Countermeasures to the Proposed US National Missile Defense System

Recommended Citation

So if US policymakers would be deterring from intervening without an NMD system, they should be deterred with an NMD system of unknown effectiveness. The Pentagon apparently understands was used.

North Korean missiles down. But in reality, even if the NMD system were highly effective, US policy makers would not know, with high confidence, how effective the system would be before it was tested against the countermeasures we discuss -- through analysis and through intercept tests -- to be effective against the types of offensive countermeasures that an attacker could reasonably be expected to deploy with the NMD system.

The planned NMD system should then be tested against the countermeasures the Red Team determines would be available to potential attackers. As the American Physical Society, the Technical Evaluation of the Operational Effectiveness Will the NMD system that the United States is developing work against the threat it is intended to defend against? Against the United States government, the approach we recommend is to test emerging missile states that might undertake a ballistic missile program and the effectiveness of the NMD system in the face of the countermeasures used by them. The NMD system would depend in large part on the “countermeasures” that an attacker could take to counter the defense by confusing or overwhelming it. In his September announcement he that would not authorize deployment of a national missile defense, President Clinton correctly stated that there remain questions to be resolved about the ability of the system to deal with countermeasures.

It is the task of the US Defense Intelligence Agency to define the characteristics of the threat that a US weapons system under development must contend with, and this threat definition is usually based on satellite scanning of their intelligence archives along with the current propulsion programs of emerging missile states.

The July 1998 Report of the Rumsfeld Commission to Assess the Ballistic Missile Threat to the United States (more commonly known as the Rumsfeld Commission, after its chair Donald Rumsfeld) called attention to four important threat analysis. First, the report noted that the absence of evidence is not evidence of absence—that is, the failure of the US intelligence community to observe something does not necessarily mean that the threat it is not taking place. Second, given the possibility of non-observable development activities, a threat analysis must assess what weapons a country can be capable of developing, given its technical sophistication.

A panel of eleven independent physicists and engineers, of which I was a member, applied this methodology to understanding what countermeasures might be available to a country able to develop a ballistic missile. To do this, we assumed that countermeasure capabilities would be the same or better than the benchmarks we had developed. We concluded that NMD scientists with considerable experience on ballistic missile defense and countermeasures issues, produced a detailed report—Countermeasures: A Technical Evaluation of the Operational Effectiveness Will the NMD System Be Effective? The first publicly available document to discuss countermeasures that might be available to emerging missile states was the September 1999 National Intelligence Estimate on the Ballistic Missile Threat to the United States, which is a compendium of the US intelligence agencies. This document noted that such states could use “readily available” technology to develop countermeasures and could do so “by the time they flight test their missiles.”

Our study took the next step; we considered in detail the types of countermeasures that would be available and then assessed how effective the planned US NMD system would be against such countermeasures. Such a detailed analysis is possible because the United States is now so close to potential deployment that it has selected the specific interceptor and sensor technologies that the NMD system would use. In summary: The NMD system has all of the sensors and interceptors planned for the full system that would be deployed by 2010 or later. This is the system the Pentagon says will be effective against missile threats using “complex” countermeasures. We made generous assumptions about the capabilities of the defense; we assume that the individual components work properly; we assume that the tanks contain the weapons and that the bazookas are effective.

We assume that the attacker can make a long-range missile and a nuclear or biological weapon to arm it with, and therefore possesses the technology and the scientific and engineering expertise required to make both. Finally, we assume that the United States is a relatively open society, and any NMD system must go through a multi-year test program in advance of its deployment. The attacker will know a great deal about the system.

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We then consider in great detail the various ways that the defense might be able to use its different sensors to tell which balloons contain the warheads—by the radar reflections of the balloons, by observing the heat emissions of the warheads, for example. We conclude that an attacker could readily make such detectors effective by changing the characteristics of the warheads or the other sensors that could be used to detect their presence.

The Defense would need to shoot at all the balloons to prevent the warheads from getting through, and an attacker could deploy enough balloons that the defense could not shoot at all of them.

The third countermeasure is a “cooled shroud,” in which an attacker covers its nuclear warheads with a double-walled cone containing liquid nitrogen. The very cold liquid nitrogen would greatly reduce the external heat emissions from the warhead. The X-band radars could see such cold warheads and in the early part of intercept. But the cooled shroud would prevent the kill vehicle from homing on the warhead: the kill vehicle’s infrared sensors could not detect the warhead in enough time to maneuver to thelocation of the warhead in time to hit it. The attacker could deploy enough cooled shrouds would simply overwhelm the planned NMD system. Our study considered how the attacker could disperse the submunitions and shield them from heating during reentry, and found that doing so would be difficult to deliver a nuclear or biological weapon via long-range missiles. An attacker using nuclear weapons could use anti-satellite decoys. In this case the decoys are not made to look exactly like a specific warhead, but the decoys are designed to mislead attacking interceptors. Above the atmosphere, there is no air resistance and lightweight objects travel on the attacker’s trajectory as heavy objects. In the case we consider, assume the attacker puts its nuclear warhead inside a balloon of blown aluminum mylar, and releases it along with dozens of empty balloons. Each of the balloons contain the warheads of a different shape from the others.

The second criticism raises a valid point, but not one that undermines the conclusions of our report. First, as noted above, we considered the full planned NMD system, with all of its sensors and interceptors, and this system worked well for our purposes. We further noted that this concept was “fully conceived,” and not just a concept. It may indeed be possible to modify the planned NMD system to respond to some of the countermeasures we discuss (but not to submunitions, which only a boost-phase system could hope to counter). But the Rumsfeld Commission’s technical evaluation of the BMDO Oversight of BMDO is not independent. The panel, which included BMDO as an observer, was not independent.

Confidence The issue of “effectiveness” (i.e., how well would the system work?) is different from, but related to, the issue of “confidence” (i.e., with what certainty would US military planners and policymakers believe the system would work? An easy way to understand the difference between these two concepts is to consider a coin that was weighed so the heads of tails and was not necessarily 50/50. What are the odds of getting heads? The odds are not known a priori. The only way to determine the odds is through testing—in this case, through repeated coin flips. The degree of confidence the coin flipper has in the odds will be based on the number of times the coin comes up “tails.” The flipper might conclude with some confidence that the odds of getting heads is zero. It is only by flipping the coin many times that the person can have any confidence in the odds of which the odds are of getting heads.

The countermeasures we recommend are designed to demonstrate that the effectiveness of the system can only be determined through testing. And in order to have high confidence in what effectiveness is, many tests are needed. Unlike the coin example, the outcome of an intercept attempt depends on many factors, so even more testing would be needed in order to have high confidence. Our report controls some of these factors. As the time line of the day of the attack and the countermeasures used—complicates the testing even more. Because testing is both expensive and time-consuming, the United States will not conduct enough tests to be able to really assess the system’s effectiveness. The bottom line is that the United States is unlikely to know—with any significant degree of confidence—how effective its NMD system would be if it needed to respond to a real attack.

Not knowing how effective its NMD system was might not be a problem for the United States if it planned to use the system only as a “last measure” if deterrence failed and an emerging missile state attacked. However, note that in the most recent report by William Cohen, argues that the United States should not make a deployment decision unless that system is shown -- through analysis and through intercept tests -- to be effective against the types of offensive countermeasures that an attacker could reasonably be expected to deploy with the NMD system.