

Executive Summary

The ballistic missile defense system that the United States will deploy later this year will have no demonstrated defensive capability and will be ineffective against a real attack by long-range ballistic missiles. The administration's claims that the system will be reliable and highly effective are irresponsible exaggerations. There is no technical justification for deployment of the system, nor are there sound reasons to procure and deploy additional interceptors.

The Missile Defense Agency should halt its deployment of the Block 2004 GMD system, and Congress should require that the system undergo operationally realistic testing before it is deployed.

On December 17, 2002, President Bush announced that he had directed the Secretary of Defense to begin fielding a ground-based missile defense that would achieve initial operational capabilities in 2004. The system is intended to defend the United States initially against attacks by long-range ballistic missiles North Korea might deploy in the future.

The general operating principles and many of the key components of the ground-based midcourse defense (GMD) system are based on technology developed under the Clinton administration's national missile defense (NMD) program. The GMD system will use ground-based interceptor missiles to launch "kill vehicles" that are intended to destroy their targets by colliding with them in the midcourse of their trajectory, outside Earth's atmosphere. The system will use ground- and sea-based radars to track the warheads and other objects released by attacking missiles, and the kill vehicles will use infrared sensors to home on their targets.

The Bush administration plans to deploy its missile defense systems in two-year blocks. The first, Block 2004, covers the years 2004 and 2005. It is the only block for which detailed information on planned deployments is publicly available, although some general information is available for Block 2006 and beyond. This report focuses on the Block 2004 GMD system.

The Missile Defense Agency (MDA) has been planning to make this system operational by September 30, 2004, with an initial deployment of 10 interceptors at Fort Greely, Alaska, and Vandenberg Air Force Base, California. More recently, the MDA has stated that the system could be operational as early as July 2004, when the first interceptor is deployed in its silo, but that only "several" interceptors would be deployed by the end of September. Current plans are to deploy a total of 20 interceptors at these two

sites by the end of 2005, and Congress has already appropriated funds for these interceptors. However, the administration's FY05 budget includes funds to procure and deploy an additional 20 interceptors.

This report analyzes the defensive capabilities of the Block 2004 GMD system as it will initially be deployed and as it is planned to evolve through 2005. To do so, we examine the GMD test program in detail and assess what it has demonstrated about the capability of the system and its individual components. We also analyze the theoretical technical capabilities of the key system components—the radars and the kill vehicle—to determine how they would function in a hypothetical ballistic missile attack by North Korea. We ultimately assess the capability of the defense to defend Hawaii, Alaska, and the west coast of the United States from North Korean attacks. (The administration has stated that the system is also intended to defend against attacks from the Middle East, but this is irrelevant since no nations there could deploy a long-range missile by 2005. Moreover, the radars available to the GMD system are oriented in the wrong direction for attacks coming from the Middle East and look instead toward Russia and China. The MDA has not begun to upgrade the one radar oriented in the right direction, and it is unlikely to be available until the end of Block 2004, if then.)

Although the Pentagon has not publicly issued any detailed assessments of the defensive capability of the system it will deploy, several officials have made statements in congressional testimony indicating that the system will be highly effective. We discuss the assumptions underlying these statements and provide a critique of these assessments. We then discuss the policy implications of the Pentagon overestimating the defensive capability of the deployed GMD system.

We also assess the Defense Department's assertions that the deployment date is "event driven" rather than "schedule driven," i.e., that the date for deploying the system and making it operational depends on events in the development and testing program and not on external factors.

Finally, we recommend changes to the current and future U.S. program to develop defenses against long-range ballistic missiles.

Findings and Recommendations

1. The Block 2004 missile defense will have no demonstrated capability to defend against a real attack since all flight intercept tests have been conducted under highly scripted conditions with the defense given advance information about the attack details.

None of the system components to be deployed as part of the Block 2004 system—including the interceptors and radars—has been flight tested in its deployed configuration. It is possible that the new three-stage interceptor with the deployment version of the kill vehicle will be flight tested once before September, but that test is not scheduled to be an intercept test. According to the MDA, the Cobra Dane radar will be key to the operation of the Block 2004 system, but it will not take part in a flight or intercept test before 2007. Moreover, there will be no system-level flight or intercept test of the defense before its activation in September 2004.

Since 1997, the MDA has conducted 10 flight tests involving prototype or surrogate system components. Eight of these were intercept tests, five of

which resulted in intercepts. All the flight tests have been research and development tests, which provide information for design modifications but do not assess the system's effectiveness under realistic operational conditions. In fact, the intercept tests to date have included many artificialities and limitations, as the MDA acknowledges.

