about the planned NMD system and its sensors has been published. A potential attacker could learn from a variety of open sources enough about the planned NMD system to design countermeasures to defeat it.

To determine whether technically simple counter-measures would be effective against the planned NMD system, we examined three potential countermeasures in detail: submunitions with biological or chemical weapons, nuclear warheads with anti-simulation balloon decoys, and nuclear warheads with cooled shrouds. We find that any of these would defeat the planned NMD system. They would either significantly degrade the effectiveness of the defense or make it fail completely. Moreover, these countermeasures would defeat the planned NMD system even if they were anticipated by the United States. And because these countermeasures use readily available materials and straightforward technologies, any emerging missile state could readily construct and employ them.

**Submunitions with Biological or Chemical Weapons.** To deliver biological or chemical weapons by long-range ballistic missile, an attacker could divide the agent for each missile among a hundred or more small warheads, or submunitions, that would be released shortly after boost phase. These submunitions would be too numerous for a limited defense—such as the planned NMD system—to even attempt to intercept all of them. Our analysis demonstrates that the attacker could readily keep the reentry heating of the submunitions low enough to protect the agents from excessive heat. Moreover, because submunitions would distribute the agent over a large area and disseminate it at low speeds, they would be a more effective means of delivering biological and chemical agents by ballistic missile than would a single large warhead. Thus, an attacker would have a strong incentive to use submunitions, aside from any concerns about missile defenses.

**Nuclear Weapons with Anti-simulation Balloon Decoys.** Anti-simulation is a powerful tactic in which the attacker disguises the warhead to make it look like a decoy, rather than attempting the more difficult task of making every decoy closely resemble a specific warhead.

To use this tactic, the attacker could place a nuclear warhead in a lightweight balloon made of aluminized mylar and release it along with a large number of similar, but empty balloons. The balloon containing the warhead could be made indistinguishable from the empty ones to all the defense sensors—including the ground-based radars, the satellite-based infrared sensors, and the sensors on the kill vehicle. The defense would therefore need to shoot at all the balloons to prevent the warhead from getting through, but the attacker could deploy so many balloons that the defense would run out of interceptors.

**Nuclear Weapons with Cooled Shrouds.** The attacker could cover a nuclear warhead with a shroud cooled to a low temperature by liquid nitrogen. The cooled shroud would reduce the infrared radiation emitted by the warhead by a factor of at least one million. This would make it nearly impossible for the kill vehicle’s heat-seeking infrared sensors to detect the warhead at a great enough distance to have time to maneuver to hit it.

This same report by the Union of Concerned Scientists and MIT Security Studies
Program raises other major objections to NMD, many of which are technical. One is that “operational and technical factors make the job of the defense more difficult than that of the attacker.” The technology to be used in the NMD system will be known to attackers years in advance, allowing the attacker to respond against a system that cannot easily be upgraded, and greatly complicating the problems in designing hit-to-kill interceptors which allow little margin for error, thus creating problems in ensuring that the system can work the first time it is used.

Other charges state that the “planned NMD system would not be effective against an accidental or unauthorized attack from Russia, or an erroneous launch based on false warning of a US attack, because Russia will upgrade its warheads to defeat the US NMD system and an unauthorized Russian attack could easily involve 50 or even 500 warheads, which would saturate and penetrate a limited NMD system. Similar arguments are made about defense against a Chinese attack on the grounds that China has already developed effective countermeasures.

The report puts a reverse spin on the conclusions of the Rumsfeld Commission by stating that the, “Available evidence strongly suggests that the Pentagon has greatly underestimated the ability and motivation of emerging missile states to deploy effective countermeasures. There are strong indications that the Pentagon’s Systems Threat Assessment Requirement (STAR) Document and Operational Requirements Document, which describe the type of threat the NMD system must defend against, underestimate the effectiveness of the countermeasures that an emerging missile state could deploy and thus inaccurately describe the actual threat. If the threat assessment and requirements documents do not accurately reflect the real-world threat, then an NMD system designed and built to meet these less demanding requirements will fail in the real world.” If this conclusion is correct, the cost to defeat the current NMD architecture would be affordable even to most Third World states.

**Postol and Other Comments About Countermeasures**

Somewhat similar objections appeared in the *New York Times* on June 9, 2000, when Theodore A. Postol of MIT – a long-standing opponent of NMD – claimed that the BMDO test program was rigged to minimize the number and quality of the decoys used in operational
testing, and that even relatively unsophisticated countries could easily develop decoys that would defeat the system planned by BMDO. Dr. Postol charged that the current kill vehicle could not discriminate between a warhead and a simple decoy and that neither the previous two tests, or any of the future tests, were demanding enough to reveal this critical weakness in the system design.

Dr. Postol charged that the June 1997 test had also revealed that the infrared profile of the target did not provide enough data for the sensors on the kill vehicle to detect differences between warheads and decoys, and that BMDO had artificially heightened the IR contrast between the warhead and decoys in following tests to disguise this fact. He released a chart said to come from BMDO that he said showed that all of the 16 tests to be performed between initial testing and deployment in 2005 were “rigged.” This included removing all decoys with infrared signatures close to the warhead, such as spherical balloons with stripes to make their infrared signatures vibrate in the same way as cone-shaped warheads, rigid decoys that looked like cones, and cone-shaped balloons.

The BMDO and Department of Defense Rebuttal

BMDO has strongly denied that countermeasures pose a near-term threat to the current NMD system, and has claimed that the charts Dr. Postol referred to disguised the fact that the decoys became steadily more sophisticated with time. 227 Lt. Gen. Ronald Kadish, the Director of BMDO, made the following comments to the Year 2000 Multinational BMD Conference on June 5, 2000: 228

… Some suggest that we are not testing the NMD system against realistic targets. But they ignore our decades-long practice for testing other complex systems, such as new aircraft. The first test planned for each new aircraft has always been a high-speed taxi test. After all, there is an understandable interest in making sure the basic mechanics, avionics, and computers work as they should before taking the far more risky step of lifting off the ground. This is the evolutionary nature of the testing approach we must use when we develop highly complex machines—we don’t test to the maximum every component of the system the first few times.

Two central technological problems confront us. The first is the discrimination problem, or can we find the warhead? The second is the so-called "hit-a-bullet-with-a-bullet" problem, or, once we find the warhead, can we hit it? Historically, solutions to both these problems have eluded us, especially against a massive raid involving hundreds of incoming warheads and countermeasures—decoys, radar chaff, and debris. Up to
now, the technological immaturity of our sensors did not allow us to discriminate, or pick out, the countermeasures within a target cluster.

During the past decade, we’ve made significant advances in our sensor and discrimination technologies, including in the areas of new high-resolution radars, digital radars with sophisticated electronic counter-countermeasures, and infrared seekers. Steady improvements in computer processing power, which has been doubling every 18 months for the last 30 years, has helped us to develop an interceptor that flies out quickly, processes the sensor data faster and with greater accuracy, and destroys the warhead.

We also have shown that we can hit another object in space, something like a five-foot ice cream cone, at closing speeds greater than 15,000 mph. Last October, on our first attempt, we demonstrated the ability of the kill vehicle to travel thousands of miles to a very specific location in space—one ultimately defined by inches and microseconds—discriminate among several objects, identify the right target, divert towards it, and collide into it. The kinetic energy created by this high-speed collision of two masses is significant enough to obliterate the target. Today we don’t need nuclear weapons to kill warheads in-flight.

We are testing the concept of hit-to-kill rigorously. Last year, our flight tests went a long way to convincing me that we had winning kill vehicle designs. In 1999, we had 6 successful intercepts using hit-to-kill technology, one in our NMD program, and five more in our theater ballistic missile defense programs.

Do we still have work to do? Absolutely, but I’m increasingly optimistic that we will not have to revisit the basic science associated with hit-to-kill….The critics of NMD tend to magnify the capabilities of states like North Korea, Iran, and Iraq. But just because states can build missiles doesn’t mean they can or will develop countermeasures. And then, even if they demonstrate a capability to build them, it is not automatically true that they can use them effectively. These countries can invent on a blackboard almost any kind of countermeasure. But can they be certain that they can make them work effectively? I would argue that they can’t.

To be confident that these countermeasures can work effectively, these states also will have to test them. The limited amount of ballistic missile and countermeasure testing done by our adversaries, in other words, amplifies the uncertainties that they must face if they are to use their weapons successfully. This uncertainty will act as a deterrent in some situations.

Jasques Gansler provided the following further background on the ability of NMD system to deal with countermeasures in June 2000.

Q: Dr. Gansler, could you … address the core criticism of Professor Postol which I thought provoked the media interest, which in turn has provoked this briefing. I mean, as I understand it, what Professor Postol said, looking at the sensor data from the IFT-1A, and reworking it, what he said is that there is no differentiating signals that come from the warhead as opposed to the decoys; that is that there is no information out there which enables an IR sensor, however good, and enables an algorithm, however good, to differentiate between a tumbling decoy—between a tumbling warhead and the range of possible decoys. You can’t discrimination, there isn’t enough information specific to the warhead. Could you address that core point?

Mr. Gansler: It is a core point. I should point out, of course, that the 1-A was not the seeker selected, and that was the Boeing-TRW one, not the Raytheon one. But it is important to recognize that we have had lots of independent assessments, including the Welch group continuing to do so.

The types of decoys that are being hypothesized, and not just his criticism but lots of other criticisms, are...
things that all of us have worked on, and I worked on anti-missile systems—I hate to say it -- 40 years ago, and I’ve been working on them ever since. And every one of those decoys has been hypothesized and, in fact, most of them have been tried, you know, by the United States and others. So these are not unknown phenomenon they questioned. They’re also not as easy as some people hypothesized to make, some of the more difficult ones.

On the other hand, the likelihood of what we will see in the early term period, I think, is very clear, that the experts, all the experts—the physicists and the engineers and so forth—all anticipate the types of decoys being relatively sophisticated as they evolve. And for that, we have looked at how to discriminate those. And there’s a large variety—a couple of dozen different things that we’ll be using. You know, a tumble rate and sensing mass and using the x-band radar, using infrared, using the infrared detectors on the seeker. As the threat is evolving, we are going to be using a large number of discrimination techniques, not just the simple one that was referred to in that particular report. So the experts—in fact, the people working for us on the contracts and the independent assessors—have all felt that this system has the inherent capability to be able to deal with those threats as they come along, and we will, of course, continue to make it more sophisticated as those threats evolve.

Q: Just to follow up on that, if I can. Can you just explain why you’ve decided in the tests that you’ve done, the last two tests and in the third intercept test, IFP-5, why you’ve decided to use a decoy that is a different shape and different size than the warhead? And can you explain in a little more detail the basic science of how you would discriminate between an actual warhead and a decoy that was the same shape and the same size as the warhead?

Mr. Gansler: Well, in fact, we will later be using decoys that are a similar shape and size, because—that’s an obvious decoy—and—

Q: So how come you didn’t use it in this test?

Mr. Gansler: Well, actually, it was kind of interesting. In this early test, what we were trying to do was to pull it off and so used something that was even larger and much more obvious, and we figured that might pull the interceptor off to the target, and in fact, it did, in the flight. It found this decoy first because it was larger, did have more radiation, and it found it first, and it said, “Oh, there’s the target,” and started to go for it, because we didn’t have the link that General Kadish mentioned before that would point out where it thought the target was. And so it searched and it found that one first, started going for it, and its software said, “That’s the wrong target.” And then it shifted to the target that had the characteristics it was supposed to have had, in this case purely in terms of the infrared characteristics because that was all that seeker had.

Now the system, the complex system that he just described will have other ways of measuring the characteristics, as I said, a couple of dozen of them. The one thing I don’t want to do is to get into the details of which techniques we’re using and which ones we’re not using, which ones work, which ones don’t, which target. That’s where the Welch report goes into it in terms of classified information. But in terms of recognizing that you have to have multiple discrimination techniques, not a single one, and in fact recognizing that likely things will have—they’ll go to the trouble of making some that have similar characteristics in heat, some that have similar characteristics in radar reflection, some that have similar characteristics in size, some that have similar characteristics in tumble, and so forth. The problem for them is to make things that look alike in all those characteristics. And that’s difficult. And it’s that combination of characteristics that we’re trying to take advantage of with the software.

Gen. Kadish: Let me say one thing. And I don’t want to be naive in this answer. But a balloon does not look like an RV to a human. I mean, it’s obvious. One is a balloon and the other is cone. But to sensors from a distance, even to the human eye, a balloon and an RV present the same dot if you will, to IR sensors and to radar sensors. And it’s just kind of like looking at the difference between a pickup truck and a car at
two miles. I mean, they are different in their orientation. So a balloon is a very effective, in certain circumstances, decoy even though it doesn’t look like an RV, and is relatively straightforward in terms of its capability to be deployed and potentially proliferate.

So that’s why we have, in our early tests, balloons to go after. And there are many other, as Dr. Gansler said, ways of discriminating. But each has a unique signature. So, just because it doesn’t look like the RV doesn’t mean it can’t be a decoy.

Q: You mentioned the phrase, “sensing mass.” Can you just explain what you mean by that?

Gen. Kadish: I’m sorry, I missed the question.

Q: He mentioned—Dr. Gansler mentioned the phrase, “sensing mass.” I’m just curious what you mean by that, how that works.

Gen. Kadish: The x-band radar can measure—take measurements that could actually—I’d rather not get into that. (Laughter.)

Mr. Gansler: That’s where you get into some of the -

Gen. Kadish: It is not helpful to have a public discussion of this type of activity.

Q: Dr. Gansler, you’ve spent your whole adult life on this business. Realizing it’s not your call, is it your personal opinion that it would be good for the country to deploy missile defense, and what is your rebuttal to those who say it will just provoke an action-reaction phenomenon, including the Russians mining space with mines, and whenever there’s a period of tension they just blow one off to blind our detection systems. Address your personal view in the possibility of escalating this into a war in space.

Mr. Gansler: Well, I guess I should say, luckily, I’ve spent my career on the engineering side, not on the public policy side, so it’s really not the kind of issue that I should be addressing and would prefer not to, because it seems to me that it’s—the kind of questions that you’re raising are the ones that the president’s going to be trying to address. My job is to determine whether the system can technically work and whether we’ve addressed what we think to be the likely threats, whether it can be done in the time period with a reasonable confidence level. Things of that sort, I can answer for you. Whether or not, you know, how it affects arms control, how it affects the arms race, how it affects things of that sort, I can’t.

I can tell you, in terms of the threat assessments that we’re trying to address that those seem to be quite realistic; that proliferation of this type of weapon, both in terms of delivery and in terms of the kill mechanism vehicles—you know, the weapons of mass destruction—seem to be quite realistic, in my personal opinion.

Secretary of Defense Cohen gave the following response to a question in an interview on National Public Radio on July 7, 2000,230

Q: Two critics of the missile defense system from MIT, Theodore Postol and George Lewis, write today in the New York Times that this test has been “dumbed down”. Here’s what they say. They say instead of the ten objects that confounded the kill vehicle in the first test in ’97, today’s test, like the two before it, will use a single mock balloon which is nearly ten times brighter than the warhead and the kill vehicle will be programmed to home in on the dimmer of the two objects. Is that true?
Secretary Cohen: It’s somewhat ironic that this is a criticism now being leveled at this particular test. We are responding and have responded to an independent review committee or commission headed up by General Welsh, Larry Welsh, who in the past has been critical of the testing program, saying it was a rush to failure. As a result of his initial recommendation we responded to it by restructuring the program so that we would walk before running, and that we would start out incrementally to test this interceptor against a relatively simple type of target missile and decoy with the idea that we will progressively increase the level of complexity as the tests continue. So we are responding and have responded to the independent review saying we should walk before we run. Then to be criticized for doing that it seems to me to be rather ironic.

There is no way to resolve such uncertainties. As has been noted, the June 2000 report of Welch Panel did raise countermeasures as a major issue, and stated: “While we believe that the current design requirements will meet the C-1 threat, the NMD program requires critical attention to potential countermeasures challenges to execute the planned evolutionary approach to the threat.” Furthermore, the US has had considerable success These programs include the 2.2 Meter Balloon, Lightweight Replica LREP, Inflatable Exoatmospheric Object (IEO), Firefly, and Multi-Balloon Canister (MBC) tests – although with similar countermeasure programs. it is far from clear how soon most threat countries could deploy similar technology or how far they would go in defeating the current and growth countermeasure capabilities of the current NMD architecture.

At the same time, a US decoy failed to deploy in a test on July 7, 2000, and little about the Iranian, North Korean, and Chinese test programs to date has revealed much sophistication in countermeasure technology.

Other Technical Objections to the Current NMD System

Other arguments are less technical and have already been discussed. They include the following points:

- Long-range missiles would be neither the only nor the optimum means of delivery for an emerging missile state attacking the United States with nuclear, biological, or chemical weapons.
- The planned testing program for the NMD system is inadequate to assess the operational effectiveness of the system.
- The deployment of the NMD system could seriously impair efforts to control the proliferation of long-range ballistic missiles and weapons of mass destruction, and thus ultimately increase the threat to the United States from these weapons.
- Deterrence will continue to be the ultimate line of defense against attacks on the United States by missiles armed with weapons of mass destruction.
The problem with such arguments is not one of technical possibility. The report by the Union of Concerned Scientists and MIT Security Studies Program is 119 pages long plus 54 pages of detailed technical appendices, and includes an analysis of past US tests against countermeasures. The problem is that while such arguments are technically interesting, and are well supported with technical detail, they are structured to support one hypothesis and serve a political purpose. Like the technical arguments for NMD, they raise important issues, but it is impossible to properly assess their merit without access to extensive technical expertise and classified data. As such they illustrate the limits to unclassified risk analysis in ways which preclude any final judgment about their merit.

Efforts to Assess Risk, Cost, and Benefits: Summary

Conclusions

Some of NMD’s strongest supporters still believe that the risks in the NMD program can be overcome by political pressure and added funding, while their opponents believe that they will be cumulatively fatal regardless of how the program is managed and scheduled. The progress that BMDO has made since the GAO report was written, however, does not seem to justify either view. The NMD program has continued to slip in ways that are a clear warning that politics and money can serve as a “forcing function” that makes technology work. At the same time, nothing about the various slippage in the NMD program as yet indicate that NMD is inherently infeasible and that it cannot be made to work within a relatively few years of its currently planned schedule.

There is also good reason to doubt whether even a successful test program will predict system performance. The number and nature of the currently scheduled tests seems designed largely to establish a limited empirical data base as a proof of principle under controlled conditions. None of the data released to date explains how the program could possibly establish any picture of the probability of intercept, reliability, or any other key parameter of the behavior of the overall system under operational conditions. The plan calls for the first site to be deployed before SIBRS will be operational, all of the X-band radars will be deployed, and the
complications inherent in adding a second site could be accurately simulated. - unclear sentence, unnecessary

These considerations are of great concern given the dismal history of US test and evaluation methods in accurately predicting the behavior of large-scale systems during their development phase, and the almost uniform history of having to make expensive and time consuming modifications to supposedly combat operational systems once deployed. It seems fair to say that US test and evaluation methods have failed to accurately characterize every major weapons system the US has deployed in the last quarter century, and have a zero success rate in predicting combat operational status.

