Union of Concerned Scientists
Citizens and Scientists for Environmental Solutions
fact sheet

Space Based Missile Defense

A space-based boost-phase missile defense system would target ballistic missiles during launch, while the boosters were burning. Proponents argue that by engaging a missile during boost phase, space based interceptors (SBIs) could avoid the crippling problems that plague interceptors designed to engage warheads during midcourse phase, when the warhead is above the atmosphere. In particular, decoys and other countermeasures can keep a midcourse interceptor from identifying the warhead amidst other objects and therefore keep the warhead from being intercepted. And a boosting missile is a more attractive target than a warhead because it is large, easy to detect (given its large plume), and vulnerable to attack (as it is not hardened).

However, such a system would require many hundreds of orbiting interceptors to defend against one or two missiles, and it would have serious inherent vulnerabilities that would render it ineffective.

Space-Based Defenses: Enormously Expensive, Inherently Ineffective

A space-based boost-phase defense is intended to intercept attacking missiles during the first few minutes of their flight, while the missiles' engines are still burning. To reach attacking missiles during this very short time, SBIs must be stationed in low-altitude orbits. However, in these orbits SBIs move rapidly with respect to the ground and cannot stay over any one location on Earth. To keep at least one interceptor within reach of a given missile launch site at all times therefore requires many SBIs in orbit. A 2003 American Physical Society study showed that many hundreds or thousands of SBIs would be required to provide limited coverage against ballistic missiles launched from areas of concern. This estimate is consistent with the size of the space layer in the Global Protection Against Limited Strikes (GPALS) missile defense system, which was proposed (but not built) by the George H.W. Bush administration in the early 1990s. GPALS called for 1,000 to 5,000 SBIs. Doubling the number of missiles that such a defense could engage would require doubling the size of the entire constellation of SBIs.

Moreover, given the technology expected for the next decade, each SBI would weigh up to a ton or more. As a result, deploying such a system would be enormously expensive and actually would exceed U.S. launch capabilities. Additionally, such a system would raise significant issues for crowding and traffic management in space.

Yet even if such a large system were built and the technology worked perfectly, it would not provide a reliable defense, for two reasons. First, even if the constellation of hundreds to thousands of interceptors described above were in place, only one or two SBIs would be in position to reach any given launching missile in time to destroy it. Consequently, the defense could be overwhelmed by simultaneously launching multiple missiles from one location.

Second, the system could not protect itself from attacks intended to remove interceptors. Because

SBIs would be in low-altitude orbits they could easily be detected and tracked from the ground; an adversary would know their current and future locations. As a result, any SBI would be vulnerable to attack by inexpensive short- or medium-range missiles. These missiles would burn out at too low an altitude to be intercepted by the SBI, but they could loft homing ASAT weapons at it. By destroying relatively few SBIs in this way, an attacker could create a gap in the defense through which it subsequently could launch its long-range missiles. In short, a defense based on deploying hundreds or thousands of SBIs at enormous cost could be defeated by a handful of enemy missiles.

Potential Offensive Uses of SBIs

Deploying even a small number of SBIs might negatively affect strategic relations because the SBIs could have a significant ability to destroy satellites, which travel in predictable orbits and achieve speeds similar to those of long-range missiles. Homing on a satellite rather than a boosting missile would require a different (possibly additional) sensor on the SBI, but an observer on the ground would not be able to tell which sensor the SBI was carrying. U.S. budget descriptions have suggested that the boost phase missile defense system might also be designed to intercept warheads during the midcourse phase of flight. The sensor needed for such midcourse intercepts would allow an interceptor to home on a satellite.

Additionally, the large amount of thrust of interceptors, which they would need to perform boost phase missile defense from space, means that they could reach and attack satellites in GEO as well as those in lower orbits.

Why is Even Funding Small Space Based Missile Defense R&D Project a Bad Idea?

In past years, the Missile Defense Agency has requested funding for the Space Testbed program, to develop a space-based interceptor; to develop the command, control, battle management and communications structures for space-based missile defense; and to launch interceptors into orbit and test them against ballistic missiles.

Although this program has been described as only research and development, Congress should not support such a program. As discussed above, space-based interceptors would not provide a credible defense against ballistic missiles, yet the technology being developed would be useful for offensive attacks on satellites. Placing even a few prototype interceptors in orbit would be seen as providing an anti-satellite (ASAT) capability.

A decision to fund this program could send a message to other countries that the United States is developing a space-based ASAT capability. This apparent pursuit of space control technologies may encourage similar development by other countries, which would reduce U.S. security. Funding a Space Testbed is not an acceptable compromise between banning and deploying a space-based missile defense.

Moreover, by putting dedicated space-based weapons in orbit for the first time, a program like the Testbed—under the guise of research and development—would effectively preempt broader Congressional decision-making about space weapons. Congress has not had a thorough debate of the wisdom of deploying space-based weapons, nor has it considered the desirability, feasibility, or costs of attempting to build a space-based anti-missile system or space-based ASAT weapons.

For more information contact Dr. Laura Grego (617-301-8062), Dr. David Wright (617-301-8060), or Stephen Young (202-331-5429).

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