



Emerging Technology Beyond 2035

Scenario-Based Technology Assessment for Future Military Contingencies

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www.rand.org/t/RRA1564-1

This report presents the development and implementation of a technology assessment process to help the Army understand the implications of key emerging technologies that could be crucial to Army missions in the years 2035 to 2050. This work aims to assist the Army for shifting operational environments, such as operations in extreme weather conditions. Emerging technologies might help the Army succeed in key missions and promote U.S. interests.



RESEARCH QUESTIONS

- What are the most-impactful drivers of the future that are outside the control of Army decisionmakers?
- How might emerging technologies help the Army succeed in key missions and promote American interests?
- To what extent do existing Army modernization priorities align with the operational requirements articulated in the scenarios?



KEY FINDINGS

The specific approach in this work focused on a scenario-based technology assessment

- The key drivers of future worlds are those deemed most relevant for conditioning future operating environments and adversaries, the types of challenges the Army might face, the sorts of future technologies with military implications, and such actions as Army modernization priorities and decisions regarding technology investment and integration.
- Five illustrative scenarios were developed in detail. Of those five, the Battle of the Arctic Depths scenario is used to demonstrate the implementation of the technology assessment.
- The technology assessment process developed in this work provides structured steps to translate scenarios into mission overviews and key challenges, identify technology candidates for the challenges, and, ultimately, assess the alignment of Army modernization priorities to candidate technology solutions and challenges.

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- Applying technology assessment for these scenarios necessitated consideration of technologies with high degrees of uncertainty.

For the Arctic Depths scenario, technology areas of lubricants, quantum, space transport, air vehicles, autonomous weapon systems (AWS), and biotechnology were analyzed

- The assessment found that many Army modernization priorities are aligned to the key challenges that the Army would face in the scenario—specifically, AWS, biotechnology, and quantum technologies.
- However, some current Army modernization priorities exhibited misalignment or no alignment for the identified challenges in the Arctic Depths scenario—specifically, misalignment around lubricants and vertical take-off and landing capabilities.
- The assessment of the Arctic Depths scenario found that there was no alignment between Army priorities and the potential need for point-to-point space transportation.



RECOMMENDATIONS

- The Army should develop key partnerships in the private sector (e.g., with industry leaders in energy, space transport, and the like) and with multinational partners (e.g., key allies within NATO) to ensure the availability and integration of technology it needs, especially for the technologies identified as critical needs through technology assessment. These partnerships may be supported through the establishment and funding of centers of excellence.
- Where misalignment in technology development and Army modernization priorities exist, leadership should consider investing resources, updating doctrine, and implementing alternative strategies to take advantage of the technologies identified as critical needs.
- To provide a more balanced perspective if comparisons across scenario-based technology assessments are desired, the Army Futures Command should further develop this portfolio of scenarios to include scenarios where technological advancements are evolutionary in nature. This step would allow Army stakeholders to provide a broader perspective from technology assessment across the exogenous uncertainty of technology development.
- The Army should be prepared for a broad range of future contingencies and world states where technology is diffuse, and the United States does not have a technological advantage. To support this, the Army ought to further develop the portfolio of scenarios considered under technology assessment activities.
- The Army should consider the desired outcomes for future technology assessments to ensure that the appropriate technology concept is applied.
- The Army should leverage technology assessment methods to address modernization priorities and requirement gaps.