Even if these problems did not exist, there are insufficient data to estimate the true nature of the potential escalation in life cycle costs which could still easily reach 50% to 100% above the currently program estimates. It seems likely that the program will slip by at least one or two years in spite of the past delays in its estimated date of completion, and the GAO’s reservations about the test and evaluation program may, if anything, be optimistic. The point it raises about the limited scale of the present BMDO program is a critical one and goes beyond the simple issue of the number of tests.

The results of reviews like the Welch Panel raise critical doubts about whether developmental simulation and testing can be a substitute for the deployment of a full test-bed system. The present BMDO program can at best establish that the components of the proposed NMD system can work. It is far too limited in scale to establish system reliability and lethality even if all of the tests are successful. It also assumes that a complex system involving massive amounts of complex command and control and sensor systems can be tested through a combination of simulations and limited technical testing before deployment.

No nation in the world has ever been remotely successful in deploying a combat ready weapons system of similar complexity in this fashion. NORAD and NADGE took nearly half a decade to transform into limited success after their initial deployment dates. The same was true
of the original Hawk, Patriot, and AEGIS interceptors. All of these much less complex systems were eventually made to work once deployed, but none came close to being reliable combat-ready systems at their initial date of deployment.

The Deployment and Non-Deployment Schedule for the Current NMD Architecture

These factors help explain why President Clinton decided to defer a decision to begin deployment of the current NMD system on September 1, 2000. He did so in spite of the fact the Congress had mandated that the US “shall deploy” the system “as soon as it is technically feasible,” and some US Defense officials had argued that a decision should be made in 2000. Lt. Gen. Ronald Kadish, the Director of BMDO, made the following case for such timing in a speech on June 5, 2000: 233

…."Headline": The United States should delay its NMD deployment readiness decision. I’m frequently asked: why has the DRR been scheduled for this summer? The answer is that the threat is emerging faster than we thought it would just five years ago. For this reason, it is essential that we protect an option for a presidential decision to deploy a system as soon as possible. In order to preserve that option, we need to undertake a technological readiness review soon.

To put the DRR in proper context, you should understand first what it is not. This summer’s internal Defense Department review is not a decision to deploy the system. The decision to proceed with deploying missile defenses lies squarely on the desk of the President, in consultation with the Congress. But before the President can formulate informed answers to the questions of whether to deploy by 2005, he must have before him some critical pieces of information concerning four primary criteria: the threat, the technological readiness of the system, the cost of that system, and our national security and arms control objectives. The DRR is actually an on-going internal Secretary of Defense evaluation that focuses only on two of the criteria—technological readiness and the cost of the system.

If the President decides that we need an operational capability by 2005, and you back up all of the activities that we need to do to meet that commitment, it turns out that building the X-band radar must occur early in the process. If this radar needs to be built in Alaska, work must begin next spring because of the short construction season. If work is to begin roughly a year from now, we have to let construction contracts this fall. If we wait another year to begin building that radar, I would not be able to assure the country that we can have the initial system up and running by 2005.

"Headline": We don’t have enough test data to make a deployment decision, and we’re not doing adequate testing. An important part of understanding the error in this headline is understanding the way we have developed and acquired weapon systems in the past, and how we have changed our approach to meet an urgent schedule. The standard approach to weapon-system acquisition has been simply too risk-averse to allow us to develop new system concepts rapidly, especially when the threat drives the urgency for development. With average cycle times for major acquisition programs over the past decades averaging 8 to 9 years, and that’s 8 to 9 years from the time the decision is made to build, it is clear that the traditional
way of doing business in defense procurement will not handle many of our future demands.

The NMD program is on a compressed, high-risk schedule to deploy a system by 2005 for one reason and one reason only—the threat. Because we are moving on that fast track, the program we are executing is high-risk, which means that a significant setback in any one element can delay the entire program. Taking such risks is inconsistent with today’s acquisition culture. For this reason, we are being accused by some of "rushing," or of pushing a system forward that, once fielded, will not be operationally effective.

But high-risk does not mean reckless. There is a difference between rushing and moving as fast as is prudent. We have every incentive to get a capability into the field as quickly as possible. We also have every incentive to get it right.

A prudent testing program, therefore, will address first the basics of the system. We’ve scheduled four tests to get two demonstrations of hit-to-kill. The first was successful. The second was partially successful. The next is planned for later this month.

**Risk and the Deployment Decision**

At the same time, BMDO had long made it clear that any such decision involved substantial risk and is driven by political factors, legislative requirements, and threat assessments that may be unrealistic. Lt. Gen. Ronald Kadish outlined these risks in an earlier speech on March 30, 2000:

> But I do not wish to minimize the immense difficulties before us. In the months ahead, there are several more tests scheduled in our national and theater missile defense programs that will involve increasing levels of complexity and integration. We still have lots of hard work ahead of us.

> We are striving to deploy an initial NMD capability, or C-1, in fiscal ‘05. This will consist of 20 interceptors designed to counter a handful of missiles with simple countermeasures. Because the threat is dynamic and we expect some dangerous states to be able to launch more missiles in that timeframe, we will move to an "expanded-capability-one" architecture, or Expanded C-1, in fiscal ’07. By 2007, in other words, we plan to deploy a total of 100 interceptors. We have requested from the Congress an additional $1.9 billion in funds through the Future Years Defense Program to execute this program, or 43% of our $4.5 billion BMDO budget for next year. In context, this represents less than two-thirds of one percent of the fiscal ’01 Defense budget.

> Given that we are scheduled to deploy in 2005, and we only started to work this in earnest about a year and a half ago, we are forced to work with a high-risk program. As most of our critics have noted, the program is high-risk, primarily because, as I stated earlier, we are driven today to accelerate the NMD program to field an effective limited defensive system by 2005 in order to meet the threat. We are moving on as many concurrent tracks as we think prudent. High risk means that the schedule is so compressed that a significant setback in one element can delay the entire program. We cannot work this program as we would a normal development program, where we develop and test sequentially. We must do these steps concurrently. To date, we have been able to meet our commitments, but the program will require continued aggressive management if we are to succeed.

> Although I continue to be optimistic about the system’s eventual capabilities, we should guard against being either overly optimistic or unduly pessimistic about the deployment readiness of the NMD system.
Rather, I am realistic. The NMD program is still a high-risk program. But I believe a successful test program and the timely execution of system-element schedules will provide us the information we need to assess reliably the progress in our NMD program.

Which brings me to a very important event in our program schedule. We put a "stake in the sand" this coming summer. This July we are preparing to conduct an NMD Deployment Readiness Review, or DRR. There seems to be some confusion about what this review really entails, so I'd like to spend a few moments describing this process for you.

To put the DRR in proper context, you should understand first what it is not. This summer's review will not result, for example, in a decision to deploy the system. The decision to deploy missile defenses to protect all fifty United States against a limited attack by a dangerous state lies squarely and entirely on the desk of the President, who will decide in consultation with Congress. But before the President can formulate informed answers to the questions of whether, when, and where to deploy, he must have before him some very critical pieces of information concerning four primary factors: the threat, our national arms control objectives, the technological readiness of the system, and the cost of that system. The DRR is a process that focuses only on the last two criteria - technology readiness and cost.

Understanding that we are talking about system "readiness," not system "deployment," is the key to properly characterizing the review that will take place this July. Led by the Under Secretary of Defense for Acquisition, Technology, and Logistics, Dr. Gansler, the Deployment Readiness Review that I am currently preparing for will concentrate on the technological progress we are making in the development of NMD technologies and system elements. As part of this analysis we also will review overall system operational effectiveness and, as I mentioned earlier, program life-cycle cost and the adequacy of projected funding.

As part of the DRR process, we will be examining the design to see if we have adequately demonstrated that the NMD elements not only work well, but that they work well together. There also are key performance parameters we have to meet and take a hard look at, one of the most important being the ability of the planned system to defend all fifty states. Judgments will have to be made about the maturity of the system and its readiness for deployment by the projected deployment date of 2005. We will also have to immerse ourselves in the evaluation of minutia more directly related to the production and physical construction of the elements, including manufacturing production readiness, our ability to field the system on schedule, and our ability to sustain the system once it is deployed.

The DRR is a process as well as an event.

No one involved in the DRR is going into this process cold. The DRR, while it is the beginning of the deployment decision-making process, is really a later stage of a multi-year developmental program. The people that will be focused on this one major review in July will already have been engaged for months and even years in a series of tiered process reviews within the Department involving all interested parties, from the action officer level up through the senior appointed officials, in what we call integrated product team reviews. This is an established and proven process for handling the development of all complex acquisition systems. In short, the DRR is a point further down an already well-trodden path. No spin up of the principals will be necessary.

The DRR is an important initial step in a lengthy and involved deployment decision process that includes at least three major acquisition decision milestones in the program over the next five years to determine the system's technological status. These decision milestones are steps we must take in the acquisition life of the NMD system. These acquisition decisions will be made in addition to major policy decisions throughout the life of the program made at the levels of the Secretary of Defense and the President. Each acquisition decision made over the course of the next five years will be based on an assessment of the program's progress at that time and will give authority to proceed on further key
activities. The July DRR, a part of that acquisition decision process, just happens to be the decision milestone nearest to us in time - and hence, it is receiving a lot of attention.

One of the key criteria we will use when conducting this technology status review will be a determination of success in our testing program. There are literally hundreds of different criteria we are watching, ranging from software development to construction specifications for this highly complex system. We have used an internal short-hand measure of two intercepts in our integrated flight test program to demonstrate our readiness. We believe this will serve as a good benchmark, though it is not the only benchmark, and that it will help us to understand when we will be in a position to undertake the Deployment Readiness Review. We have one intercept already under our belt and confidence that our basic interceptor design works. As we look forward to achieving our second intercept in integrated flight test number 5, we are increasingly confident that we will be able to get our second intercept.

That said, and I will reiterate this point again later because I believe it is fundamentally important to understand, we were able to achieve a number of successes during the IFT-4 test, even though we failed to get our second intercept. We successfully proved in that test that many of the technologies and systems we will require to detect, acquire, and track the target missiles and reentry vehicles will work. We demonstrated the efficient processing of commands and effective control over critical system elements. From this perspective, IFT-4 was a major success. This is important information that also will be taken into account as we assess the technological status of the program. Our testing program is rigorous, highly complicated and involved. I have full confidence in our testing regime, that once we have completed it, we will have sufficient data and analysis to know with a high degree of certainty whether the system we are planning to deploy will work as designed.

The internal DoD review process we call DRR, therefore, will attempt to assess many, many aspects of this program, to include testing successes and lessons learned, other technical aspects of the program, construction timelines and deadlines, and even such practical matters as construction contracts. The intercepts we are striving to achieve are only the most visible criteria that we will have to take into account when we decide from a technological standpoint whether or not it is prudent to proceed with the production of the system.

If a decision is made in 2000 to deploy, a decision that also will include a commitment to a specific site, we will conduct a Defense Acquisition Board review in fiscal '01 and another in fiscal '03 to assess the acquisition status of the program. The Defense Acquisition Board is a senior level forum that meets as required to advise the Department's top acquisition executive - Dr. Gansler - on critical decisions concerning major defense acquisition programs. As a major acquisition program, the NMD system necessarily falls under the purview of this board. Based on program performance at each point in time, we would seek approval to start implementing the longer lead-time items first, such as construction work on the X-band radar, the missile field, and the upgrading of our Early Warning Radars. This first DAB review is also required before we continue with the integration of our BM/C3 system.

We won't seek approval to procure and deploy the ground-based interceptors and necessary spares until fiscal '03. What this means is that we can continue to test and refine the elements of our system until their individual decision dates are due, as driven by the ultimate deployment date. We are phasing our deployment based on the technological progress of the various system elements, progress that will be reviewed by the Defense Acquisition Board during the five years leading up to the deployment of the initial 20 interceptors in 2005.

This brings me to another important question I frequently get about the DRR, that is, why has it been scheduled for this summer? Why not next summer? The answer is that there is general agreement across the government that we need to deploy a system to meet a threat in 2005. Construction activities will be limited by short construction seasons, especially if a decision is made to deploy in Alaska. A decision to build an
X-Band Radar in Alaska, for example, will mean that site construction must begin in the spring of 2001 if we are to attain our goal of having an operational capability in 2005. Because these activities have long lead-times, construction contracts need to be awarded this fall. But before we can even get to this step, will we need a presidential decision and congressional budget authorization to proceed. If we do not have a deployment decision by this fall, our entire deployment schedule will be jeopardized.

After receiving the results of the Deployment Readiness Review, now scheduled for July, and after making his own judgments about the system and related policy issues, the Secretary of Defense will forward a recommendation to the President. That, ladies and gentlemen, is the phased deployment decision process, and as you can see, the July DRR is only an initiating part of that process.

Now, what about our NMD test program? We have had a very encouraging start in this multiyear series of tests that continue through eventual deployment. Initially, we had two fly-by tests to demonstrate the sensor performance of two different kill-vehicles. These were followed by two integrated flight tests to support the DRR decision process.

Last October's test, Integrated Flight Test Three, demonstrated the ability of the kill vehicle to travel thousands of miles to a very specific location in space - one ultimately defined by inches and microseconds - discriminate among several objects, identify the right target, divert towards it, and collide into it at a closing velocity of over 15,000 miles an hour. We did that very well. We did not do it "by accident." The flash of light captured by our infrared sensors punctuated the technical complexity of this achievement. In spite of what some critics might say, we accomplished all of our test objectives in that flight, which aimed entirely at demonstrating the EKV technology. We now know our interceptor concept works - it worked the very first time we tried - a fact that has helped to build our confidence that we can maintain our aggressive schedule.

Much attention has been given to last January's Integrated Flight Test Four. IFT-4, just our second test, showed that, despite the success in IFT-3, that success won't always happen. But remember, IFT-4 was one in a long-line of increasingly demanding testing events we have planned through 2005. While many have called that flight test a failure, this is not an accurate characterization.

Viewed in a mission context, we failed in IFT-4 to hit the target - we missed the RV. However, in the context of testing, IFT-4 was a successful developmental test that proved we could integrate our separate major elements and make them work together as one system. The major elements of the architecture we tested were: the early warning satellite constellation and tracking radar system, the X-band radar prototype, and the battle management system. Together, they brought the kill vehicle within striking distance of its intended target - the EKV deployed, conducted its navigational star shots, acquired and diverted for the target cluster.

In the final six seconds, we had a malfunction in our interceptor sensor system that prevented us from colliding with the target. We've since learned that we had an obstruction in the EKV's krypton cooling system. We've taken the necessary corrective actions, both on the equipment and in our processes, to mitigate against a recurrence in our next and all subsequent tests. Everything we did in IFT-4, except the intercept part, we did perfectly. And because we did it near perfectly, we actually had to do very little else in the integration and command and control part of our test in order to prepare for IFT-5. As a result of the fixes we have had to make, we postponed by two months the next integrated flight test, IFT-5, to June 26. There are two key points to take away from this. First, our accelerated NMD schedule does not mean we are "rushing." If we were rushing, I would have stuck to our original test date. Second, everything that failed on IFT-4 worked on IFT-3. We believe we have a solid EKV design, and that we will not have to go back and review the fundamental science of our hit-to-kill vehicle.

As I said earlier, the NMD system is one of the most complex systems our country has ever attempted.
to develop and produce. The interception phase of the NMD mission is clearly the most visible phase and it is key to our success. Yet we must not lose sight of the fact that the successful integration of the highly interdependent system elements is no less critical. The integration and support aspects of our testing events are transparent to most people, but I assure you that we could not do the job without them. Our tests are designed to weed out flaws. While we strive for success on every test, we do not expect that we will always have it. We learn from our successes and failures - and, often, we learn more from the failures.

The country has accepted the higher level of risk associated with the compressed NMD development and deployment schedules in order to complete the program on time. As someone who has had a lot of acquisition experience, it would be nice to move ahead with a program that allowed me to do development testing and production sequentially, rather than concurrently. But I assure, we do not have that luxury with this program.

Now, I will have failed in my discussion with you this morning if I have not driven home the following point concerning the NMD program - that is that the program is driving the decision-making process - and not the other way around. I have the very challenging job of balancing the technical requirements of this program with other requirements, including the requirement to deploy a system to meet the projected threat to our homeland.

So we are compelled to work the NMD program concurrently. We are making good progress against the schedule we must work, which is geared to deploy an initial capability by 2005. The DRR will start the process of committing to the NMD system, but there are many things to be evaluated along the way. Our test program is good. And we can always use more data. I believe we are where we want to be. Thank you.

**Why the Deployment Decision Was Not a Deployment Decision**

Dr. Jacques Gansler also explained in some detail why a deployment decision might not really be a deployment decision as early as a briefing he gave on June 20, 2000:

There are basically four major decisions that will be made. The last one is the easiest one; that simply says the system is ready. That’s the one in which you say, “I have 20 interceptors. I’m ready to go.” It’s these three that are the major decision points in the development process, the first of which, the so-called Deployment Readiness Review, is the one that is scheduled this year. That one is the one that—the secretary of Defense will then make a recommendation to the president as to whether or not we have done the technical demonstration adequate to show that in fact you could, if you decide to do so, make a fiscal-year ’05 impact.

Between the time the secretary makes his recommendation and the president makes his decision, in the fall of this year, there is some time period there for the decision-making process. I’ll come back in a minute and tell you exactly what this commits us to, in terms of that radar on Shemya that I mentioned earlier. But the primary things that have to be done at this time, if you want to make a 2005 schedule, is you have to select the site, authorize site construction for the radar in Shemya, start to do the design and then the build of it. And I’ll show you the schedule of that in a minute. And there are a few early long-lead parts that we might want to order at that point.

The second key point in terms of the decision process is next year, when again to make the 2005 schedule, you have to actually start the building of the radars and the communications. They become the second long-lead item. And you will authorize some long-lead parts then for the interceptors, which are the third major decision. This is the decision at which you actually commit the interceptors. And in terms of the typical program, this is when you say, “I am going to build my weapons.” This is the decision that actually gets
made in 2003. That’s the real decision, in terms of commitment, to building weapons.

So here you commit to construction of the radar at Shemya, the X-band radar. Here you commit to the other radar upgrades and the communication systems and the building of the radar or the X-band radar. And here you commit to the actual interceptor builds. And then, as I said earlier, to the IOC.

Now, there are a series of flight tests that are planned all the way through this program. These are the two that I told you about—this 1 and 1(a) -- and two that I told you about for the seeker calibration against the sophisticated targets. This is the one where we hit the target. This is the one where we tested the rest of the system and—the last five seconds didn’t work—and then this is the one that’s coming up right now. These will give you the indication of the technical feasibility for this decision point.

Then there are a series of additional flights. This Flight No. 8 is critical because it is the place in which we are going to first be testing that next-generation booster that I mentioned, the booster that we have planned for the production. So it’s important that that booster be tested before you have this next decision. It’s a milestone point.

