

D O C U M E N T E D   B R I E F I N G

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*Army Air and  
Missile Defense*

*Future Challenges*

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## SUMMARY

The Army must take steps today if it is to provide effective air and missile defenses against the threats that will emerge 20 years hence. Most analysts predict that the globalization of the economy means that existing and new technologies will become increasingly available worldwide and that many sophisticated weapons will be easier and cheaper to produce or acquire. But trends in the international political sphere are harder to identify. The international arena has seen such flux in the past two decades that it is difficult to predict what changes will occur in the next 20 to 25 years, but they could be substantial.

RAND examined how a wide range of possible trends might shape the future world situation. Doing so, we believe, provides insight into how these trends and accompanying technological changes might influence the Army's plans to develop its air and missile defenses (AMD). We drew on previous RAND work that characterized six possible futures for 2025 to establish a context for Army AMD in the period. Representative scenarios for each of these futures provided a means for illustrating how differing geopolitical or strategic situations might influence air and missile defense requirements for the future. We used the six scenarios to identify potential AMD shortfalls or redundancies in various settings and, consequently, those areas where the Army might best focus its research and development (R&D) efforts.

One conclusion that we draw from our analysis is that the threat of cruise missile attack, and the need to defend against it, is present in all futures and scenarios. Although large numbers of cruise missiles or ones based on sophisticated technology are likely to be present only in those scenarios that include conventional conflict, unsophisticated versions based on unmanned aerial vehicles (UAVs) could be present in small numbers in any scenario. And, regardless of the type of operation, the U.S. military will need early access to airports that can be threatened by even unsophisticated cruise missiles that could be available to drug lords and terrorists. In some circumstances, very large and densely populated areas may be at risk from cruise missile attack. Indeed, much of the continental United States (CONUS) was at such risk in one scenario.

Because cruise missiles and UAVs are universal threats, short-range air defenses (SHORAD) will also be needed to defend against weapons that make it through the outer layers. In those cases where manned aircraft are likely to be present, SHORAD systems can degrade the enemy's ability to attack U.S. and allied assets effectively by forcing enemy ground-attack aircraft to higher altitudes or by

denying the enemy information gathered by UAVs. Rockets and mortars were also present in all scenarios considered, and destroying them in the air would be desirable. However, developing such a capability might not be worth the investment if other approaches, such as counterbattery fire, are effective in dealing with these threats.

In contrast, the need for defense against theater ballistic missiles (TBMs) depends on the likelihood of conventional war in the future. If the world evolves to the state where such war is unlikely, the need for TBM defenses is not high. Nevertheless, until it becomes clear that the future is evolving in a way that makes it unlikely that the United States would be involved in conflicts with rogue states or a peer competitor, TBM defenses will be needed in theater during the initial stages of the operation. Because no single system fielded by any of the services can defend all assets in theater from all likely threats, Army as well as Navy systems are needed early. Indeed, once Army antitactical ballistic missile (ATBM) systems arrive in theater, they provide some unique capabilities. These include the ability to protect inland areas, as well as an autonomous radar with significant detection and tracking capability. Some additional capabilities, however, would enhance the ability of the Army's ATBM systems to perform their mission. One is the ability to accompany ground forces engaged in fast-paced maneuver operations. The other, which would be needed if the future world that envisions a peer competitor becomes a reality, is the capability to defeat large and sustained barrage attacks of TBMs.

When compared with the current and postulated AMD systems, these requirements then lead to the identification of R&D efforts that should be emphasized. The Army should place increased emphasis on providing defense against cruise missiles because it will be needed whatever the world looks like 20 years from now. To ensure that those defenses are effective, the Army needs to develop a balloon- or aircraft-mounted system capable of detecting low-altitude cruise missiles at long range. Assuming that naval systems would be available to defend seaports, the Army should concentrate on making its cruise missile defenses deployable so they will be available to protect airports that are crucial to the opening of a theater. Finally, to provide for the defense of CONUS or other large territories, effort should be invested in developing long-range interceptors so that cruise missile defenses can protect large geographic areas with a reasonable number of launchers.

To field SHORAD systems capable against the variety of threats likely in a wide range of futures, the Army should develop complementary systems. There remains a need to retain large numbers of SHORAD systems with capability against manned aircraft. Laser systems seem to have the potential to defeat threats that missiles cannot—rockets, artillery, and mortars. However, laser technology is still immature, and fielding an effective weapon will require

technological breakthroughs that are not guaranteed to occur. Thus, as a hedge against failing to obtain those breakthroughs, it would be wise to continue investigating improvements to the resistance of SHORAD missiles to countermeasures, as well as ways to make laser weapons feasible.

Finally, with respect to defenses against TBMs, the Army may want to wait until trends that will define the future become more evident before significantly increasing its investment in such systems. If the emergence of a near-peer competitor makes the world more dangerous, then the Army will need to develop very effective interceptors and launchers with large numbers of ready rounds to counter large-barrage missile attacks. Even if such a future world does not develop, however, the Army should investigate ways to further enhance its anti-TBM systems. It needs to develop smaller and more-efficient radars and generators to make the Theater High-Altitude Area Defense system (THAAD) more easily deployable and supportable. Also, the Army needs to develop a mobile or easily transportable system capable of keeping up with fast-paced operations.