First, the test conditions have not been varied: The test geometries and closing speed and angle have been nearly identical. The tests have occurred at the same time of day, even though the infrared signal of an object in space depends strongly on whether it is in sunlight or in shadow. And in each test the target cluster included the same or similar objects.

Second, the system's ability to discriminate the warhead from other elements in the target cluster has not been realistically tested: The mock warhead and balloons have had very different radar and infrared signatures. More important, the defense was provided with detailed a priori information about the characteristics and expected appearance of all the objects in the test. The radars that will be part of the Block 2004 system will not be able to discriminate warheads from other objects (decoys or debris), so discrimination will rely on the kill vehicle alone. Yet no tests in which the kill vehicle relies on its sensor to discriminate the warhead have been conducted, and none are planned through 2007.

The basic goal of these intercept tests has, according to the MDA, been to demonstrate hit to kill. But hit to kill was first demonstrated more than 20 years ago; the goal here should be to demonstrate hit to kill under conditions relevant to intercepting long-range missiles. These tests have not done so because the endgame conditions have been unrealistic. Since the tests used a prototype two-stage interceptor, the closing speed between the kill vehicle and mock warhead was artificially low by as much as a factor of two. The defense used information from either a GPS receiver or a C-band beacon on the mock warhead to determine its position, and this was used to provide the kill vehicle with very accurate tracking data.

The new Pacific test bed, coupled with the new three-stage interceptor, will allow the MDA to conduct tests under more realistic conditions. However, the test bed alone will not address the lack of realism in flight testing, nor is it needed to address the key realism issues: testing without a priori information, under unscripted conditions, and against realistic countermeasures. The MDA flight test program through September 2007 will not include countermeasures that the Pentagon's director of operational testing and evaluation has identified as simple for the enemy to implement.

In fact, the MDA has no current plans to conduct tests under unscripted conditions, nor is it clear that such operationally realistic testing will ever be conducted.

2. A technical analysis of the Block 2004 GMD system shows there is no basis for believing the system will have any capability to defend against a real attack.

Because the testing program has provided essentially no data about how the system or its components would perform in a real missile attack, this report analyzes the theoretical technical capabilities of the system to assess its defensive capability. Our judgment that the Block 2004 system will be

ineffective against a real attack is based on two factors: the inability of the system to deal with unsophisticated countermeasures and, for attacks against Hawaii, the marginal tracking capability of the available radars.

Countermeasures. Unsophisticated countermeasures that could readily be implemented by countries such as North Korea remain an unsolved problem for midcourse defenses against long-range missiles. This problem has been identified in numerous government documents over the past several years.

Moreover, in 2000, a panel of independent scientists and engineers conducted a detailed technical assessment of the missile defense system under development by the Clinton administration. That system would ultimately have included up to nine X-band radars with very good discrimination capabilities as well as a constellation of satellite-based infrared sensors. The panel found that the fully deployed system would be rendered ineffective by unsophisticated but effective countermeasures.

Unlike the previously proposed system, the Block 2004 system will not include an X-band radar, and the radars available to it are not able to discriminate objects—warheads, balloons, debris—from one another. Nor will there be any satellite-based infrared sensors. Thus, any discrimination of the warhead must be performed by the infrared sensor on the kill vehicle. For this reason, the Block 2004 system will be vulnerable to even simpler countermeasures than those that would have defeated the Clinton system.

For example, by painting their surfaces, balloon decoys can be given the same infrared signature as a bare warhead. There are also several anti-homing countermeasures to prevent the kill vehicle from homing on the warhead. These include leaving the warhead attached to the final missile stage and thus forcing the defense to choose which end of the target to hit; enclosing the warhead in a large balloon so the kill vehicle could not determine its exact location; and tethering several balloons to the warhead at a distance of a few meters. The latter strategy could be especially effective if one or more of the balloons had a higher temperature and greater infrared signal than the warhead.

The MDA has conceded that midcourse countermeasures will present major difficulties for the GMD system, but argues that boost-phase defenses will solve the problem of midcourse countermeasures. But the United States will not have any boost-phase defenses ready for deployment until later this decade, if then.

Radar Tracking Capabilities. To defend Hawaii from North Korean attacks, the Block 2004 system will essentially rely on the Aegis SPY radar. This radar was designed for air defense and, despite various upgrades over the years, its ability to detect and track long-range missiles is quite limited.