And then the third one here is the point at which you actually make your decision to release for the interceptors. And here you’d like to be using the production design interceptor. Now, the interceptor functionally is the same for the ones we’re testing right now as for the one that will be built in production. But as you know, when you go from engineering to production, you do a lot of quality changes, process changes, and you want to make sure that the production—the interceptor, in this case the kill vehicle, is the final proven design. And so that will determine this. This “DAB,” by the way, is Defense Acquisition Board. This is the review board that I chair that makes the recommendations to the secretary what we do next.

So as you can see, then we—during this process, we are adding increasing sophistication to the decoys and to the system to counter those decoys as the system evolves.

There’s also a series of test flights that we have that are not intercept flights but are actually putting up additional decoys and additional demonstrations on the target side just to try to check out the radars, check out a lot of the rest of the system. These are risk-reduction flights…. There’s a whole series of those, in fact, that have been going on and that will continue. We had one not long ago where we had actually 22 different objects in space to test out the radar for its discrimination capabilities. That’s the sort of thing that I was thinking of in terms of improving our discrimination capability.

After that time, Secretary Cohen progressively qualified and delayed any movement towards deployment decision. Speaking in mid-July 2000, Cohen summarized the state of the program as follows:

The test itself was a disappointment, but it was one of those failures that was least expected....That happens from time to time —that you have a failure of something that's fairly routine...The failure here was not the failure of the most sophisticated elements of it. That's something that's not fatal to the program, and so I would reserve the judgment until I get all the way through the analysis.... It would have been helpful to have had this test succeed...But it doesn't mean that the technology is not there yet. I still could make a recommendation [to deploy]. I just have to wait and sit down and review all the information. It's a very important recommendation. I want to make sure that I have as much information as I can before submitting to the president a recommendation which will be very important to him and to the country...I think you'll have to stay tuned. Sometime in August I'll give you a response.
Secretary Cohen went further in a speech on July 27, 2000. A little over a year ago, on June 22, 1999, Cohen had said, “Next year, we will, for the first time, determine whether to deploy a limited National Missile Defense, when we review the results of flight tests and other developmental efforts, consider cost estimates, and evaluate the threat…\(^{237}\):

This time, Secretary Cohen made clear that even a “yes” decision would be tied to the construction requirements to set up a radar station on Shemya Island in Alaska, at the western end of the Aleutians, by 2005. This construction would have to begin by the summer of 2001 because the weather is so poor on the remote island that the construction season lasts just a few months. In order to begin construction in the summer of 2000, however, contracts have to during the winter of 2000/2001, which means that President Clinton would ordinarily have to approve the decision to issue a contract no later than November 2000. The contracts would enable the Defense Department to begin buying thousands of tons of cement and rocks for construction of the foundation of the radar station and support buildings, and rent barges to convey some building and support material from Seattle to Alaska. In addition, a contract would be let for the construction of a small electric generation plant on the island.

He also made it clear that such a “yes” would still be highly provisional, \(^{238}\)

All the president would do on this occasion is to decide whether he would want to keep that option open to hit the initial operating capability of 2005…If we want to keep that option open, the president could make a decision of saying, ‘Let the contracts for the fall…No construction would begin until next year, and at that point, his successor would be in a position to make a judgment (on whether to go ahead),’ he added. The decision that the president will make during the course of either August or early September would be a recommendation as to whether to continue the process so that his successor would be in a position to have the option to go forward with the actual deployment of the system, beginning with a radar construction in Alaska…

This increasingly tenuous approach to deploying NMD was reinforced by press reports that the Clinton Administration was attempting to defer the legal issues inherent in a deployment decision and avoid any firm decision about the ABM Treaty. According to such reports, Secretary Cohen announced on July 25, 2000 that the Administration’s lawyers had the Anti-Ballistic Missile treaty as allowing preliminary construction work on the new X-band radar on Shemya Island, Alaska, up to the point where rails were laid for placement of the powerful...
missile-tracking radar on a concrete pad – which was not scheduled until 2002.

Cohen stated that President Clinton had not yet accepted his lawyers’ analysis. But he did state that if Clinton made a decision by September “A consideration will have to be - by President Clinton - whether or not this puts any undue pressure on his successor…That’s a factor we’ll have to measure and weigh…As far as a technical breach of the ABM treaty, his decision in August or September would not constitute that, in our judgment.”

Cohen also said a decision by Clinton to begin the construction work on Shemya might have the added benefit of moving the Russians toward an accommodation on the ABM treaty.

On August 7, 2000, Cohen again deferred a decision, and issued a brief statement indicating that he was unlikely to recommend a course of action to President Clinton until early September. This deferral still gave Clinton time to decide before leaving office whether to authorize initial steps toward building a new missile-tracking radar in Alaska. Although Cohen had previously stated he would make his recommendation to Clinton by mid-August, following a full-scale deployment readiness review, his statement warned that, "Components of the Department of Defense are currently completing their assessment of the program to develop a national missile defense system. A number of difficult issues remain to be resolved before they can report to me".

These issues included deciding whether the rocket booster to be used for the antimissile system could be ready for full-scale production by 2003, and whether the Pentagon should go ahead as scheduled with the next flight test this fall of the antimissile system. BMDO officials indicated that they were considering putting the test off until December or later because the failure of the last two flight tests raised questions about whether the Pentagon was pushing too hard to meet a target date for deploying the system by 2005. It does not take much reading between these lines to see that the Department became committed to doing what it had to do to adjust the deployment schedule to make NMD work in spite of artificial deadlines and Congressional mandates.
Clinton Decides to Defer Deployment

Finally, on September 1, 2000, President Clinton made this decision official. He gave a speech at Georgetown University in which he stated that he lacked “absolute confidence” in the existing NMD technology, and announced he would leave it to his successor to decide whether to deploy a national missile defense system. He said that he would not authorize the Pentagon to award contracts to begin building an X-band radar on Shemya Island in the Aleutian Islands.

The key portions affecting technical risk included the following statements:

The system now under development is designed to work as follows: in the event of an attack, American satellites would detect the launch of missiles. Our radar would track the enemy warheads, and highly accurate, high-speed, ground-based interceptors would destroy them before they could reach their targets in the United States.

We have made substantial progress on a system that would be based in Alaska and that, when operational, could protect all 50 states from the near-term missile threats we face, those emanating from North Korea and the Middle East. The system could be deployed sooner than any of the proposed alternatives.

Since last fall, we’ve been conducting flight tests to see if this N.M.D. system actually can reliably intercept a ballistic missile. We’ve begun to show that the different parts of this system can work together. Our Defense Department has overcome daunting technical obstacles in a remarkably short period of time and I’m proud of the work that Secretary Cohen, General Shelton and their teams have done. One test proved that it is, in fact, possible to hit a bullet with a bullet.

Still, though the technology for N.M.D. is promising, the system as a whole is not yet proven. After the initial tests succeeded, our two most recent tests failed for different reasons to achieve an intercept. Several more tests are planned. They will tell us whether N.M.D. can work reliably under realistic conditions.

Critical elements of the program, such as the booster rocket for the missile interceptor, have yet to be tested. There are also questions to be resolved about the ability of the system to deal with countermeasures. In other words, measures by those firing the missiles to confuse the missile defense into thinking it is hitting a target when it is not.

There is a reasonable chance that all these challenges can be met in time. But I simply cannot conclude with the information I have today that we have enough confidence in the technology and the operational effectiveness of the entire N.M.D. system to move forward to deployment. Therefore, I have decided not to authorize deployment of a national missile defense at this time.

Instead, I have asked Secretary Cohen to continue a robust program of development and testing. That effort still is at an early stage. Only 3 of the 19 planned intercept tests have been held so far. We need more tests against more challenging targets and more simulations before we can responsibly commit our nation’s resources to deployment. We should use this time to insure that N.M.D., if deployed, would actually enhance our overall national security . . . .

I want you to know that I have reached this decision about not deploying the N.M.D. after careful
deliberation. My decision will not have a significant impact on the date the overall system could be deployed in the next administration, if the next president decides to go forward.

Clinton stressed that he had directed Defense Secretary William Cohen to “continue a robust program of testing,” and that work would forward with additional testing of the EKV to destroy warheads in flight and develop other key components, including a new booster rocket. He claimed his decision only meant the delay of a year, and that a system could still be deployed in 2006-2007.

Clinton also said, however, that, “We should use this time to ensure that NMD (national missile defense), if deployed, would actually enhance our overall national security...A national missile defense, if deployed, should be part of a larger strategy to preserve and enhance the peace, strength and security we now enjoy, and to build an even safer world...I have tried to maximize the ability of the next president to pursue that strategy.”

Finally, Clinton said his decision gave the United States time to work with the Russians to overcome their opposition to the system, and to court the support of U.S. allies:

“The United States and Russia still have nuclear arsenals that can devastate each other, and this is still a period of transition in our relationship,” Clinton said. “Therefore, for them, as well as for us, maintaining strategic stability increases trust and confidence on both sides; it reduces the risk of confrontation; it makes it possible to build an even better partnership, and an even safer world.”

**Looking Beyond the Current System and Deployment Plan**

While the near-term focus on the NMD options for Homeland defense must focus on tangible options for federal action, there are a number of technical developments that could lead to the deployment of a more advanced system. At the same time, there are a number of policymakers and technical experts who believe that the US should deploy other technologies.

**The Advanced Technology Program**

BMDO already is working on a program that provides a contingency capability to deploy a more advanced system that the current NMD system, and which is not part of the current NMD architecture per se. This effort is important both because it ensures that the NMD program has
suitable technical growth and flexibility, and because of its potential implications for arms control and START.

Jacques S. Gansler, the Under Secretary of Defense for Acquisition and Technology provided the following summary of this aspect of the program in his testimony to the House Armed Services Committee on February 25, 1999:

“Activities in the missile defense technology base are key to countering future, more difficult threats. The technology base program underpins the theater ballistic missile defense, cruise missile defense, NMD, and Space Based Laser programs. It will enable the Department to provide block upgrades to baseline systems, perform technology demonstrations, reduce program risk, accelerate the insertion of new technologies, and develop advanced technologies to provide a hedge against future surprises. Advanced technologies are also being exploited to reduce the cost of future missile defense systems.

“In the past, BMDO explored many potential solutions to ballistic missile defense, including exotic or leap-ahead technologies (X-ray lasers, neutral particle beams, Brilliant Pebbles). Today's thrust is to provide research and development in technical areas that support our missile defense programs. Three programs in particular illustrate BMDO's current thinking: 1) the Atmospheric Interceptor Technology program, which develops advanced missile technologies for PAC-3, THAAD, and Navy Theater Wide to address advanced threats and reduce cost, 2) the Exoatmospheric Interceptor Technology program, which is developing and demonstrating advanced seeker concepts, as well as advanced materials, to provide upgrades to both NMD and TMD interceptors, to counter the evolving threat and reduce cost, and 3) the Advanced Radar Technology program which improves signal processing capabilities and reduces key component costs. We expect these programs to provide useful hardware and data to the TMD and NMD programs.

“Recently, BMDO and the Air Force had an Independent Review Team of laser, operational, and programmatic experts examine the Space Based Laser program. They proposed that any orbital flight experiment be preceded by extensive integrated ground demonstrations of key technologies and flight system elements. The subsequent orbital spacecraft experiment they envision would demonstrate large, lightweight deployable optics, a new concept in very large mirrors that could enable dramatic savings in vehicle weight and attendant cost.

“We have developed a laser technology program that balances long-term research and development goals with a nearer-term goal to demonstrate the basic feasibility of a system. The total outlay for the program will be $139 million in FY 1999 and $139 million per year through FY 2000-2005. The technology program, jointly funded by BMDO and the Air Force, will fund a ground demonstration and permit a subsequent decision to increase funding enroute to orbiting a spacecraft. Affordability--both of a demonstration flight and of an eventual operational system--is a key concern on which we intend to focus.”

**The Space-Based Laser Program**

While the US has explored many advanced technologies for NMD since 1984, the space-based laser is the only one that BMDO has described as providing a possible mid-term option. A space-based laser would intercept an attacking missile by focusing and maintaining a high
powered laser on a target until it destroyed it. The energy for the sustained laser burst would generated by the chemical reaction of the hydrogen fluoride (HF) molecule – which would be created in an excited state from which the subsequent optical energy is drawn by an optical resonator surrounding the gain generator.

The Federation of American Scientists provides that following overview of the development effort.\(^{240}\)

Such a possible use of lasers has been a key area of study since 1973, when the Mid Infrared Advanced Chemical Laser (MIRACL) was tested against tactical missiles and drone aircraft. Work on such systems continued through the 1980s, with the Airborne Laser Laboratory, which completed the first test laser intercepts above the earth. Initial work on laser based defense systems was overseen by the Defense Advanced Research Projects Agency (DARPA), but transferred to the newly created Strategic Defense Initiative Organization (SDIO) in 1984.

Work continues today under the auspices of the BMDO, the successor to the SDIO. … the Defense Advanced Research Projects Agency (DARPA), the Air Force and the Ballistic Missile Defense Organization (BMDO), formerly the Strategic Defense Initiative Organization (SDIO), have developed the technologies essential for a Space-Based Laser (SBL) system. The Alpha LAMP Integration (ALI) program has recently performed integrated high-energy ground testing of the laser and beam expander to demonstrate the critical system elements. The next step is an integrated space vehicle ground test with a space demonstration to conclusively prove the feasibility of deploying an operational SBL system.

Future plans include orbiting the SBL Readiness Demonstrator (SBLRD) in order to test all of the systems together in their intended working environment. The SBLRD satellite will be comprised of four major subsystems: the ATP system, which provides acquisition, tracking, targeting, stabilization, and assessment capabilities; the laser device, which provides for the optical power, and beam quality, as well as maintains nozzle efficiency; the optics and beam control systems, which enhance and focus the beam, augmenting the capabilities of the laser device; and the space systems, which provide a stable platform, storage of the reactants, and furnish electrical power (but do not power the laser).

The SBL Readiness Demonstration (SBLRD) is a technology integration project that could result in a demonstration of the capability to perform boost phase Theater Missile Defense from space. The objectives of the space demonstration include gaining performance information critical to the development of an operational SBL system, as well as gain a general understanding of operating such a system.

BMDO and the Air Force agreed to transfer the execution of the SBLRD project and the related SBL technology developments to the Air Force. BMDO retained overarching SBL architecture responsibilities.

The SBL program will build on a broad variety of technologies developed by the SDIO in the 1980s. The work on the Large Optics Demonstration Experiment (LODE), completed in 1987, provided the means to control the beams of large, high-powered lasers. The Large Advanced Mirror Program (LAMP) designed and built a 4-meter diameter space designed mirror with the required optical figure and surface quality. In 1991, the Alpha laser (2.8-mm) developed by the SDIO achieved megawatt power at the requisite operating level in a low-pressure environment similar to space. Numerous Acquisition, Tracking, and Pointing/ Fire Control (ATP/ FC) experiments both completed and currently underway will provide the SBL platform with stable aimpoints. Successes in the field of ATP include advances in inertial reference, vibration
isolation, and rapid retargeting/precision pointing (R2P2). In 1995 the Space Pointing Integrated Controls Experiment offered near weapons level results during testing.

**Alpha High Energy Laser (HEL)**

The Mid-Infrared Advanced Chemical Laser (MIRACL) first achieved megawatt class power levels originally sponsored by the Navy, later by DARPA, and then by BMDO. Because the design was intended for sea level operation, the MIRACL laser does not achieve the optimum efficiency necessary for space-based operation. DARPA launched the Alpha laser program, with the goal of developing a megawatt level SBL that was scaleable to more powerful weapon levels and optimized for space operation. In this design, stacked cylindrical rings of nozzles are used for reactant mixing. The gain generation assembly achieves higher power by simply stacking more rings. In 1991, the Alpha laser demonstrated megawatt class power levels similar to MIRACL, but in a low pressure, space operation environment. Alpha demonstrates that multi-megawatt, space-compatible lasers can be built and operated.

**Large Advanced Mirror Program (LAMP)**

To demonstrate the ability to fabricate the large mirror required by an SBL, the Large Advanced Mirror Program (LAMP) built a lightweight, segmented 4 m diameter mirror on which testing was completed in 1989. Tests verified that the surface optical figure and quality desired were achieved, and that the mirror was controlled to the required tolerances by adaptive optics adjustments. This mirror consists of a 17-mm thick face sheet bonded to fine figure actuators that are mounted on a graphite epoxy supported reaction structure. To this day, this is the largest mirror completed for use in space. This LAMP segmented design is applicable to 10-m class mirrors, and the Large Optical Segment (LOS) program has since produced a mirror segment sized for an 11-m mirror. The large dimension of this LOS mirror segment approximates the diameter of the LAMP mirror.

**Beam Control- Large Optics Demonstration Experiment (LODE) and ALI**

The ability to control a beam was demonstrated at low power under the Large Optics Demonstration Experiment (LODE) in 1987. The current high power beam control technology is now being integrated with the Alpha laser and the LAMP mirror in a high power ground demonstration of the entire high-energy laser weapon element. This is known as the Alpha-LAMP Integration (ALI) program.

**Acquisition, Tracking, Pointing (ATP)**

The ATP technologies required (sensors, optics, processors, etc.) have been validated through a series of component and integrated testing programs over the last decade. In 1985, the Talon Gold brassboard operated sub-scale versions of all the elements needed in the operational ATP system including separate pointing and tracking apertures, an illuminator, an inertial reference gyro system, fire control mode logic, sensors and trackers. Talon Gold achieved performance levels equivalent to that needed for the SBL. In 1991, the space-borne Relay Mirror Experiment (RME), relayed a low-power laser beam from a ground site to low-earth orbit and back down to a scoring target board at another location with greater pointing accuracy and beam stability than needed by SBL. The technology to point and control the large space structures of the SBL was validated in 1993 by the Rapid Retargeting and Precision Pointing (R2P2) program that used a hardware test bed to develop and test the large and small angle spacecraft slewing control laws and algorithms. The Space Pointing Integrated Controls Experiment (SPICE) demonstrated in 1995 near weapon scale disturbance isolation of 60-80 dB and a pointing jitter reduction of 75:1. In 1998, the Phillips-Laboratory-executed High Altitude Balloon Experiment, (HABE) will demonstrate autonomous end-to-end operation of the key ATP-Fire Control (FC) functions in a realistic timeline against actual thrusting ballistic missiles. HABE will use a visible low-power marker beam as a surrogate to the megawatt HF beam and measure beam-pointing accuracy, jitter and drift against a fixed aimpoint on the
Lt. General Lyles, the former director of BMDO, provided the following broad overview of the system and its development schedule in his testimony to the Subcommittee on Military Research & Development of the House Armed Services Committee February 25, 1999:

The key focus of our Advanced Technology directed energy program remains the chemical Space-Based Laser (SBL). SBL is a high-payoff, next generation concept for a missile defense system. The SBL concept we envision would provide the Nation with a highly effective, continuous boost-phase intercept capability for both theater and national missile defense missions. In addition, SBL could perform non-missile defense missions, such as aerospace superiority and information dominance. Working with ground-, sea- and air-based missile defenses, the SBL’s boost-phase intercepts could “thin out” missile attacks and reduce the burden on mid-course and terminal phase defenses. The SBL will be instrumental in protecting airfields and ports in the early stages of the conflict. Additionally, because of its global presence, SBL will be available to protect U.S. Allies and coalitions that may be threatened by inter-theater ballistic missiles.

