Union of Concerned Scientists

FACT SHEET

The Troubled Kill Vehicle in U.S. National Missile Defenses

The principal system intended to defend the United States homeland against long-range ballistic missiles is the Ground-based Midcourse Defense (GMD) anti-missile system. The system is embattled, with a poor test record that is not improving over time. In particular, the exoatmospheric kill vehicle (EKV), the part of the Ground Based Interceptor (GBI) intended to collide with the incoming warhead to destroy it, is performing badly. The problems are so great that the Obama administration has decided to redesign the kill vehicle and replace the existing versions.

Problems with the First Generation Kill Vehicles

Currently 30 GBIs are deployed in underground silos, with 26 at Fort Greely in central Alaska and four at Vandenberg Air Force Base in California. The administration plans to deploy 14 more at Fort Greely by the end of 2017, bringing the total number to 44. The current procurement cost for each GBI is about $75 million.[1]

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The kill vehicle comes in two variants, designated Capability Enhancement-1 (CE-I) and Capability Enhancement-2 (CE-II). Once released in space by the booster rocket, the EKV uses on-board infrared sensors to detect the target complex, and uses small rockets called thrusters to maneuver itself into a direct high-speed collision with what it identifies as the target. Of the 30 deployed interceptors, around 20 are equipped with CE-I EKVs and 10 have CE-II EKVs.

Both versions were developed in a rush with poorly disciplined engineering and acquisitions practices. The Missile Defense Agency (MDA) initially deployed the first CE-I kill vehicle in July 2004 to meet President George W. Bush's 2002 directive that required fielding an "initial capability" for a system to defend the United States within two years. Those early CE-I kill vehicles, which were essentially developmental versions, were deployed at a steady pace with the last of 24 installed in September 2007.

However, the first flight test—not an intercept test—of an interceptor carrying a CE-I EKV was not until December 2005, after the system was already fielded. Two successful intercept tests followed, in 2007 and 2008.

The MDA knew that the CE-I EKV had problems and in 2007 initiated a program to refurbish the CE-I EKVs, making some improvements and replacing components that, during manufacture or through testing, had proved problematic. The Government Accountability Office (GAO) reported in 2012 that this refurbishment program was expected to continue for many more years and would cost between $14 and $24 million per GBI.[2]

In July 2013, the Pentagon tested the refurbished CE-I EKV, which incorporated roughly 25 changes, in an intercept test involving more stressful conditions than previous tests.[3] The system failed when the kill vehicle did not separate from its booster, possibly due to a battery-related problem.[4] Even more troubling, the test-review board "found several issues of concern with the design of the kill vehicle."[5] These problems appear to affect both the CE-I and CE-II; the MDA has said it is "working toward a correction to the entire fleet before the end of this year."[6]

Problems with the Second Generation Kill Vehicles

The Bush administration, long aware that the CE-I had problems and contained parts that were obsolete, had already begun by 2005 development of the CE-II EKV. The MDA began fielding GBIs equipped with the CE-II EKV in October 2008, once again before it had been through even one intercept test. Currently about 10 of the 30 fielded GBIs have a CE-II EKV. These new interceptors have not performed well in tests and have yet to demonstrate a successful intercept.

Specifically, the CE-II failed two intercept tests in 2010, the first on January 31 and its near-repeat on December 15, due to different problems with the kill vehicles. The MDA

eventually attributed the first failure to a quality control problem during construction. However, the second failure indicated a more serious problem: a design flaw in the guidance system. Following the second failure, then-MDA Director Lt. Gen. O'Reilly halted the delivery of CE-II-equipped interceptors. He required that the CE-II EKV have a successful intercept test before delivery of EKVs would continue and before the 10 GBIs equipped with the CE-II could be considered operational.

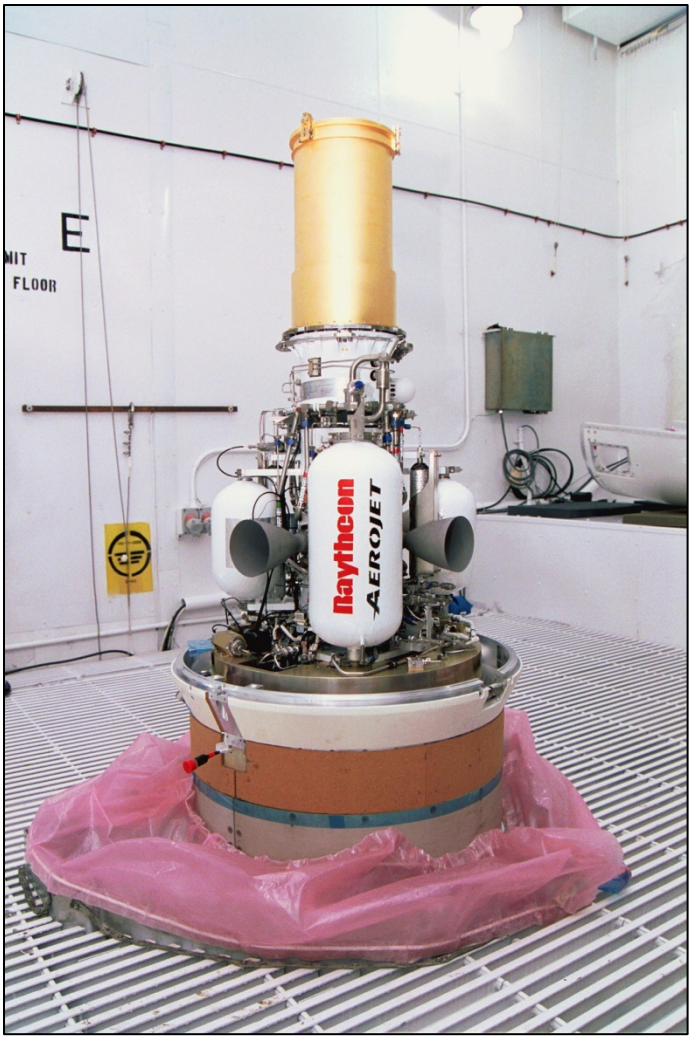
A successful January 2013 flight (non-intercept) test seemed to confirm that the CE-II guidance system failure was identified correctly and the mitigation scheme worked, clearing the way for an intercept test of a repaired CE-II kill vehicle.