Our analysis indicates that the radar would be able to track the warhead only for the first few tens of seconds of its flight or not at all, because it has a short detection range. Thus the Block 2004 system will be able to provide only limited tracking information about a missile attack by North Korea on Hawaii, resulting in a large uncertainty in the location of the threat cloud. In this case, the defense may not be able to direct the interceptor close to the

threat cloud, and the kill vehicle could have a difficult time locating and homing on the target.

3. The Bush administration claims about the Block 2004 defense capability are misleading and unrealistic.

The administration has consistently claimed that the Block 2004 system will be highly effective against a small number of incoming missiles, even when it is initially made operational later this year. High-level Pentagon and MDA officials have asserted the following:

- The system to be deployed in 2004 would be 90 percent effective against a North Korean missile if it launched two interceptors.
- The first interceptor deployed will provide a defense of the United States.
- The system capability is limited only by the number of interceptors.

These statements are irresponsible. Underlying all of them is an assumption that the kill probability of the interceptors—the probability that an interceptor will hit its target—will be very high. There is no data to justify such an assumption. The kill probability depends as much on the characteristics of the attack—the warhead type and trajectory, the numbers and types of decoys, and the kind of countermeasures used—as it does on the performance of the defense components. Based on the poor defense capability in the face of unsophisticated countermeasures, the kill probability is likely to be on low, not high.

According to the General Accounting Office, while the MDA has assigned numerical values to the interceptor kill probability, it has not provided its assumptions about the attack characteristics that would affect the kill probability. In essence, the MDA appears to be picking numbers out of thin air.

The MDA has also claimed that its simulation software will provide valuable information about the effectiveness of the Block 2004 GMD system. This is not true. As the director of operational testing and evaluation noted in his FY03 report to Congress, “Due to the immature nature of the systems they emulate, models and simulations of the BMDS [ballistic missile defense system] cannot be adequately validated at this time.”

Finally, MDA officials have stated that the demonstration of hit to kill provides confidence that the system will work. However, the United States demonstrated that it could perform hit to kill more than 20 years ago. Being able to destroy a target is not the issue; the important question is whether it can do so under unanticipated conditions in a real attack. This was graphically demonstrated in the 1991 Gulf War when the Patriot missile defense failed to intercept almost all of the incoming Iraqi short-range missiles despite its successful performance in intercept tests (and early Pentagon claims of high effectiveness).

Such overstatements of the GMD system’s defensive capability could have serious repercussions. To the extent that policy makers believe such claims, they will affect decision making. According to administration officials, the president believes he will have “many more options” available if he has a limited operational defense. If the president is told that the system could reliably defend against a North Korean ballistic missile attack, he

might be willing to accept more risks when making policy and military decisions. Similarly, a belief in the efficacy of the deployed defense could reduce the administration's motivation to try to address the North Korean missile program by other means, such as diplomacy. It is not difficult to find examples in which the perceptions of high-level policy makers differed starkly from the technical assessment of experts who were more familiar with the details. A striking example is the explosion of the space shuttle Challenger in 1986.

U.S. overstatements of the system effectiveness could also inspire over-reactions on the part of Russia and China, which in turn could undermine U.S. security.

4. There is no justification for procuring and deploying additional interceptors over the next several years.

Deploying more interceptors will not address the fundamental limitations of the Block 2004 GMD system that severely constrain its effectiveness, nor will they improve its defense capability in a meaningful way. Because the system cannot counter threats that employ unsophisticated countermeasures, the kill probability will almost certainly be low. Consequently, more interceptors are largely irrelevant to system effectiveness.

Moreover, adding more interceptors in silos will not make intercept tests more realistic, and takes missiles away from the testing program.

5. There is no technical justification for deployment of the Block 2004 missile defense system.

The MDA claims that the program is “event driven,” but while development and testing timelines continue to slip, the deployment schedule has moved up. The administration's goal is not the earliest possible deployment of a militarily effective capability, but simply of missile defense hardware. As physics Nobel laureate Richard Feynman wrote in the report of the presidential commission on the space shuttle Challenger accident, “For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled.”

6. The MDA should halt its deployment of the Block 2004 GMD system and Congress should require the MDA to conduct operationally realistic testing of the system before it is deployed.

For a defensive system to be useful to U.S. policy makers and military leaders, more must be known about its likely performance under operational conditions. As this report demonstrates, there are strong reasons to believe that the GMD system will not be effective, neither in its Block 2004 configuration, nor in future block iterations. It is essential that the GMD system be tested by an independent agency under operationally realistic conditions. Congress should insist that realistic testing be conducted to demonstrate system effectiveness under the types of operational conditions that would be encountered in actual battle, including a lack of prior information about the enemy missile, its warheads, and its flight path. Until such tests are performed, there is no justification for deployment of this system.