The SBL program is managed by BMDO and executed by the U.S. Air Force on our behalf. I think that Lieutenant General Martin, USAF will discuss the SBL program in detail in his testimony. Both BMDO and the Air Force are requesting funds in the fiscal year 2000 budget for the SBL program. We are working jointly on this very important program, pooling resources and ensuring the program is following a clear direction. The BMDO budget contains $75 million and the Air Force budget has $63.8 million, for a combined request of $138.8 million. This level of funding on an annual basis will allow us to work on the program at a moderate pace while focusing our efforts on reducing the program’s technical and engineering challenges.

In the near term, the SBL program will focus on ground-based efforts to develop and demonstrate the component and subsystem technologies required for an operational space-based laser system. These efforts will lead to the design and development of an Integrated Flight Experiment (IFX) vehicle to be tested in space. I believe this approach is a prudent, moderate-risk development program.

We recently sponsored the third Independent Review Team (IRT-3) as part of the ongoing assessment of technology readiness, role, and content for a meaningful Integrated Flight Experiment program for SBL.

Lt. General Gregory S. Martin, the Principal Deputy Assistant Secretary of the Air Force for Acquisition, provided a more detailed progress report on the SBL program and advanced technology programs in his testimony on the same day:

“The Space-Based Laser (SBL) could provide the National Command Authorities with a highly reliable missile defense and space superiority weapon. If deployed, SBL will be a significant capability affording the nation global presence and precision engagement at the speed of light. It will likely be the boost-phase layer in a robust NMD architecture.

“The SBL vision recognizes the accelerating pace of ballistic missile proliferation worldwide. There are numerous developing countries with the ability to deliver weapons of mass destruction using ballistic missiles. SBL is a global, directed energy space platform that could address such a threat as well as the trend towards simultaneous launches and longer range missiles. SBL is also being designed to prevent catastrophe from an accidental or unauthorized missile launch.
“The SBL program could also act as a counter-proliferation weapon due to its robust capability to eliminate targets during their boost phase. Boost phase intercept tremendously deters the use of chemical, biological, and nuclear warheads through the ominous threat of debris falling on the launcher’s territory.

“An important future step for the SBL system is an Integrated Flight Experiment (IFX). The IFX is the first step in proving feasibility and utility of killing ballistic missiles in boost phase from orbit. The IFX is essential to reducing risk for an affordable SBL and enhancing readiness in the event of a decision to deploy an operational SBL system. The IFX will permit the Air Force to integrate laser components into a space platform to perform on-orbit experiments that will reduce risk in several important areas:

- Key technologies (e.g., deployable optics, remote beam control, high energy nozzles),
- Space vehicle, laser, and optical system integration for operation in space,
- Reliable performance of Acquisition, Tracking, Pointing, and Fire Control,
- Human interaction to include command and control, and
- Affordability of the system.

“SBL’s primary mission will be national ballistic missile defense; however, the IFX may show military utility in other areas as well. SBL may have potential use in tasks such as: ground surveillance and reconnaissance; tactical warning; target designation; space object tracking and identification; and destruction of airborne or soft ground targets. It is also possible that a SBL constellation could engage most TBMs. The possible evolution of missions is consistent with the Air Force’s historical development approach of migrating technology from air platforms to space platforms. The IFX will help us evaluate these possibilities.

“Thus far the SBL program has been successful in reducing the cost and technical risks of deploying and operating multi-megawatt lasers in space. The 1998 achievement of high power laser autonomous laser alignment demonstrates that the critical laser optical path can be monitored and adjusted remotely from the ground. The SBL program has developed, simplified and proven several key subsystems such as uncooled, deformable mirrors, resulting in a 40 percent reduction in spacecraft weight and significantly reducing optical component production cost and time.

“In spite of the SBL program’s technical achievements, there was concern that an IFX would not be launched soon enough to enable an operational SBL system in time to meet the projected threat. In response, the Air Force and BMDO increased funding for the SBL program by $46M per year through the FYDP ($29M per year from the Air Force, $17M per year from BMDO), raising the total to $139M per year. This additional funding will be used to accelerate risk reduction and technology development prior to the IFX. The Air Force and BMDO also revised the SBL acquisition strategy to pull the best technical experts together to focus on achieving the IFX sooner.

“BMDO recently sponsored the third Independent Review Team (IRT-3) as part of the ongoing assessment of technological readiness, role, and content for an effective IFX. The IRT-3 concluded the range of appropriate time frames for an IFX launch is 2010 to 2012. Currently planned budget levels and priorities lead to a launch planned for 2012. The team noted that achieving operational capability is less dependent on an IFX launch date than DoD commitment to deployment and “the IRT perceives that the Department is embarking on such a program.” The IRT-3 recommended the Air Force lay out a specific series of near-, mid-, and far-term milestones to ensure disciplined progress toward the IFX and enhance readiness to deploy an operational system. The team also recommended including deployable optics in the IFX to reduce risk for the overall SBL effort. Finally, IRT-3 reiterated the need for a ground facility to provide...
end-to-end system checkout before launch, and that such a facility should be operational at least 2 years before planned launch.

“In addition to its commitment to NMD, the Air Force is committed to long term investment in directed energy (DE). As a weapon, DE is a relatively new concept, and it offers a revolutionary ability to achieve our objectives rapidly and with few casualties. The synergistic, parallel development of ABL and SBL, as pathfinders, are the critical first steps in operationalizing DE weapons, and both will serve as effective incubators for investigating and developing the potential of DE systems. The Air Force, as a result of its more than 20 years experience in DE, is well postured to lead the development of this revolutionary capability.

There is little question about the technical merits of research on an SBL program. There are many questions about rushing forwards toward deployment, which are compounded by the fact that such a system may have limited benefit in terms of providing theater defense capability as well as national missile defense capability.

BMDO does not publish unclassified data on the test program, schedule, costs, and risks inherent in deployment. About the most that is available on such a system are summary statements that current planning is based on a system of 20-24 satellites, operating at a 40° inclination, intended to provide the optimum TMD threat negation capability. Comments on effectiveness are limited to generalizations such “kill times per missile will range from 1 to 10 seconds, depending on the range from the missile. Retargeting times are calculated at times as low as 0.5 seconds for new targets requiring small angle changes. It is estimated that a constellation consisting of only 12 satellites can negate 94% of all missile threats in most theater threat scenarios. Thus a system consisting of 20 satellites is expected by BMDO to provide nearly full threat negation.”

A USAF Air Force officer has said that a 24 SBL satellite constellation can kill 20 Taepo Dong 2 missiles launched anywhere in the world at anytime. Each SBL satellite is projected by BMDO to weigh 17,500 kilograms. Using the Aerospace Corporation’s historical cost versus weight information, which shows that satellites average cost is roughly $50,000 per pound, the first satellite in this constellation would approach $2 billion dollars.

One key area of uncertainty that has only been hinted at by the Secretary of Defense is that deploying the full array of X-band radars needed to complete the system requires the basing...
of radars on the territory of at least two NATO allies—evidently Canada and Britain. Secretary Cohen stated to the Senate Armed Services Committee on July 25, 2000 that,\textsuperscript{244}

We have had extensive discussions about our NMD proposal with NATO allies and we will weigh allied views, and impact on alliance relationships in our decisions. It is important to do this because we want the NATO alliance to continue to be a strong and effective instrument of Atlantic security in the conditions we will face in the coming years, and that requires a high degree allied understanding of our major defense policies. Beyond that, two of the radars in our NMD proposal are located in NATO countries, and so the consent will be needed for us to use them.

While there are policymakers who argue that the SBL system already is mature enough to be deployed as a substitute for the current NMD architecture, there are no unclassified data on the cost of such a system, and no technical risk assessments. Such assertions are mostly also made by people with limited technical experience, background in cost-risk analysis, or experience in large-scale systems integration. Once again, there is one set of true believers that feels such a system must be deployed as soon as possible and another set that believes with equal faith it can never work and is not necessary. The end result is more a battle between “cults” than an informed public policy debate.

\textbf{Alternative Approaches to the Present NMD Architecture}

At the same time, there are policymakers and experts who argue for a theater-based and ABM Treaty compliant form of missile defense such as forward-based systems designed to attack missile launches during the boost phase. Experts like Theodore A. Postol and Richard Garwin have proposed the deployment of a boost-phase defense as a substitute for NMD. A wide range of other experts have called for air or sea-based systems.\textsuperscript{245}

John Deutch, Harold Brown, and John P. White argued for such a system in an article in the summer 2000 issue of \textit{Foreign Policy}.\textsuperscript{246} They see forward land and sea-based theater defenses like AEGIS and THAAD as offering a credible way of dealing with near-term threats while research and development could continue on an NMD system, and deployment could be timed to meet an emerging new threat without creating immediate problems for the ABM Treaty and in US and Russian relations.
These are highly respected individuals with considerably more technical expertise than those who advocated rushing into the deployment of an SBL or other space-based system. Nevertheless, their approaches seem to be politically motivated, and their arguments for such systems have the same lack of a detailed architecture, schedules, and cost and technical analysis that affects the arguments for an SBL system. At present, there simply is not enough unclassified data available to accurately assess the benefits, costs, and risks of such alternatives, and there seems to be little practical chance the US will follow such a course unless the threat changes radically in ways the US does not now anticipate.

Some of the arguments for such systems also seem designed more to block the deployment of the present NMD system than to provide a realistic option. As a result, they often ignore some key political and technical realities:

- Any form of NMD capability still requires renegotiation of the ABM treaty. Advanced, long-range boost phase defenses clearly are NMD system components.

- Sea based systems would be effective in the case of Korea, but would not be effective against threats like China, or against Iran and Iraq unless sea-based assets could be deployed in the Caspian and Black Seas. It is far from clear that this is more realistic, and less politically provocative than the present NMD system.

- Some deployments, such as those near the Taiwan Straits, covering Japan, or involving deployments near Russia might be viewed as far more politically provocative than the present NMD system.

- Such systems require strategic warning and sustained deployment. It is unclear that such warning can be counted upon, and sustained deployment could be very costly.

- There could be little or no capability to deal with “accidental” launches.

- Deployment of sea-based systems for missile defense purposes would often mean diverting limited assets away from other missions.

- Land-based systems would have limited coverage, often over areas unsuited for NMD purposes.

- Air-based systems would often require sustained penetration of enemy and/or friendly air space to provide coverage of attack vectors against both the US and its allies.

- New forms of coalition warfare would be needed if the systems are land or air based, and would probably be required for sea basing. The arrangements required to obtain allied consent and support can be politically difficult and pose a potential third country veto on US action. This involves the use of any C4I/BM and sensor component on foreign soil or waters, as well as the fire unit.
• Many forms of attack could leave armed missiles in flight, but cause them to fall short. In the case of some ICBM intercepts, the warheads could strike in Canada, FSU, China, or Western Europe. In the case of Iran and Iraq, an IRBM missile intercept might cause the missile to strike Central Europe or the FSU.

• Like the existing NMD system, such systems would increase the incentive to use air breathers or carryout covert CBRN attacks on both the US homeland or our allies. Undefended allies or neutrals might become proxy targets instead of the US.

• Virtually all plumes would have to be attacked without time for advanced characterization. The nature of the timing of the attack would, however, have to be different for an ICBM or MRBM/IRBM to ensure the warhead did not fall on neutral territory.

• The development of an effective system would probably require the full deployment of SIBRS plus advanced X-Band radars, moving the deployment date beyond 2010.

• The development of suitable EKVs and boosters is often implied to be technically simple, and little description is usually available of the planned architecture, deployment requirements, and C\textsuperscript{4}I/BM system. Realistic costing, test requirements, operational PK estimates, and development and deployment time estimates are generally lacking.

Whatever the theoretical merits of such radical departures from the present BMDO may be, Jacques S. Gansler, the Under Secretary of Defense for Acquisition and Technology, advanced the following arguments against their near-to-mid term practicality in a Defense Department briefing on June 20, 2000: 247

…people have talked about, “Well, why did you pick mid-course?” As you know, some of the people have been commenting, a number of very distinguished people have commented, on the potential benefits, say, of a boost-phase system or even a terminal-phase, but most of the focus has been more on the boost phase.

…In the boost phase, you have a variety of ways you can approach this. You can do it from land, as the Russians have perhaps suggested—in other words, a Russian-based boost-phase intercept system—or you can do it from a sea-based either surface or subsurface system. In both those cases, you would need to be very close to the booster. You would also need to have a very rapid response because the first signal you’ll get is from a satellite telling you there has been a launch, and that comes as soon as it recognizes that there’s been a launch.

You could then try to—with a high-performance interceptor, one that we don’t have now—try to get out quickly and shoot down that booster. It of course makes the assumption you know that it is an ICBM beforehand—you might have shot down a satellite launch or otherwise—and so there’s some command-and-control issues very clearly associated with this system and, as I said, the development of systems.

Now, another alternative that people have suggested is the space-based systems. Here you have the choice of either a space-based laser system or a space-based interceptor of the same sort that you might use from the ground. Of course, if you are going to use a convention intercept from space, you have to have a very high-performance interceptor or intercept it in the mid-course phase. Or if you are using a laser, then you’d have to develop that and put it into space. We have, as you know, the space-based laser under development. The time period for the first experiment of that is around in the 2012 time period, and then the development
much further out than that.

So besides the obvious point that these other systems do violate the treaties, you also have the development time associated with them. And essentially, none of these are compatible with the 2005 time period; so that one would essentially be starting over to develop the high-performance capability for the boost-phase intercept of the interceptor. Or certainly from the space-based system, the time period is far different.

Now, the other extreme would be the terminal-phase system. Now, that has some very distinct advantages to it in terms of being able to sort out decoys. The earth’s—the atmosphere will do that in sorting out the decoys for you. The disadvantage associated with that is that you have to have lots of interceptors because this is a point defense system, and if you are trying to defend 50 states, then you’ve got lots and lots of places you have to have intercept. Very expensive system, and it’s a terminal defense system, so that essentially it’s intercepting right over your head, which has some obvious disadvantages also in terms of both nuclear, biological and chemical warheads.

So, while all of these have disadvantages, including the mid-course which we selected, it’s very clear that, at least if you are trying to get something against a relatively simple system, that the shortest time period system, and the one that was selected, was the mid-course. Now, the big disadvantage of the mid-course is the fact that it’s quite easy to generate decoys in the mid-course phase. And so I’m going to talk a lot about discrimination and what we’ve been doing to address discrimination, because that is the obvious weakness associated with the mid-course.

The news is, you have plenty of time to make decisions, plenty of time to do sorting and, in fact, even to get man-in-the-loop capability so that you can decide whether you want to launch and how much you want to launch. Another advantage of this mid-course because you have lots of time is you can do a shoot, and then look and see if you were successful, and then shoot again, so-called “shoot-look-shoot” capability, so you have multiple shots at it.

What we will do, in fact, is not just use the shoot-look-shoot, but on the ones heading towards continental United States, we will probably also use a multiple launch against them so that we will have a multiple probability of being able to hit the target; and if we are unable to discriminate between, say, a decoy and the warhead, we’ll shoot them both down, so that we will have a multiple fire as well as the shoot-look-shoot capability because of the long time period associated with it. That was the approach that we ended up taking to do that mission and to try to do it, as I said, by 2005.

The other approaches that you’ve heard some about I suppose I should mention. The theater missile defense approach, that the Russians have been talking about, clearly does not have the capability of defending against—for long-range capability against the United States. But those are the options that people have been talking about and why we picked the mid-course phase.

Such statements scarcely, however, mean that the US should freeze its options around the current system. President Clinton’s deferral of the deployment of the existing NMD system on September 1, 2000 is a good reason for zero-based study of other concepts like using Global Hawk and an airborne intercept, a sea-based system designed to use existing US ships and relatively limited technical growth in existing ship based anti-missile systems, and other options including space-based system. The Air Force has made progress in ABL and has developed
plans to launch airborne boost-phase intercept missiles. The US Navy has evidently conducted extensive analysis of this option, and it might offer a near-term boost-defense capability that could be used against threats near coastal areas like Iran, Iraq, and North Korea.

Such options could offer the advantage of both national and theater coverage of some threats, and deserve more examination. At present, BMDO seems to be limiting any zero-based review of its options because they are seen as a potential political threat to deploying the present NMD architecture rather than because they are not potentially valid options.

The Bush Proposal

Another key question is whether a new Administration will develop different priorities as part of the 2000 presidential campaign. George W. Bush has proposed a much more ambitious missile defense program that would cover the US and its allies on an almost global basis. On May 23rd, Governor Bush set forth the following broad outline of a new approach to nuclear forces, arms control, and NMD:248

When it comes to nuclear weapons, the world has changed faster than U.S. policy. The emerging security threats to the United States, its friends and allies, and even to Russia, now come from rogue states, terrorist groups and other adversaries seeking weapons of mass destruction, and the means to deliver them. Threats also come from insecure nuclear stockpiles and the proliferation of dangerous technologies. Russia itself is no longer our enemy. The Cold War logic that led to the creation of massive stockpiles on both sides is now outdated. Our mutual security need no longer depend on a nuclear balance of terror.

While deterrence remains the first line of defense against nuclear attack, the standoff of the Cold War was born of a different time. That was a time when our arsenal also served to check the conventional superiority of the Warsaw Pact. Then, the Soviet Union's power reached deep into the heart of Europe - to Berlin, Warsaw, Budapest, Prague. Today, these are the capitals of NATO countries. Yet almost a decade after the end of the Cold War, our nuclear policy still resides in that already distant past. The Clinton-Gore administration has had over seven years to bring the U.S. force posture into the post-Cold War world. Instead, they remain locked in a Cold War mentality.

It is time to leave the Cold War behind, and defend against the new threats of the 21st century.

America must build effective missile defenses, based on the best available options, at the earliest possible date. Our missile defense must be designed to protect all 50 states – and our friends and allies and deployed forces overseas – from missile attacks by rogue nations, or accidental launches.

The Clinton administration at first denied the need for a national missile defense system. Then it delayed. Now the approach it proposes is flawed – a system initially based on a single site, when experts say that more is needed. A missile defense system should not only defend our country, it should defend our allies, with whom I will consult as we develop our plans. And any change in the ABM treaty must allow the
technologies and experiments required to deploy adequate missile defenses. The administration is driving toward a hasty decision, on a political timetable. No decision would be better than a flawed agreement that ties the hands of the next President and prevents America from defending itself.

Yet there are positive, practical ways to demonstrate to Russia that we are no longer enemies. Russia, our allies and the world need to understand our intentions. America’s development of missile defenses is a search for security, not a search for advantage.

America should rethink the requirements for nuclear deterrence in a new security environment. The premises of Cold War nuclear targeting should no longer dictate the size of our arsenal. As president, I will ask the Secretary of Defense to conduct an assessment of our nuclear force posture and determine how best to meet our security needs. While the exact number of weapons can come only from such an assessment, I will pursue the lowest possible number consistent with our national security. It should be possible to reduce the number of American nuclear weapons significantly further than what has already been agreed to under START II, without compromising our security in any way. We should not keep weapons that our military planners do not need. These unneeded weapons are the expensive relics of dead conflicts. And they do nothing to make us more secure.