That test is currently scheduled for summer 2014, perhaps as soon as June. However, the July 2013 CE-I EKV test failure also indicated possible problems with components shared by the CE-II. The MDA plans to correct these problems in the entire fleet of interceptors by the end of 2014, but in the meantime this could lead to a delay in the planned CE-II test.

At present, the price tag to fix the CE-II EKVs that have already been produced stands at $1.3 billion. And despite these many problems, Congress is being asked to purchase 14 additional GBIs that may be equipped with the beleaguered CE-II EKV if the upcoming test is successful.

> ***Time and again, the process for developing and procuring these kill vehicles has been driven by politically motivated time lines, rather than sound technical procedures and oversight.***

A successful test is necessary to gain confidence that the problem with the EKV has been correctly identified and resolved, but a single test is not a sufficient basis for establishing the reliability of the interceptor and justifying the purchase of additional interceptors. This is particularly true in light of the fact that the GAO reported that all of the GMD flight tests conducted as of 2012 had revealed problems requiring either hardware or software changes to the GBIs.[7] Although the first CE-II EKV was fielded more than five years ago, it has yet to have a single successful intercept test. This is not "fly before you buy."



Prototype exoatmospheric kill vehicle.

Photo: Missile Defense Agency.

Back to the Drawing Board

In response to these many failures of the CE-I and CE-II EKVs, the Obama administration decided to redesign a new kill vehicle and is seeking $99.5 million in the FY15 budget from Congress for this purpose. This proposal has received initial support in both the House and Senate. Additionally, $26 million is slated for work on a common kill vehicle (CKV) that could be used not only for the GMD but other interceptors, including the SM-3.

However, unless oversight and procurement practices are improved, these efforts will likely again produce a flawed

outcome. Time and again, the process for developing and procuring these kill vehicles has been driven by politically motivated time lines, rather than sound technical procedures and oversight, and has resulted in problems with the resulting product.

The Bush administration's decision to rush deployment of the GMD system in 2002 and to exempt the missile defense program from normal procurement practices kicked off a hurried development process that made failure almost inevitable. Obama administration officials cite North Korea's display of what some claim is a possible new mobile intercontinental missile, the KN-08, at a military parade in 2012 as the motivation for their 2013 decision to deploy and procure 14 additional GBIs. However, those GBIs will likely be equipped with CE-2 EKVs, a system so flawed the administration has already decided to redesign the kill vehicle.

The Way Forward

In this case, history should not be allowed to repeat itself. More than 10 years of developing this complicated technical system outside of normal Pentagon oversight processes has not yielded success. If the United States decides that missile defense is important and worth the strategic tradeoffs, then it ought to be pursued correctly, with clear and realistic goals and under rigorous oversight.

These practices, such as completing thorough analyses of alternatives, pursuing independent cost estimates, and providing Congress complete and timely progress reports are essential to good results. At a minimum, the administration must ensure that the redesign of the kill vehicle uses a thorough development and acquisition process that is not driven by political timelines or inflated threat assessments.

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[1] This is the price per interceptor given by Missile Defense Agency Director Vice Admiral James Syring in July 2013 for the 14 additional GBIs to be deployed by 2017. Hearing of the Defense Subcommittee of the Senate Appropriations Committee, July 17, 2013.

[2] U.S. Government Accountability Office, "Missile Defense: Opportunity Exists to Strengthen Acquisitions by Reducing Concurrency," April 20, 2012, p. 78.

[3] "We've incorporated over 20—I want to say 24 or 25 improvements to the current CE-1 fleet that I'll demonstrate in flight within the next month, and that—those improvements and those continued—the continued improvements of the current fleet is part of my R&D request as well." Vice Admiral James Syring, House Armed Services Committee, May 8, 2013.

[4] Andrea Shalal-Esa, "Battery Problem Eyed as Cause of U.S. Missile Defense Failure –Source," ***Reuters***, July 12, 2013.

[5] Testimony of J. Michael Gilmore, Director for Operational Test & Evaluation, Department of Defense, Senate Armed Services Committee, April 2, 2014.

[6] Testimony of Vice Adm. James Syring, Director of the Missile Defense Agency, House Armed Services Committee, March 25, 2014.

[7] U.S. Government Accountability Office, "Missile Defense: Opportunity Exists to Strengthen Acquisitions by Reducing Concurrency," April 2012, pp. 18-19.

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