In addition, the United States should remove as many weapons as possible from high-alert, hair-trigger status – another unnecessary vestige of Cold War confrontation. Preparation for quick launch – within minutes after warning of an attack – was the rule during the era of superpower rivalry. But today, for two nations at peace, keeping so many weapons on high alert may create unacceptable risks of accidental or unauthorized launch. So, as president, I will ask for an assessment of what we can safely do to lower the alert status of our forces.

These changes to our forces should not require years and years of detailed arms control negotiations. There is a precedent that proves the power of leadership. In 1991, the United States invited the Soviet Union to join it in removing tactical nuclear weapons from the arsenal. Huge reductions were achieved in a matter of months, making the world much safer, more quickly.

Similarly, in the area of strategic nuclear weapons, we should invite the Russian government to accept the new vision I have outlined, and act on it. But the United States should be prepared to lead by example, because it is in our best interest and the best interest of the world. This would be an act of principled leadership – a chance to seize the moment and begin a new era of nuclear security. A new era of cooperation on proliferation and nuclear safety.

The Cold War era is history. Our nation must recognize new threats, not fixate on old ones. On the issue of nuclear weapons, the United States has an opportunity to lead to a safer world – both to defend against nuclear threats and reduce nuclear tensions. It is possible to build a missile defense, and defuse confrontation with Russia. America should do both.

It is important to note that Bush did not talk about system architectures, schedules, costs, or effectiveness. He also did not discuss missile defense per se, but rather a broad new approach to a range of national security issues. The Bush campaign made this clear in its press releases on the speech. Bush also spoke after meeting with a group of national security experts including George Shultz, former Secretary of State; Henry Kissinger, former Secretary of State and architect of the U.S.-Soviet Anti-Ballistic Missile Treaty; Donald Rumsfeld, former Secretary of
Defense; Colin Powell, retired general and former Chairman of the Joint Chiefs of Staff; and Brent Scowcroft, former National Security Advisor.

As a result, it is not possible to assess the Bush proposal as an alternative approach to the present NMD system, nor is it fair to criticize a set of potentially valuable concepts because they lack the level of detail that a serving Administration might propose. None of the prior problems in the cost, program structure, and test schedule for the existing NMD concept mean that the US cannot develop a system over time that will provide both more ambitious coverage of the American homeland and coverage of America’s allies. What is clear, however, is that there is great doubt as to the time at which a cost-effective system can be deployed, and as to what the architecture of any major element of such a system should be.

**The Need for a Net Technology Assessment**

These issues illustrate one of the many costs of having politicized the present NMD architecture. Many of the challenges to the current system involve concepts and ideas for which there is not public net technology assessment of either the threat or the range of defensive options, and where it is unclear that any assessment has really been performed at a classified level.

The current land-based interceptor system may indeed is the right one, but it is clear that there is a need for regularly updated assessments of the comparative value of sea and air based boost phase defense systems and the airborne laser to establish this, and measure the progress in the RDT&E and deployment efforts in each area. This assessment should include the trade-off between advances in theater and national missile defense, and highlight the need to analyze technology in terms of America’s overall strategic needs and not simply the physical defense of its territory.

The cost to defeat NMD, and the technology involved, also needs net technical assessment. The current counter measure debate is largely a matter of competing assertions, there is no detailed assessment of the projected growth capability of the initial NMD system, and no explicit assessment of its value relative to boost phase and other defense concepts. These
problems are coupled to a failure to link NMD to theater defense, to explicitly analyze the risk posed by other methods of delivery, and to explicitly analyze the trade-offs between improvements in defense and offense.

It is an unfortunate reality that vast amounts are written on NMD and missile threats, but that the public debate and most public literature has little or no detailed intellectual depth or substance in a number of critical areas.

**Role of Other Nations in Ballistic Missile Defense**

The US has long made it clear that it is seeking allied cooperation in creating missile defenses. This was a key element of SDIO activity from the founding of the modern NMD program, and senior US Defense officials have repeatedly stressed the US interest in such efforts: Jasques S. Gansler, the Under Secretary of Defense Acquisition and Technology summarized the state of US cooperation with other countries on missile defense as follows in his testimony to the House Armed Services Committee on February 25, 1999:

> The increased likelihood of committing forces to coalition operations makes the case for greater armaments cooperation with friends and allies. The Department’s approach to international participation in the development and deployment of theater missile defense systems continues to build upon consultations with our allies and friends and the establishment of bilateral and multilateral research and development programs.

The Medium Extended Air Defense System (MEADS) is a cooperative development program between the U.S., Germany, and Italy to develop a mobile cruise and ballistic missile defense system. Recently, the Department decided that the planned MEADS system was unaffordable as structured. Therefore, we are redirecting MEADS towards the development of evolving technologies that will be lower risk and more affordable, and yet allow us to meet the requirement for a highly mobile, rapidly deployable system for defense of our maneuver forces. The FY 2000 budget provides about $150 million over the next three years for technology development focusing on a 360° fire control radar and a mobile launcher, and utilizing the PAC-3 missile as the MEADS interceptor. The Department has kept its international partners apprised of the proposal to restructure MEADS and hopes they will join in this new approach.

The Arrow Continuation Experiments program, a cooperative program with Israel, concluded with the successful Arrow II flight test in September 1998. Given the success of this program, Israel committed to the near-term deployment of an active theater missile defense system. In 1998, amendments to the Arrow Deployability Program agreement provide for the integration, test, and evaluation of the Arrow Weapon System, namely, the jointly developed Arrow interceptor and Israeli-developed ground equipment, focused on enhancing the system’s interoperability with U.S. theater missile defense systems. It also gives Israel the option of acquiring an additional surveillance/fire control radar for an eventual third Arrow battery. The FY 2000 budget provides nearly $120 million over the next three years for the deployability program, a hardware simulation testbed, and an architecture analysis study. We are currently developing interface
requirements (hardware, software, and procedures) to establish some level of interoperability between Arrow and the Patriot systems.

The Russian American Observational System (RAMOS) program was initiated in 1992 to engage the Russian Federation in cooperative early warning and theater missile defense research with the primary goal to build confidence through cooperation. The technical goals were defined to answer questions concerning risk areas for future early warning space programs. In the past two years, we have developed Russian and American sensors and jointly tested them aboard a U.S. aircraft, demonstrating significant technical cooperation, and we have taken the first joint images from space. We strongly wish to continue our cooperative efforts involving early warning satellite technologies. We have recently identified two potential future research projects that are consistent with the original objectives for RAMOS. They are: 1) to continue aircraft experiments and simulations to study mid and long wave infrared background clutter as it applies to theater missile tracking, and 2) to fund Russian early warning prototype sensor development for future space flight. We will spend $8 million in FY 2000, and $13 million between

FY 2001-2002 on this effort, and provide about half of this funding for the Russian research efforts. We will also fund Russian research on early warning--providing almost $8 million in FY 2000 and $20 million between FY 2001-2002. We expect to have discussions with the Russians next month on continuing this important series of experiments.”

Lt. General Lyles provided the following background in his testimony to the Subcommittee on Military Research & Development of the House Armed Services Committee
February 25, 1999:

“Our International Cooperative program element contains two project areas. First, our cooperative programs with Israel. Secondly, our cooperative efforts with Russia. I would like to outline briefly our efforts in both areas.

“Cooperative Programs with Israel. The U.S.-Israeli cooperative Arrow Program continues to make progress toward the deployment of a contingency capable Arrow Weapon System (AWS) later this year. On September 14, 1998, Israel conducted a successful fly-out test against a simulated ballistic missile target. For the first time, the Arrow II interceptor was controlled throughout the flight by the other system elements of the Arrow Weapon System; for example: the surveillance/fire control radar (Green Pine), fire control center (Citron Tree) and launcher control center (Hazel Nut Tree). The integrated AWS flight test was a combined Phase II/III test that served to complete the Phase II Arrow Continuation Experiments (ACES) program and to begin the integrated flight tests under the Phase III Arrow Deployability Program (ADP). The next ADP flight test is scheduled for this summer and will be an intercept test against a ballistic missile target. If successful, the Israeli Air Force will declare the Arrow Weapon System to be initially operational, as a limited contingency capability.

Several proof-of-concept tests have been conducted toward achieving Arrow interoperability with U.S. theater missile defense systems. The Arrow Link-16 Upgrade Converter is in final development and will be delivered to Israel later this spring. This device is a two-way translator that will convert U.S. Link 16 TADIL-J formulated messages to the Arrow-formatted protocols, and vice-a-verse. Once the Foreign Military Sales case is concluded for Israel to purchase a JTIDS 2H terminal, with delivery anticipated in late 1999 or early 2000, Israel will have the full capability for Arrow to “interoperate” with U.S. TAMD systems.

We are continuing our efforts that use both the Israeli Test Bed (ITB) and the Israeli Systems Architecture and Integration (ISA&I) analysis capabilities to assist with the deployment of the Arrow Weapon System.
In addition, we are working with Israel in the ITB and ISA&I to refine procedures for combined operations between USEUCOM and the Israeli Air Force, and to examine future missile defense architectures that consider evolving regional threats. Recent contingency operations with Israel have benefited greatly from the work conducted bilaterally in the ITB and ISA&I.

We continue to reap benefits from our cooperative missile defense programs with Israel. In one specific case, the Arrow seeker technology flown by Israel is the same seeker planned to be flown aboard THAAD. Similarly, the lethality mechanism used in Arrow will greatly assist us as we develop the Navy Area system that also employs a fragmentation warhead. Additionally, the experience gained with the cooperative Arrow flight tests will provide many benefits as we begin a very robust flight test program for our TAMD systems this year.

Cooperative Programs with Russia. The Russian-American Observatory Sensor (RAMOS) program has been our cooperative effort with Russia on space-based surveillance technology. The program was conceived as a way to jointly develop and test these technologies. The projected budget to complete this program over the next few years is about $250 million. After very careful scrutiny we decided that the technical merits of the program did not warrant that level of funding - especially in light of the limited resources available for technology programs that directly benefit the missile defense mission.

While I appreciate the importance of cooperative programs with Russia, I cannot recommend continuation of the RAMOS project as it existed. However, in the spirit of cooperation with Russia, we are considering two other cooperative programs with Russia that promise similar benefits but at a substantially reduced cost. Both will ensure that the Russian scientific and technical community is engaged in a funded endeavor with America research interests. For instance, we will continue to work with the and several Russian research institutes (through the Utah State University Space Dynamics Lab) to cooperatively research space surveillance technologies of mutual interest. As the Committee recognizes, it is in our collective interest to work cooperatively with Russia’s technical and scientific community on a wide-range of mutual interests. Together, we can build a bridge of technical and political understanding, while lessening the opportunity for rogue states to gain access Russian space and missile expertise.

I will personally ensure that we keep the Committee and interested Members fully informed as we proceed with our plans.

Europe, NATO, Asia, and the Arab States

The US has pushed its European allies, Israel, and key Asian allies like Japan to support it in developing missile defenses. Defense Secretary William S. Cohen made a strong case for such cooperation in missile defense at the Werkunde Conference on February 5, 2000. He made it clear that the US did not wish to be in a position where a rogue nation or group might threaten Western cities. He used the example of what would have happened to Kuwait and Saudi Arabia had Saddam Hussein had a limited number of ICBMs. *He could have threatened to launch those missiles if the allied coalition tried to move against him.*

“If Hussein had said] ‘If you try to expel me from Kuwait, I’ll put one in Berlin, one in Munich, one in New York, Washington, Rome, Los Angeles, etc… How many countries would have been quite so eager to...
support deployment of some 500,000 troops to expel him from Kuwait?

In practice, however, the US has found only mixed and limited international support for ballistic missile defenses. While some European nations have shown some interest in the system, European systems like MEADS have received little serious funding. Nations that cannot finance the basic modernization of their existing forces are not prepared to fund major new defenses against threats that have not yet materialized. Many Europeans fear the arms control impact of a US deployment of NMD more than the threat from rogue states, and see the US as rushing forward in ways that will do more to destabilize East-West relations than bring added security. They also see a world in which the US can and will buy NMD, while Europe will not -- leaving an unshielded Europe that could then become an alternative target for nations seeking to pressure the West.

These European concerns were a key reason that Secretary Cohen made the following additional comments about the need for NMD in a speech at the same Werkunde Conference in Munich,

This habit of adaptation—the constant reevaluation and reappraisal of the threats of our day and age—is the reason that the United States is moving forward in areas such as ballistic missile defense. We must recognize the iron law of modernity: as technology spreads and improves, the security threats beyond our borders—and the security expectations within our borders—both increase.

For America and Europe, the threat of missiles from rogue nations is substantial and increasing. North Korea is building—and selling—long-range missiles and has assembled an arsenal with nuclear, chemical, and biological capabilities. Iran, with foreign assistance, is buying—and developing—long-range missiles. It has chemical weapons, and is seeking nuclear and biological capabilities. Iraq had an active missile program and chemical and biological weapons, and was close to nuclear capability. Saddam has been trying since 1991 to maintain a production base for all of these and, if the world community allows him to flout with impunity its UN Security Council resolutions, he will resume his activities where he was stopped. Libya has chemical capabilities and is trying to buy long-range missiles.

We must be clear: these countries do not need long-range missiles to intimidate their neighbors, much as they seek to do. They want long-range missiles to coerce and threaten us—the North American and European parts of NATO. We project that in the next 5 to 10 years these rogue countries will be able to hold all of NATO at risk with their missile forces. In the United States, we have concluded that we cannot wait to begin to deal with this threat until we are in the midst of a crisis in which one of these rogue states attempts to blackmail the United States from carrying out its alliance obligations and protecting its interests.

The solution is clear: America needs both theater missile defense systems and a limited national missile defense system. Would a national missile defense system mean the United States is abandoning deterrence? Absolutely not. Missile defenses are a logical adjunct to our traditional policy. Defenses enhance
deterrence by reducing the political and military value of rogue missiles. They can prevent damage if a rogue leader miscalculates. Will missile defenses protecting the United States weaken our defense commitments to allies? No, just the contrary. They will make it clear that even in the face of rogue long-range missiles, U.S. defense commitments—including those to NATO—will be upheld. Importantly, it is also becoming increasingly clear that effective limited defenses are technologically achievable.

Russia understands the value of missile defenses. The only ABM system in the world is the one around Moscow. We have made very clear to the Russian government that the limited defense contemplated for the United States is not directed at Russian forces. Indeed, it would not be capable of defeating those forces or undermining their strategic deterrent. In no way would it create any rationale for Moscow to increase its offensive forces or, indeed, to balk at additional reductions.

We have also made clear that we do not want to abandon the ABM Treaty. We are working with Russia to modify the treaty to allow us to defend ourselves against threats while preserving its basic purpose of promoting strategic stability between the United States and Europe. The threats that we will soon face were not envisioned when the Treaty was signed 28 years ago. The Treaty did envision, however, that the strategic situation might change such that the Treaty would need to change. There is no reason to force a choice between arms control and strategic stability, on the one hand, and defending our population from rogue-state missile threats, on the other.

Finally, I should note that President Clinton has made no decision to deploy a national missile defense system and will consider multiple factors before doing so: the evolving threat; the costs; the technical efficacy of such a system; and the strategic issues and considerations that involve our European allies and Russia itself.

So I hope to have a vigorous and forthright discussion here and in the coming months about how we should make these advances in missile defense fit into our larger plans for trans Atlantic security, rather than debate why such a defense is becoming necessary.

The US has not, however, succeeded in making a convincing case. Even somewhat supportive governments like Britain have shown they have grave reservations about the impact of US deployment. European concerns with money, Russia, and arms control are not going to be influenced by American rhetoric, particularly at a time when many in Europe see the US as arrogant and unwilling to listen to European concerns. At the Group of Eight (G-8) -- Britain, Canada, France, Germany, Italy, Japan, Russia and the United States -- summit meeting in July 23, 2000, the majority of European governments clearly saw NMD as a threat to arms control. In spite of US participation, the conference statement made this clear in terms that strongly backed the ABM Treaty over NMD.

We look forward to the early entry into force and full implementation of the Strategic Arms Reduction Treaty (START) II and to the conclusion of START III as soon as possible, while preserving and strengthening the Anti-Ballistic Missile (ABM) Treaty as a cornerstone of strategic stability and as a basis for further reductions of strategic offensive weapons, in accordance with its provisions. We welcome the ratification of the CTBT and START II by Russia.
A few days earlier, European Commission President Romano Prodi had expressed equal concern over the United States’ plan to build a national missile defense (NMD) system during discussions with Yukio Hatoyama, leader of the Democratic Party of Japan (DPJ). Prodi said the NMD project could lead to an arms race, adding that some people have questioned the plan despite wanting to avoid conflict with the U.S. Prodi, a former Italian prime minister, was in Japan to represent the European Union at G-8 summit. During the summit, the foreign ministers of Britain, Canada, France and Germany joined Russia in expressing concern over the US plan to deploy NMD plan when their foreign ministers met in Japan’s Miyazaki city as a prelude to the Okinawa summit. French President Jacques Chirac reiterated France’s opposition more openly, “We feel this project could give a new start to the proliferation of armaments, be it nuclear or missiles.”

These attitudes could present major problems for the deployment of the existing NMD architecture because the full-scale US NMD system requires at least one X-band radar site in Canada and one in Europe. Britain, which is planned to be the base for an upgraded radar necessary for a national missile defense, has tentatively accepted the Clinton administration’s view that North Korea presented a threat. France and Germany never agreed with this assessment. The French foreign minister, Hubert Védrine, said in an interview in June 2000 that a missile defense would be disruptive to the Atlantic alliance. “There are members of the alliance who wonder if this won’t lead to unequal security,” he said. “If there is a real threat, why are you protecting only yourselves?” In any event, said Mr. Védrine, North Korea was a country that harmed its own population more than other states.

Furthermore, a growing gap is emerging between any near-term US decision to deploy an NMD decision and the ability of either the US or Europe to provide a system tailored to European needs. This would require the equivalent of an improved wide-area THAAD or AEGIS system and such options are unlikely to be available before 2010 at the earliest. The only alternative would be European acquisition of some variant of the US NMD system. Both would be costly enough to virtually halt European conventional force.
improvements at anything approaching current NATO European procurement budgets, and the potential friction with Russia would be immense – not only in terms of the Russian reaction towards Europe but Russian sensitivities to the deployment of a US system.

Many, if not most, European nations are also concerned that the US is jeopardizing the overall process of regional and global arms control, and provoking a new kind of arms race with Russia and China, to deal with a threat that does not yet exist and may never exist. This was very clear during the Foreign Ministers meeting in Miyzaki, Japan in July 2000 to prepare for a July 21-23, 2000 G8 meeting. Ministers signed a statement expressing their concern with missile proliferation, but they also urged “preserving and strengthening” the ABM Treaty “as a cornerstone of strategic stability.” Even Canada expressed its concern with the US position.

President Clinton mentioned several of these issues in his speech of September 1, 2000 deferring a decision on deployment.

In the meantime, we will continue to work with our allies and with Russia to strengthen their understanding and support for our efforts to meet the emerging ballistic missile threat, and to explore creative ways that we can cooperate to enhance their security against this threat, as well.

An effective N.M.D. could play an important part of our national security strategy. But it could not be the sum total of that strategy. It can never be the sum total of that strategy for dealing with nuclear and missile threats. Moreover, ballistic missiles armed with nuclear weapons, as I said earlier, do not represent the sum total of the threats we face. Those include chemical and biological weapons, and a range of deadly technologies for deploying them.

So it would be folly to base the defense of our nation solely on a strategy of waiting until missiles are in the air and then trying to shoot them down. We must work with our allies and with Russia to prevent potential adversaries from ever threatening us with nuclear, chemical and biological weapons of mass destruction in the first place, and to make sure they know the devastating consequences of doing so.

Over the past 30 years, Republican and Democratic presidents alike have negotiated an array of arms control treaties with Russia. We and our allies have relied on these treaties to insure strategic stability and predictability with Russia, to get on with the job of dismantling the legacy of the cold war and to further the transition from confrontation to cooperation with our former adversary in the most important arena: nuclear weapons.

…Apart from the Russians, another critical diplomatic consideration in the N.M.D. decision is the view of our NATO allies. They have all made clear that they hope the United States will pursue strategic defense in a way that preserves, not abrogates, the ABM Treaty. If we decide to proceed with N.M.D. deployment, we must have their support because key components of N.M.D. would be based on their territories. The decision I have made also gives the United States time to answer our allies’ questions and consult further on the path ahead.
Finally, we must consider the impact of a decision to deploy on security in Asia. As the next president makes a deployment decision, he will need to avoid stimulating an already dangerous regional nuclear capability from China to South Asia.

It is hardly surprising, therefore, that Europe was largely supportive of President Clinton’s decision. President Jacques Chirac of France, one of the most pointed critics of the American plan, was the only leader to issue a personal statement that evening. He said he had been informed of Mr. Clinton’s decision by letter that day, which he said he received with “great interest” given France’s view that the project “risks undermining the strategic equilibrium and a return to the nuclear arms race.” British and German leaders also praised Mr. Clinton’s decision.

British Foreign Minister Robin Cook said that Mr. Clinton had “taken careful account of the views” of America’s allies and other international partners in pulling up short on the deployment of missile defenses, which would violate the Antiballistic Missile Treaty of 1972. “We look forward to continuing dialogue on this subject with the current” administration in Washington “and, in due course, with its successor, and with our NATO allies and others.”

A spokesman of the German government said that Chancellor Gerhard Schröder had “understanding and respect” for the “wise decision,” adding that Germany’s “reservations about this project are well known.” Karsten D. Voigt, who coordinates German-American affairs in the Foreign ministry, said, the decision was welcome because it gave more time for consultations inside the alliance, where there have been some reservations against the substance of the national missile defense concept and also some complaints over the lack of time for consultations.

Other regions face more immediate and tangible missile threats. The regional impact of NMD on China and North Korea has already been discussed, as have the problems raised in terms of Iran and Iraq. Asian nations like Japan, South Korea, and Taiwan have shown considerable interest in using the theater missile defense systems the US is developing as NMD systems, but have not committed themselves to a major common development effort. They have carried out some joint research and development, but have generally left the US to develop and field theater missile systems that they can adapt as NMD systems. The Arab Gulf states and
Egypt have expressed an interest in US offers to share missile warning data, but have not moved forward toward tangible cooperation. Ironically, Russia and China have talked about cooperating in NMD at the ministerial level, and as a reaction to the “threat” posed by the US NMD system.\textsuperscript{261}

\textbf{Israel}

The one major exception is Israel. Israel, more than any other state, faces a tangible threat of missile attack. The missiles offer Israel’s enemies a possible way of overcoming its current advantage in conventional capabilities. At the same time, an Arab or Iranian attack using weapons of mass destruction would put Israelis very existence at risk because of Israel’s small size, its concentrated urban population, and the fact that 85\% of its population is condensed into a triangle in Northern Israel. This triangle is a maximum of 68 miles wide in the south and 130 miles long. In addition, the Arab countries and Iran have the ability to target Israel’s two main coastal urban areas because they are largely non-Arab. These population concentrations make Israel acutely vulnerable to the direct effects of nuclear and biological weapons and fall out. It also makes it acutely vulnerable to both direct missile attacks on its coastal cites, and asymmetric ship based attacks from coastal waters.

It is hardly surprising, therefore, that Israel has given careful study to active and passive defense, and particularly to missile defense, and is one of the few nations in the world to have developed its own national missile defenses. Israel has also begun to examine the missile defense implications of its peace with Jordan, and the fact that Jordan could be the deliberate or inadvertent target of Iranian and Iraqi missile launches. Israel has developed a comprehensive missile defense plan, including a 10-year funding plan. The Arrow missile defense program forms the core of this plan, but it involves layered defense, a possible boost-phase interceptor, new battle management systems and sensors, and close cooperation with the US. It also involves consideration of extending the defense umbrella to cover Jordan, reducing the vulnerability of Israeli missile and nuclear forces, and possible cooperation with Turkey.\textsuperscript{262}

The resulting Homa (barrier) project now calls for both tactical and theater defenses to be overlayed in ways that combine Israeli systems with US reinforcements. Israel recognizes, however, that any program must be technology and threat driven and respond to new developments and events. It also recognizes that effective defense against long-range missiles

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involves terminal velocities that severely limit the effectiveness of the anti-tactical ballistic missiles it can afford to develop. As a result, Israel is faced with the challenge of either finding some form of boost phase defense or an “upper tier” wide-area threat defense with a high intercept capability against missiles closing from ranges in excess of 1,000 kilometers. (Missile launch ranges from Iraq, Libya and Syria are under 1,000 kilometers and have closing velocities suited to lower tier theater missile defenses and which still give tactical ballistic missile defenses some effectiveness in point defense over a reasonably wide range of deployment locations. Iran must generally launch from ranges in excess of 1,000 kilometers, and the closing speeds of more modern and longer-range missiles like the Shahab are faster and present much more serious intercept problems.)
The Tactical High Energy Laser (THEL) or Nautilus

The Tactical High Energy Laser or THEL program was originally a $100 million program, with the US paying $70 million and Israel paying $30 million. At present it is primarily a defense against unguided rockets, rather than guided missiles. It is far from clear that it will work, since current versions need to hold a rocket in flight for nearly 15 seconds, and the average flight time of an 80-240 mm rocket is generally less than 30 seconds. They are also dependent on a clear line of sight, so haze and smoke present major problems. Nevertheless, tests at White Sands proved in February 1996 that a laser could track a missile for the required time, and that a deuterium fluoride laser beam could destroy a missile in flight. This led the US to push the concept forward, largely in an effort to provide defenses against Hizbollah rocket attacks on northern Israel. Rockets can also be used to launch large numbers of biological and chemical weapons, however, and THEL provides a tactical layer of defense.

The THEL program ran into trouble in 1999 when a series of technical difficulties encountered during initial tests and chemical leaks caused by faulty valves delayed the project by up to a year. The delays resulted in cost overruns totaling $30-50 million over the $130.8 million ceiling. The cost overruns jeopardized the future of the project as the contractor and the US government argued over who was responsible for the extra cost. THEL was saved when the Israeli Ministry of Defense and the US Army agreed to each pay a quarter of the overruns while the contractor is still responsible for the other half.

While costs reached $185 million by May 2000, with $64 million coming from Israel, the THEL deuterium fluoride laser proved to be successful in tests against incoming Katyusha rockets in June 2000. As a result, the demonstrator will be dismantled and shipped to Israel for operational testing in October 2000. It will then become a static fire unit as part of the Homa or “barrier” multilayered defense system that Israel is deploying along its border with Lebanon. The creation and deployment of a mobile operational THEL test bed is unlikely to be complete before early 2001, however, and the cost-effectiveness of the program remains uncertain.

The THEL system also proved to be successful in shooting down two Katyusha rockets during August 28 test at the White Sands Missile Range in New Mexico. This success against multiple targets is an unprecedented technological accomplishment, and a first for US laser...
It has been indicated that “The THEL system may be ready for delivery to Israel as early as the end of February (2001), but this date is subject to change should Israel and the United States reach an agreement to develop a smaller, mobile version of the weapon.”

The THEL could be a deterrent in the theaters like Korea against North Korean stockpile of short-range missiles. It also could be deployed in the Persian Gulf, where Iran is armed with Katyushas. The Israel Defense Force (IDF), however, has doubts that THEL can protect Israel against ‘Katyusha’ rocket from Lebanon. IDF argue that Israel and Lebanon border is too long, and “even three THEL systems could not handle such barrage along the border.”

**The Patriot and PAC-3**

Israel currently deploys three Patriot batteries using systems and missiles whose anti-tactical ballistic missile (ATBM) defenses have been upgraded since the Gulf War. They now have software that allows them to distinguish between the missile booster and warhead far more accurately, and they have a much greater kill probability against an oncoming warhead. Each battery has three missile launch vehicles. It is receiving new equipment with a value estimated at $73 million, which was approved by the US Department of Defense in June 1998. This equipment includes three AN/MPQ-53 radar sets, three AN/MSQ-104 engagement control stations, three M-983 tractors, nine M931A2 trucks and other equipment. It is also developing its own ATBM defenses.

The Patriot is an air defense system with moderate capabilities in a largely point defense mode as a tactical ballistic missile defense system. It also provides considerable defense against cruise missiles, adding a key layer to Israeli defenses, and is being steadily improved to widen its coverage against Scud-type threats. Its speed and range are limited, however, and cannot be particularly effective against IRBM-type threats like the Shahab-3 which have closing velocities that limited the Patriot’s defense area coverage to a much narrower radius near the missile launcher.

The Patriot’s capability will be further enhanced by the PAC-3 upgrade. The PAC 3 upgrade expands the area from which Patriot can intercept a missile, reduces the risk of “leakage” against ballistic missiles, introduces a superior direct hit to kill system, and improves defense against cruise missiles. The system has had major development problems and cost overruns, but did have a successful hit-to-kill intercept in March 1999. The US Department of
Defense licensed the new Patriot technology for export in November 1999.\textsuperscript{273}

**The Arrow**

The Arrow missile is an anti-tactical ballistic missile defense with limited area coverage that is tailored to Israel’s needs and limited geographic area. The Arrow-2 is supposed to intercept incoming missile warheads at ranges, which have been variously reported as being from 10-40 kilometers or 33,000-131,000 feet. The missile is a two-stage, hypersonic, solid-fuel missile with a fragmentation warhead. Each Arrow-2 battery has four missile launchers with six missile tubes each, and will normally be equipped with at least 50 missiles. The system uses a Green Pine search and track radar, a Citron Tree fire control center, a Hazelnut Tree launch control center, and the Arrow 2 launcher. Its manning requires about 100 personnel.

Plans call for three batteries, although only two are fully funded. Israeli calculates that two batteries can defend “most populated areas in Israel.” The official program cost is often said to be around $1.6 billion, although some Israelis feel the true total system-related cost will be in excess of $3 billion.\textsuperscript{274}

The program is constantly evolving to respond to changes in technology, the development and test program, and changes in the threat. As of March 1999, it was a three-phase program with the following features:

- **Phase I: Validate Defense Concept and Demonstrate Pre-prototype Missile**
  - Fixed price contract: $158 million
  - The US pays 80%; Israel pays 20%.
  - Completed in December 1982.

- **Phase II: Demonstrate Lethality, develop and demonstrate tactical interceptor and launcher.**
  - Fixed price contract: $330 million.
  - The US pays 72%; Israel pays 28%.
  - Successfully completed.

- **Phase III: Develop and integrate tactical system, conduct weapon system tests, and develop and implement interoperability.**
  - Program cost estimated at: $616 million.
  - The US pays 48%; Israel pays 52%.
  - Began in March 1996.
• System integration in progress.

Israel originally planned to deploy the Arrow in two sites near Tel Aviv and Haifa which could cover up to 85% of Israel’s population. It expanded this plan to include a third site in June 1998, with an additional $57 million allocated to this battery. Partly because of the increasing pace of the threat from Iran and Syria, Israel accelerated work on the Arrow. It then planned to deploy the system in mid-1998. However, a fire at a plant near Tel Aviv caused an estimated $30 million in damage and delayed the program. As a result, the first Arrow 2 missile battery was activated on November 29, 1998, and began training in December 1998.275 In 1999, Israel urged the US to consider expanding the Arrow system into a regional defense by including additional batteries in Jordan and Turkey. With additional batteries, the Arrow would protect all of Turkey, Jordan, and Israel against attacks from a country such as Iran. However, it is unlikely that the US will agree to this and it is unclear that Jordan even wants the Arrow.276

It is difficult to put the Arrow 2 into technical perspective. Like all systems this complex, it has had a troubled life in terms of its original technical design, management and system integration problems. It has had some successful tests, notably in an integrated weapon system test and fly out against a simulated target on September 14, 1998. It also destroyed an Israeli seal-launch TM-91 missile, which was simulating an Iraq Al Hussein missile, during its first comprehensive system test in November 1999. However, the Arrow has also had test failures and severe management and development problems. It has had only seven firing tests as of the end of 1999, and its current test program calls for less than one-fifth of the tests necessary to fully validate its reliability and effectiveness.277

The development schedule that Israel has adopted is a high-risk program with limited testing that raises serious questions about the extent to which even successful follow-up tests will provide highly reliable data on its operational probability of intercept, particularly under real-world conditions against different types of missiles and different types of “volleys.” It seems possible that it may prove highly effective against Scud type missiles. However, it clearly has only limited capability against newer systems like the Iranian Shahab series, which is already forcing Israel to develop a follow-on version of the Arrow 2. Occasional Israeli claims that Arrow can provide a reliable defense capability against the regional missile threat seem to be designed to deter possible enemies from launching, rather than claims that the Israeli advocates of the Arrow feel are technically credible.278
There has been some limited progress. On September 15, 2000, Arrow 2 (ATBM) achieved its first frontal interceptions of a target missile aimed at Israel.\textsuperscript{279} According to executives of Israel Aircraft Industries (IAI), “the system is operational and, when we need it, the system will function.”\textsuperscript{280} The president of IAI further commented, the system will be fully operational by 2001.

The Arrow 2’s growth capability to deal with missiles like the No Dong, Shahab 3, Taepo Dong-1, CSS-4, and Shahab-4 is questionable. Under these conditions, the launch footprint or defensive area the Arrow can cover with a high probability of intercept might well be so restricted in area that Israel would have to rely primarily on other layers of its missile defense system.\textsuperscript{281}

**The Integrated Boost-Phase Intercept System and Moab**

Israel is examining a number of options for an integrated boost-phase intercept system and gave such programs a high priority in its security talks with the US in 1999. Israel is closely studying the US airborne laser program, but its leading candidate for an Israeli system is the Moab. The Moab is a missile that can be carried on an F-15 or UAV, and that is designed to engage theater ballistic missiles at ranges of around 100 kilometers soon after launch. The Moabs would be a modified form of the Python 4 with a new booster to accelerate the missile to speeds of 1.5-2 kilometers per second. Maximum firing range is stated to be 80 kilometers from a firing altitude of 30,000 feet and up to 100 kilometers from 50,000 feet.\textsuperscript{282}

The Moab would initially be deployed on the IAF’s F-15Is, but would eventually use a high altitude UAV that would loiter at 60-66,000 feet. Israel is looking at possible use of its Hermes UAV or some form of the Teledyne Ryan Global Hawk UAV, which can loiter for 42 hours at 40,000 feet or beyond. Conceptual pictures of the UAV show some stealth characteristics. The UAVs would be flown in launch zone constellations, nominally of four UAVs. They would be controlled by a mobile command center which would use a data link with a low data rate of less than 1 kilobit per second and which would control flight and operations. The system would be integrated into the overall IAF BM/C\textsuperscript{4}I theater air defense network.\textsuperscript{283}

Cost and technical feasibility present major problems. The system is being designed by Rafael, and two cost-driven design characteristics include the use of engagement speeds below the aeroheating threshold of the missile to avoid cooling the infrared seeker, dome cooling, and a
protective cap. The missile also locks on at launch to avoid an expensive data link. This design places considerable stress on the ability to design a missile with the required performance and the associated search/track systems and command and control capabilities. Much also depends on the threat being suitably close to Israel or an Israeli area of operations, the ability of Israeli intelligence to predict a narrow launch area for enemy missiles and the probable time of launch, since Israel may not be able to react to previous missile launches without risking the successful penetration of a first round or volley of enemy missiles.

**Warning and Command and Control**

Israel receives spaced-based warning, tracking, and point of impact data from the US as part of an agreement signed in April 1996. It also receives warning data, and substantial information on Iranian, Iraqi, Libyan, and Syrian programs. Much of these same data are also, in fact, provided to Egypt, Jordan, and the Southern Gulf states.

Israel is, however, studying the possibility of creating its own space-based system and a space-based queuing system for intercept purposes. Such a system hardly seems cost-effective, given Israel’s financial constraints, but the Technion Space Research Institute in Haifa has carried out studies of such options. Israel began to acquire the capability to launch satellites with electro-optical sensors and digital down-links. The Shavit I launched Israel's satellite payload on September 19, 1989. It used a three stage booster system capable of launching a 4,000 pound payload over 1,200 miles or a 2,000 pound payload over 1,800 miles. It is doubtful that it had a payload capable of intelligence missions and seems to have been launched, in part, to offset the psychological impact of Iraq’s missile launches.

This seems to be equally true of the Ofeq 2 launched in April 1990, one day after Saddam Hussein threatened to destroy Israel with chemical weapons if it should attack Baghdad. Israel used its three-stage Shavit launch vehicle to launch the Ofeq-3 from a secret launch site at the Palmachim test range near the coast south of Tel Aviv on April 5, 1995. Israeli radio almost certainly exaggerated in claiming that the satellite could transmit imagery “that allows identification of license numbers in downtown Baghdad.” In fact some reports indicate that only about 36 kilograms of its 225-kilogram weight was payload and the rest was structure. Nevertheless, the Ofeq 3 had a much larger payload than the Ofeq 2, and the IDF spokesman confirmed that the 495 pound satellite was in a low orbit that circled the earth every 90 minutes and covered Syria, Iran, and Iraq. It is scarcely coincidental that the Ofeq 3’s orbit takes it almost
directly over the Golan and Damascus, about 90 miles north of Teheran and 240 miles north of Baghdad.\textsuperscript{285}

Since that time, other launches of Israel’s Ofeq and Amos series of satellites have demonstrated Israel’s technical capability to launch sophisticated satellites. The Ofeq 3 launch in April 1995 seems to have been of a more capable photo reconnaissance satellite, although it evidently did not include advanced all-weather coverage and real time data processing and transmission capability.\textsuperscript{286} There have been important technical failures like the failure to launch the Ofeq 4 intelligence satellite on February 4, 1998.\textsuperscript{287} The Ofeq 4 was intended to be an all-weather photo reconnaissance satellite with real-time capability. It is unclear whether it was intended to replace the Ofeq 3 or work together with it. Changes in the orbit of the Ofeq 3 after the Ofeq 4 failed to reach orbit might suggest the latter.\textsuperscript{288}

The IDF has concluded that its own warning system would require three or four satellites flying in a low earth orbit to provide continuous coverage of the most likely 1000 by 1000 kilometer launch area.\textsuperscript{289} Israel’s current space budget is only about $50 million a year and an effective program would cost hundreds of millions of dollars and provide less coverage and information than the US system. As a result, Israel may choose to rely on US capabilities. However, Israel may soon have another option. West Indian Space Ltd., a joint venture between US and Israeli companies, is trying to become the first commercial provider of high-resolution satellite images. It plans to operate eight small satellites based on the Ofeq design. Israel is believed to be the company’s first customer.\textsuperscript{290}

**The Interoperable Defense Effort: Israeli and US Cooperation**

Israel does not act alone in planning and developing its defenses. The US may oppose Israel’s status as a nuclear power, but it works closely with Israel on theater missile defense. The US and Israel have formed a Binational Interoperability Working Group (BIWG) to implement full interoperability between US tactical and theater missile defense systems and Israeli developments like the Arrow. A ministerial level Policy Advisory Group (PAG) was established in April 1996 to facilitate such cooperation at the highest levels within the Israeli Ministry of Defense and the US. The end result is that Israel is developing both a national missile defense and a high degree of interoperable capability with the US.

The current goal the US has is to make the Arrow fully interoperable with US systems by
2001, using the US Link-16 and Joint Tactical Information Distribution System (JTIDS). This would allow US ship-based systems like the Aegis and land-based US Army systems like the THAAD to be linked in a common, secure digital sensor and battle management system, greatly improving their synergy and ability to restrick a penetrating warhead and handle multiple targets at the same time. Israel and the US are also developing combined standard operating procedures for theater missile defense interoperability and will conduct joint simulations and exercises. The US is also providing technical support to Israel in its development of improved versions of the Arrow, related sensors and BM/C³I, its use of US satellite-based warning and point of impact data, and its development of a UAV for boost-phase intercept purposes.

This US planning for missile defense cooperation with Israel does affect the Arab-Israeli balance. At the same time, Israel is examining cooperation with Jordan and Turkey and the US plans cooperation with key friendly Arab states like Egypt, Jordan, and the nations of the Southern Gulf. While US assistance to Arab states would not be based on the integration of interoperable indigenous defenses with US defenses, virtually all US theater defense planning examines scenarios for the deployment of Patriot PAC three and US mid-range (lower tier) and theater-wide (upper-tier) missile defenses to Egypt and the Southern Gulf states.

These points are often lost in the region’s focus on Arrow, but it is critical to understand that a major US program supports Israel’s missile defenses and that missile defense is not simply relevant to Israeli defense scenarios but to the defense of friendly Arab states. This US policy has been briefed to every Arab country that is friendly to the US in the Southern Gulf at the ministerial level, as well as to Egypt and Jordan. The US began to hold detailed high-level conversations with members of the Gulf Cooperation Council in Abu Dhabi in April 1998. It has since organized a continuing series of conferences and planning sessions at the senior officer/expert level.

The Complex Structure of the Full Israeli Missile Defense Program

The following list, compiled by combining various media reports, shows recent trends in Israeli missile and anti-missile developments, including projects underway and recently acquired military hardware, and related developments in US capabilities to provide additional missile defenses:

- Israel deploys three batteries of the US Patriot missile with improved anti-tactical ballistic missile capabilities, and will acquire the PAC-3 in the future. It has full access to US ATBM technology, including

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the improved missile, AN/MPQ-53 radar, and AN/MSQ-104 engagement ground stations. The US has also shown that it can rapidly reinforce Israel with three or more additional batteries.\textsuperscript{294}

- The upgrading of the Patriot systems to the PAC-3 will provide improved coverage and lower “leakage” rates against short to medium-range ballistic missiles. It will also provide excellent air and cruise missile defenses. The PAC-3 is now scheduled to complete development around 2000. No deployment date for possible support of Israel is yet fixed. Even the PAC-3, however, will have a notably smaller defensive area coverage, or “footprint” against missiles closing with the kind of velocities produced by launch ranges in excess of 1,000 miles.

- Israel designed the Nautilus laser system, initially for rocket defense in a joint project with the USA. The Nautilus was supposed to eventually be deployed in the north to counter Hizbollah rocket attacks. In February 1996 it destroyed a 122 mm Katyusha rocket in-flight during a test at White Sands. Because of the success of the prototype, it has developed into the Theater High Energy Laser (THEL). The project has recently been expanded to include interception of not only short-range rockets and artillery, but also medium-range Scuds and longer-range missiles such as Iran’s Shahab series.\textsuperscript{295} The US allocated $15 million for the THEL in FY1999.\textsuperscript{296}

- The Arrow anti-tactical ballistic missile project, two-thirds of which is supported with US funding, continues into its fourth development phase. Intercept testing for the Arrow 2 missile has begun. The first Arrow units began to deploy in 19989.

- The Rafael Moab UAV forms part of the Israeli Boost-phase Intercept System. This is intended to engage TBMs soon after launch, using weapons fired from a UAV. Moab would launch an improved Rafael Python 4 air-to-air missile. Range is stated as 80-100km depending on altitude of release.

- A ministerial level Policy Advisory Group (PAG) was established in April 1996 within the Israeli Ministry of Defense and US Department of Defense to facilitate US-Israeli cooperation at the highest levels. The end result is that Israel is developing both a national missile defense and a high degree of interoperable capability with the US. The US and Israel are seeking to make the Arrow fully interoperable with US TMD systems by 2001. This effort will use the Link-16 secure data exchange system and the US Joint Tactical Information Distribution System (JTIDS). At the same time, Israel and the US are developing combined standard operating procedures for theater missile defense interoperability and will conduct joint simulations and exercises. The US is also providing technical support to Israel in its development of improved versions of the Arrow, related sensors and BM/C\textsuperscript{4}I, its use of US satellite-based warning and point of impact data, and its development of a UAV for boost-phase intercept purposes.

- The coverage provided by the Patriots and Arrows could be supplemented in the near to mid-term with US Navy Aegis ship-borne defenses which will be interoperable with US and Israeli-operated Patriots. The PAC-3 is now scheduled to complete development around 2003. No deployment date for possible support of Israel is yet fixed.

- Israel will benefit from US development of the land-based THAAD (Theater High Altitude Area Defense) and sea-based AEGIS upper-tier, wide area theater ballistic missile defense systems. These will provide wider area coverage than the Arrow, and high endo and exoatmospheric engagement capability. The US sea-based system will be capable of ascent, midcourse, and exo-descent phase intercepts. These systems are currently scheduled to complete development around FY2007. Any deployment would probably take place after 2008. Israel might also benefit from the USAF airborne laser development program, which might provide an additional layer of boost phase intercept capability.

- Israeli early warning and defenses would benefit from US national missile defense activities, particularly...
from improved battle management and C$^3$ systems, and from the deployment of improved satellite detection systems on the space-based infrared system which will have both high and low orbit components. These systems will significantly improve plume detection, impact point estimates, and course to intercept detection and prediction. It might benefit from successful development and deployment of the ground-based interceptor endoatmospheric kill vehicle.

**Conclusions and Recommended Program**

Proliferation poses a broad range of threats to the US homeland, to our allies, and coalition partners. The proliferation of long-range missiles armed with weapons of mass destruction is one of these threats. It has become obvious that nations such as Iran and North Korea may be acquiring the capability to build such missiles and the ability to arm them with nuclear or highly lethal biological weapons. While such threats are now only potential ones, these shifts in technological and manufacturing capability mean that nations like Iran and North Korea may be able to pose serious threats to the American homeland, possibly as early as during the next few years. Such threats may create a near to mid-term need for national missile defense (NMD).

There is an even greater chance that longer-term threats to the US homeland will emerge that are far more serious than the near-term threats that could be posed by nations like Iran and North Korea. Advances in missile, biotechnology, and the spread of related manufacturing capabilities could give a number of nations the capability to develop missiles that can reach American territory that are armed with warheads capable of causing massive casualties. Even if no near to mid-term missile threats is deployed by proliferating countries, the US may well need to develop a more robust and capable NMD system to deal with such longer-term threats.

At the same time, the missile threats from proliferating countries remain *potential* threats. They are only part of the spectrum of military threats the US must deal with. The primary missile threat to the US will continue to come from the existing forces of Russia and China, not from new proliferators like Iran, Iraq, and North Korea. The decision to deploy an NMD program cannot be decoupled from its potential impact in provoking changes in the very real threats the US already faces from Russia and China and in creating major problems for arms control.
As a result, the US faces a mix of uncertain threats and practical deployment problems that confronts the US with a major practical dilemma. On the one hand, the US will take risks if it waits to develop NMD until a threat has definitively materialized as a deployed force. On the other hand, a threat-driven approach to deployment could compromise or prevent the deployment of a truly capable system and commit the US to a partially capable or failed approach to NMD.

There are additional problems with delaying deployment because simply going on to complete a development program may well not be an adequate substitute for limited deployment. As the previous analysis has discussed, some of the worst risks inherent in early deployment of an NMD system lie in the need to deploy such a system before full systems integration can be tested, and limited intercept tests and evaluations can be expanded to deal with the massive analytic uncertainties imposed by the “law of large numbers” – the fact that engineering tests based on limited technical samples almost invariably do not provide a meaningful test of the effectiveness of complex full-scale systems.

**Deploying a National Missile Defense System and the “Delicate Balance of Deterrence”**

Other issues compound the problems for US decision-making. First, there are many other ways that an attacker can strike at the American homeland. The currently contemplated national missile defense is only effective against systems with intercontinental ranges. It provides little or no defense against shorter range, sea-launched ballistic missiles, cruise missiles, or bombers. It provides no defense against chemical, biological, radiological, or nuclear (CBRN) weapons smuggled into the US or assembled on its soil. It provides no defense against attacks using new technologies like cyberwarfare.

The primary threats that proliferation poses to the US do not originate from peer competitors or nations that oppose the US per se. They are outgrowths of theater and regional-level conflicts and tensions, primarily in the Gulf, Middle East, Koreas, and Taiwan Straits. National missile defense cannot defend America’s allies, except to the degree it helps ensure that the US cannot be threatened or blackmailed by the risk of attacks on its soil. It cannot defend
allied territory, or the sources of America’s key imports and the security of a global economy. National missile defense that is decoupled from theater defense can only defend the American homeland in the narrowest physical sense. It cannot defend the homeland in terms of its economy or American strategic interests.

The currently contemplated national missile defense system also presents major problems in terms of Russia and China. It will have little intercept capability against an accidental or limited launch of the more sophisticated Russian missile systems, whose penetration aids might well defeat the US interceptors. It is not designed to deal with any substantial attack by missile forces as large as those of Russia, and could not deal with a major Chinese build-up of its new ICBMs. Current NMD options cannot provide a shield that can protect the US in ways that are a substitute for strong offensive retaliatory forces, arms control efforts to limit and reduce the Russian and Chinese threat, or efforts to negotiate a solution to regional tensions.

Deploying an NMD system could simply “squeeze the balloon” in the sense it pushes hostile states and movements to use other forms of attack, many of which are cheaper than missile attacks, harder to attribute and retaliate against, and at least as lethal. Unless NMD is part of a fully balance homeland defense program, it may well do no good and might do more harm than good. Even if it is part of such a program, it could simply increase the threat to our allies, and overseas interests, limit progress in arms control, and create new regional tensions. In this sense, the largely bipolar “delicate balance of terror” that shape the Cold War has been replaced by a multipolar “delicate balance of deterrence” that requires far more sophisticated US policies and approaches to homeland defense.

Reconsidering the Programming Options for Deploying a National Missile Defense System and the “Delicate Balance of Deterrence”

The US is now reaping the costs of politicizing its NMD program. President Clinton has deferred any decision on deploying the first part of an NMD system and left it to his successor. This decisions reflects problems in the development and test program, in negotiating an approach
to arms control that will allow the US to deploy NMD without weakening its arms control options, and questions about the capability of the particular systems architecture to which the US has been committed.

In theory, the US has been legally required to deploy an NMD system providing national coverage by 2005. In practice, the US has been rushing forward with a one-site system to provide very limited national coverage against an attack coming from North Korea. In doing so, it has adopted an inadequate and under funded development program, and test and evaluation methods that cannot objectively determine success even if all of the present milestones are met. The creation of a more adequate two-site system, supported by space-based sensors could not be deployed until well after 2010, and that system would have serious limitations and involve significant risks if it had to be scaled up to deal with more sophisticated threats and penetration aids.

The US must now find the proper balance between the value of deploying an NMD system and not deploying one. At the same time, it must now address many of the issues it has failed to address in moving ahead with a compromised and politicized system that is more a reflection of domestic political battles rather than valid strategic requirements. There is no simple and decisive answer to the question of whether the US needs to deploy an NMD system to meet its Homeland defense needs. An analysis of the particular missile threats the present system is designed to deal with, however, raises serious questions in a number of vital areas. These include:

- Just how serious the threat from “rogue states” really is.
- The impact of deploying an NMD system will have on arms control, START and the ABM Treaty.
- The impact deployment will have on the future size of the Russian and Chinese nuclear threats.
- The impact on other threats to the US homeland like air breathers, cruise missiles, covert and terrorist CBRN attacks, and cyber attacks, and the cost and feasibility of creating a cohesive and integrated approach to homeland defense.
- The need, cost, and feasibility of a cohesive approach to missile and CBRN defense that includes protection of our allies and strategic interests overseas.

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• The risks inherent in the present schedule, test and evaluation program, and cost estimates shaping the US NMD program, and,

• Whether the current configuration of the NMD system really meets a valid set of homeland defense needs for NMD or some alternative system is needed.

Meeting the Strategic and Technical Requirements for Deploying a National Missile Defense System

These questions cannot be fully resolved on the basis of the information now available, and there is no certain or single “right” set of answers to any of the major the issues and uncertainties raised in this analysis. However, the evidence that is publicly available supports the following conclusions:

• There is no evidence of an existing threat from nations like Iran and North Korea to justify the deployment of a full-scale US National Missile Defense system, and there is no certainty that any mix of states will deploy such a threat in the future. At the same time, there is evidence of a potential threat. It is also clear that the US cannot count on warning of the deployment of missile threats from these countries, or on the ability to characterize whether such missiles will have the kind of highly lethal biological or nuclear warheads that could make them a serious threat to the American homeland.

• NMD is not a substitute for strong offensive US capabilities, the ability to carry out massive retaliation against a state or entity that uses weapons of mass destruction using any form of delivery, and ultimately for nuclear retaliatory capabilities. Any nation willing to risk a ballistic missile attack on the US is almost certain to be willing to risk attacks of virtually any kind on both the US and its allies. Missile defenses do not punish hostile regimes or destroy hostile forces. They do not approach the kind of existential ambiguity that mere US possession of a vastly superior nuclear delivery capability creates in the mind of any regime willing to use weapons of mass destruction against the US. If there is a real risk that weapons of mass destruction will be used against the US or its allies in any form, efforts to seek a “zero option” in terms of US nuclear forces are more likely to destabilize a crisis, and lead to the use of weapons of mass destruction, than prevent it. This will be true regardless of whether the US deploys an NMD system.

• No form of NMD system can, by itself, credibly protect the US against rogue threats. The cost to potential attackers of defeating or vitiating an NMD system by using shorter-range systems, covert attacks, and terrorist/proxy attacks is simply too low. In some ways, creating a ballistic missile threat to the American homeland is one of the least attractive ways to wage asymmetric warfare against the US. At the same time, the US may have no other choice than to both deploy NMD and improve its defensive and retaliatory capabilities to deal with all other means of asymmetric warfare.

• Effective defense of the American homeland requires the US to take a wide range of steps, of which NMD is only one. Diplomacy, regional counterproliferation capabilities, missile defenses, and coalitions to contain rogue states offer tools that are at least as important as NMD systems in dealing with rogue threats. In fact, the inherent limitations of NMD may make it one of the least cost-effective ways of dealing with such threats unless it is clearly linked to a comprehensive approach to dealing with proliferation that gives at least equal priority to other forms of defense.

• The deployment of NMD cannot be decoupled from some clear security concept of how to provide similar
defenses for American forces deployed overseas and for our key allies and coalition partners. They already face direct threats in the Asia, the Gulf, and the Middle East. If the US deploys convincing missile defenses it may well drive attackers to strike at America’s friends and allies as a means of obtaining strategic leverage, and “theater defense” for the US is “homeland defense” for its allies.

- The study of missile threats cannot be credibly decoupled from the broader threats posed by existing nuclear powers and by other forms of proliferation in justifying an NMD program. Both the broad cost-effectiveness of any aspect of Homeland defense, and the cost of an enemy to defeating a given US capability by shifting resources to other threats, needs explicit analysis.

- There is a strong case to be made for linking the deployment of any NMD system to the successful renegotiation of START and the ABM Treaty and/or the development of suitable confidence measures to make Russia confident that the US will not develop or deploy a “break out” capability that would create the kind of NMD system that could limit Russia’s ability to strike the US. Unlike the potential threat from nations like Iran and North Korea, the nuclear and missile threat from Russia remains tangible and massive. While the risk of any such Russian attack seems minimal, so does the risk of direct attack by so-called rogue states, and the alienation of Russia poses a wide range of other threats to US security interests.

- China presents similar problems, but is a different kind of threat. There is a clear need to reevaluate the potential threat posed by China, and to consider what kind of negotiation – if any – could limit the growth of the Chinese threat so that the deployment of NMD did not result in a net increase in the Chinese threat to the US.

- At the same time, it is nations like Russia and China whose technology transfers have created the possibility of a major threat from rogue states, and the US cannot afford to be paralyzed by the terms of the ABM Treaty or the risk that Russia will maintain higher force levels than are called for under the terms of START II and START III.

**Politicizing NMD Into Failure**

These strategic issues interact with serious technical problems in the presently contemplated US NMD system. The one-site system the US could deploy between now and 2007 is far more the result of a long series of historical compromises made for partisan political reasons than a system designed to meet national needs.

Some of the strongest political advocates of the current NMD system are its worst enemies in practice. For ideological reasons, they deny the need for a complex, expensive, time-consuming, and comprehensive test program. They deny the technical and cost risks involved. They deny the need to assess possible countermeasures in far more depth, and the trade-offs that funding such a system may force in reducing other US and allied defense capabilities. They also call for a potential effort to rush into the deployment of such a system, an action which could prevent effective negotiations with our European allies and Russia, intensify relations with China,
block the renegotiations efforts of present arms control agreements, and stimulate a new arms race.

The irony surrounding such an approach to national missile defense is that those who feel that ideology and policy can overcome the laws of physics, the realities of engineering, and the need for a balanced approach to national security may ultimately do as much to block the real-world deployment of an effective program as those who believe that ideology and policy call for every possible effort to deny that an effective system is possible or can be deployed in ways that reduce the threat to the US homeland.

More than that, they also are limiting consideration of alternative or supplemental programs like boost-phase defense, and sea, air, and space-based options. The US has largely ceased to debate the need for effective defense against limited and accidental launches by nations as sophisticated as Russia. It is dodging the need to come to grips with the potential threat posed by China. It is segmenting the national debate over homeland defense in ways that mean the need for NMD is kept separate from the need for other forms of missile and airbreather defense, and defense against covert and terrorist CBRN attacks and cyber attacks.

A Risk Prone Test and Evaluation Program

The resulting compromises have limited the capabilities of the present NMD system, have forced the creation of a development and deployment schedule with a high element of risk, and have politicized the test and evaluation schedule. The current US NMD program is not the proper course of action for deploying even the present NMD system. The technical risks are unacceptably high and this had been made clear by the most senior technical exports in the Department of Defense.

No result of the current limited NMD test program could produce fully credible results in terms of program effectiveness. This test and evaluation program is too limited in scope, and there are no precedents for the successful deployment of such a complex combat system without years of practical experience and modification based on the field trials of an operational system.
Learning from deployment is almost certainly the only way to evolve an effective system.

Put differently, the present deployment program seems to be based on the technical myth that a test and evaluation methodology can substitute for the actual deployment of a test-bed system that puts all of the required capabilities into the field, and which involves the necessary changes and modifications needed to ensure a truly combat-capable system.

**Deferral is the Right Decision, but It is Far From an Adequate Approach**

President Clinton’s decision on September 1, 2000 to defer the award of contracts to begin building a new high-powered radar in the Aleutian Islands as an initial step towards deployment of the present NMD system is a wise one. This is true even though it means leaving deployment decisions to the project into the next presidency, and delaying initial deployment to at least 2006 or 2007, rather than 2005. It seems equally wise to postpone the next test of a national missile defense system until at least January, 2001. There is no reason to force the pace of the test program and good reason to delay it and restructure it.

Simply delaying the present program, however, is neither effective leadership or an answer to the strategic and technical issues that now surround the NMD program. Far more serious changes are needed to address *all* of the following critical problems:

- Failure to integrate theater and homeland offensive/defense issues.
- Failure to honestly examine the “balloon effect”: forcing attackers to use other methods, and strike at US allies or external vulnerabilities like oil and Asian trade.
- Rushing forward with half-defined interim single-site system with SIBRS without any clear picture of ultimate system requirements and costs.
- Deployment schedule makes effective test and evaluation impossible. Costing and effectiveness models are badly politicized.
- Freezing on current system in purely homeland context means ignoring boost-phase and theater-homeland options.
- Lack of Net Technical Assessment and realistic evaluation of cost to defeat proposed programs and solutions.
• Failure to explicitly consider offensive and retaliatory options.

The Minimum Step: Shifting to a Success-Driven Approach

At a minimum, the next Administration should restructure the current NMD program to focus on a success-oriented, rather than schedule-driven program. The technology proposed for the present US NMD system still involves major risks and systems integration problems. These risks tend to be understated by those advocating an NMD system, and overstated by those who oppose one. However, the methods BMDO has so far publicly proposed for risk analysis and test and evaluation simply raise too many critical questions.

Over-reliance on a limited number of tests at an accelerated schedule makes it seem very doubtful that the current number of tests can at best do more than provide technical proof of concept. An uncertain proof of concept is not adequate for an NMD system that is so complex that an accurate picture of its cost and effectiveness cannot be counted on through such methods.

This argues strongly for shifting from reliance on any kind of limited test, evaluation program, and for a shift to a full scale, “test bed” approach. It seems likely that the full-scale field trial of a working US NMD system with at least one interceptor site will prove to be the only way in which the US can evolve the level of real-world NMD capabilities it needs. A shift to such a “test bed system” that evolves according to a success-driven schedule would give the US a high probability that the end result will be a successful field-proven development platform. It is also the kind of approach that will enable the US to deal with the currently contemplated threat, and to rapidly scale up its NMD capabilities if serious new threats materialize.
The Leadership and Program the Nation Needs

Creating a truly effective program, however, means going far beyond simply adjusting the present program to use a most realistic schedule and approach to testing evaluation. What is needed is action that goes far beyond simply deferring the present program. The next Administration should take the following steps to shape the kind of National Missile Defense system necessary to be an effective component of a Homeland defense program:

- Reshape the test and deployment schedule of its initial NMD system, and the budget and program, to ensure a fully successful program development over a longer period of time, rather than attempt to rush forward in response to an exaggerated view of the threat.
- Greatly expand the test and evaluation effort of the program to ensure success,
- Require a full-scale Net Technical Assessment, including a realistic evaluation of the cost to defeat proposed NMD programs options.
- Fully examine the decoy and countermeasure issue, and adopt a more demanding and sophisticated test program.
- Maintain the research and development program necessary to ensure that the US can deploy a much more sophisticated NMD system over time if a more sophisticated threat should materialize in the period beyond 2010.
- Keep the commitment to the present NMD architecture flexible. Continuously examine credible boost phase options, and particularly the use of airborne and sea-based forward intercept systems.
- Adequately fund the development and deployment program on a less driven by actual success or kill it. Don’t “nickel and dime” it, or try to force the pace, in ways that ensure failure.
- Give the decisions affecting each stage of NMD deployment the transparency that the American people and Congress need, and which can shape an informed and less partisan debate. Clearly define the different phases of the NMD system, their architecture, their cost, and the estimated effectiveness of each phase in dealing with potential threats. Develop an annual report on the evolution of this plan, with a supporting net assessment defining the threat and the capability of the proposed system relative to proposed countermeasures. Make it clear that national coverage does not mean true national coverage with uniform probability of intercept and show the actual differences in coverage by area.
- Tie the schedule, deployment, and architecture of the US NMD system to the changing nature of the threat. Do not assume that the US can have precise intelligence and strategic warning on the deployment of missile threats, or identify potential threat states years in advance. Evolve a program that can react to real-world uncertainties regarding strategic warning and real-world deployment lead-times. At the same time, do not demonize currently hostile states, or ignore progress in moderating the threat they pose to the US.
- Explicitly examine the trade-offs between expenditures on NMD and other aspects of US military capabilities such as offensive capabilities and conventional power projection. NMD is not a religion. It has
no more inherent value than other aspects of US military strength, and any argument for NMD must be explicitly justified in terms of its advantages and disadvantages relative to other uses of the defense budget.

- Carry out a “zero-based” review of the trade-offs between the present NMD system and boost-phase, sea-based, and airborne laser defense systems. Provide a rolling analysis of all of the RDT&E and deployment options available to creating an effective NMD system, rather than optimize rigidly around the current architecture.

- Give equal priority to other threats against the American homeland such as shorter-range delivery systems, air breathers, and covert or terrorist attacks using weapons of mass destruction. There is no worse solution to the threat posed by asymmetric weapons and mass destruction than to focus on NMD, and one threat such as nuclear weapons, in the face of so many alternative methods of attack and advances in other areas such as biological weapons.

- Honestly examine the “Balloon Effect”: Forcing attacker to use other methods, strike at US Allies. Consider External Vulnerabilities: Oil and Asian trade. Look beyond NMD to NMD/TMD.

- NMD can never be a cost-effective form of homeland defense without adequate CBRN and cyberdefense.

- Fully evaluate the overall threat that all forms of missiles, weapons of mass destruction, and asymmetric warfare pose to the allies and friends of the US. Recognize the fact that missile threats to the US are now largely theater-driven and that the US cannot deploy a national missile defense and leave its allies without such defenses. without making them the potential targets of intimidation and retaliation. Make theater missile defenses, defenses, US offensive capabilities, and “extended deterrence” part of an integrated approach to revising US strategy and force plans.

- Examine scalable ABM Treaty compliant options as well. Sea-based, airborne, and wide area land-based TMD defenses are critical.

- Link NMD to a clearly defined Theater Missile Defense system and plan that shows the interaction between the deployment of NMD and TMD, the political impacts, costs, and shifts in theater capabilities. Examine the related costs in terms of improving theater air and cruise missile defense. The isolation of NMD and TMD planning makes no sense in a world where conflicts and threats are theater-driven, tangible missile threats already exist at the theater level, and the decoupling of NMD and TMD architectures has only limited real-world war fighting capability.

- Give equal priority to the development of clearly superior offensive and retaliatory capabilities to ensure a high level of deterrence and carry out massive retaliation. Preserve a nuclear option and develop new approaches to extended deterrence.

- Re-evaluate the threat and include Russia and China, arms control risks: Examine the threat in terms of both deployment and non-deployment, and impact of deployment on pushing threats to use other forms of attack.

- Conduct a “zero-based” look at the interaction between missile defense and arms control. Examine missile defense as a partner to arms control

- Continue to seek to modify the barriers that current arms control agreements pose to the deployment of NMD without abandoning the search for arms control and improved relations with potential threat states. NMD is not a substitute for arms control and negotiation.
• Shape deployment of the initial components of NMD as a “test bed” system in ways that minimize the impact on US arms control efforts and stimulating higher levels of threat from Russia and China than would otherwise be the case.

Some of these criteria set competing goals, and all involve a high degree of uncertainty and the need for a flexible and evolutionary US approach. It should be clear that the program that makes sense today may require major changes to respond to events over a period as short as the next two to three years, and there is little room for ideology as distinguished from pragmatism. There is an equal need to accept the full complexity of the issues and uncertainties involved.

The exact nature of any time schedule and cost estimate for a revised NMD system that grew out of such a review and reduced the risks in the present system to more acceptable levels is speculative. Regardless of how the system is changed, however, the US must be prepared for much higher life-cycle costs. The data so far made public on the estimated costs of an NMD system indicate that a properly structured program is likely to cost at least 50% more than BMDO currently estimates. Such cost escalation is typical of the history of programs that are at the current level of sophistication of the NMD program. It could cost anywhere from two to six times the currently estimated cost over the next 10 years, with the high side of this cost escalation tied to the need to deploy a much larger and more sophisticated system than the US now contemplates.

This could delay deploying any components of the initial NMD system several years, although any assessment of the precise details of such a system must follow a major program review and would require a comprehensive redesign of the program schedule by the Ballistic Missile Defense Organization (BMDO). Even so, it is still possible that a suitable test bed system could evolve quickly enough to deploy some elements of a combat effective system with advanced features like the Space-Based Infrared System (SBIRS) by 2010-2012.

No Deployment Option Can Make Some Level of Strategic Competition Go Away

Regardless of the technical solution the US decides upon, major strategic and political problems will continue to exist. The problem in dealing with Russia, China, and our allies will...
remain serious. Every negotiating effort will need to be made to limit the potential backlash in
terms of the impact of a US deployment on Russian and Chinese behavior, arms control, and our
allies to “acceptable” levels. The US should not commit itself to NMD blindly and without
regard to the evolution of the threat and progress in arms control.

At the same time, the various cases for and against the near-term deployment of an NMD
system have closely balanced merit. The US cannot allow a rigid adherence to the ABM Treaty
to paralyze its efforts to serve its own vital national security interests. The pivotal argument for
moving forward NMD may well prove to be the lack of warning and reaction time in reacting to
potential threats if hostile states continue to develop new forces of intercontinental missiles. The
US cannot wait to develop an NMD system until such a threat can be proven to exist and then
suddenly deploy a suitable defense.

Some negative consequences may have to be accepted if the US is to make any progress
in Homeland defense. There is no practical prospect that any US deployment of any form of
NMD system can totally eliminate the risk that such deployment will lead to higher levels of a
Russian and Chinese threat, or some political costs. The US must be equally prepared for the
prospect that the successful deployment of an NMD system will lead hostile states to adapt by
developing improved capabilities to use covert, short range, and proxy methods of attacking the
American homeland or stepping up their capabilities to attack America’s friends and allies as a
substitute for attacking the US.

Put bluntly, NMD is probably purposeless unless it is linked to a steadily strengthened
global counterproliferation strategy, an integrated approach to homeland defense, and the
ongoing search to balance NMD against both arms control programs and US efforts to improve
its offensive and retaliatory options. Sometimes policy really does have to be complex to be
effective!
1 This text is taken from the White House press release of January 5, 2000.
2 Secretary of Defense William S. Cohen, DoD News Briefing, Wednesday, January 20, 1999 - 11 a.m. (EST) [Also participating in the briefing was Gen. Henry H. Shelton, chairman of the Joint Chiefs of Staff]
4 There are extensive working materials in “Appendix III: Unclassified Working Papers, Report of the Commission to Assess the Ballistic Missile Threat to the United States,” Washington, Commission to Assess the Ballistic Missile Threat to the United States, July 15, 1998. These papers are often of very high quality but they are strictly unclassified studies by experts outside government and do not reflect any aspect of the Commission’s access to US intelligence and classified technical expertise. See http://www.access.gpo.gov/su_docs/newnote.html.
5 They do describe the Russian and Chinese threat in broad terms, and touch on the general nature of the threat posed by short-range ballistic missiles and cruise missiles without discussing them by country. See ftp://fedbbs.access.gpo.gov/gpo_bbs/cia/bmt.htm, p. 11.
18 For an example of such hard-line commentary, see Aleksei Likovoid, “The UN Demands Preservation of the Anti-Ballistic Missile Defense Treaty, Nezavisimaya Gazeta, December 15, 1999, p. 16.
24 The full text of each document is available on the Internet at http://www.bullatomsci.org/issues/2000/mj00/mj00schwartz.html
27 See The full text of each document is available on the Internet at http://www.bullatomsci.org/issues/2000/mj00/mj00schwartz.html.

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29 The document refers to SHF radars, which are often referred to as X-band radars in discussions of the NMD system. SHF stands for “super high frequency” and is the frequency band 3 to 30 gigahertz. This includes the X-band (8-12 gigahertz).


31 Novye Izvestia, April 29, 2000; Associated Press April 29, 2000, 1037.


41 Washington Post, July 6, 2000; Page A14.

42 Associated Press, July 8, 2000, 1459.


44 Associate Press, July 18, 2000, 0644.

45 Reuters, July 18, 2000, 0604.


55 For example, see the views of Ambassador Yuri Nazarkin, Andrei Pointkovsky, and Vitaly Tsygichko “The Anti-Ballistic Missile Defense System is not Holy Writ, Segodnya, November 18, 1999, p. 4 as quoted in Defense and Security, November 22, 1999.


Reuters, July 8, 2000, 0634.


Associated Press, July 18, 2000, 0644.

Reuters, July 18, 2000, 0604.

Associate Press, July 18, 2000, 0733.

Washington Post Foreign Service, July 14, 2000; Page A01


Adapted from nuclear note book, Chinese Nuclear forces 2000, prepared by Robert S.Norris and William M Arkin of the Natural Resources Defense Council (NRDC).

Adapted from work by Shirley A. Kan in China: Ballistic and Cruise Missiles, Congressional Research Service, CRS 97-391 F, September 28, 199

Deployed since 1980. Response time of 2.5 hours, strap-down inertial guidance. Stored in caves and mountainside tunnels.

Deployed since 1981, most targeted on the US. Gyroplatform inertial guidance with on-board computer and storable liquid fuel. Deployed in hardened underground silos. Normally kept unfueled and without warheads

Possible MIRVing capability. Booster tested in 1998.

Supposedly road, rail, river mobile.

Deployed since 1971, strap-down inertial guidance. Reaction time 110 minutes. China sold 36 to Saudi Arabia.

Same fuel and guidance as JL-1. Automatic command-control-firing system from TEL. Reports of terminal guidance, possible radar. May be a DF-21A.First regiment deployed in 1985.

Land mobile for truck transfer from semi-hardened sites to launch sites. No reports of test firings. One report that development has been abandoned

To be deployed on new 094 SSBN with 16 tubes each. First SSBN that could target US from waters near China.

Launch from mobile TEL with preparation time of 30 minutes. Strap-down inertial guidance with on-board computer with terminal velocity correction. May be seeking GPS guidance. Four fired in Taiwan crisis in 1995. Three landed in general target area, one crashed prematurely. Four more fired in Taiwan crisis in 1996. Four landed in general target area. Some reported indicate that 20-30 more had been prepared for firing.

US imposed sanctions on China and Pakistan because this system was sold to China.

Unconfirmed reports that Iran has acquired this missile technology.


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For further details, see Review of United States Policy Toward North Korea: Findings and Recommendations, Unclassified Report by Dr. William J. Perry, U.S. North Korea Policy Coordinator and Special Advisor to the President and the Secretary of State, Washington, DC, October 12, 1999; and Testimony Before the Senate Foreign Relations Committee, Subcommittee on East Asian and Pacific Affairs, Washington, DC, October 12, 1999.


For further details, see Review of United States Policy Toward North Korea: Findings and Recommendations, Unclassified Report by Dr. William J. Perry, U.S. North Korea Policy Coordinator and Special Advisor to the President and the Secretary of State, Washington, DC, October 12, 1999; and Testimony Before the Senate Foreign Relations Committee, Subcommittee on East Asian and Pacific Affairs, Washington, DC, October 12, 1999.


The U.S. Department of State, “U.S.-D.P.R.K. Conclude Three Days of Missile Talks,”

Press Statement, November 3, 2000


Associated Press, July 12, 2000, 0433 and 2334.

Reuters, July 17, 2000, 1510.


Associated Press, July 22, 2000, 0823.


Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.


Reuters, July 16, 2000, 0826.

Reuters, July 17, 2000, 1257.

Reuters, July 15, 2000, 2158.

Reuters, July 18, 2000, 0634.


Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.

Associated Press, July 15, 2000, 0935; Reuters, July 15, 2000, 0714.

Reuters, July 17, 2000, 1257.

Reuters, July 15, 2000, 2158.


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159 White House Briefing Room, text of President Clinton’s speech, September 2, 2000.
160 This history is based on material provided by BMDO.
177 THE WHITE HOUSE

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NMD flight tests use a target warhead, currently launched from Vandenberg Air Force Base in California, and an interceptor launched from Kwajalein Missile Range in the Marshall Islands in the Pacific. The flight paths of both the target and the interceptor have been chosen so that the two are in the downward portions of their trajectories during the intercept, which prevents debris from an impact from being thrown into outer space and possibly damaging satellites in orbit. Those conditions, however, are considerably different from what an actual engagement might look like.


Internet record of the Full Committee hearing on U.S. national missile defense policy and the Anti-Ballistic Missile Treaty, October 13, 1999.


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Based on the Department of Defense release of the executive summary of the report on June 20, 2000.


214 DoD press release, Number 393-00, July 8, 2000.

215 DoD News Briefing, July 8, 2000 - 1:37 a.m. EDT.


217 The following analysis is drawn entirely from the material provided in Bradley Graham, “Countdown to Collision.” Washington Post, December 10, 2000, Internet edition.


230 DoD News Briefing, July 7, 2000


237 Reuters, July 26, 2000, 18:10

238 Reuters, July 26, 2000, 18:10

239 Associated Press, July 26, 2000, 1604.


253 Associated Press, July 20, 2000, 0342.


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257 White House Briefing Room, text of President Clinton’s speech, September 2, 2000.
262 Jane’s Defense Weekly, July 10, 1996, p. 3
264 Lennox, Duncan and David Eshel, “Israeli high-energy laser project may face more delays,” Jane’s Defense Weekly, April 7, 1999, p. 21.
269 Ibid.
272 Jane’s Defense Weekly, May 17, 1999, p. 3
279 Ibid.


293 Much of this assessment is based on work provided by the Ballistic Missile Defense Office of the US Department of Defense in February, 1999.

