

Systematic Method for Prioritizing Investments in Game-Changing Technologies

The Evaluation and Comparison Process Framework

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ISSUE

The current economic and technological environment requires making difficult choices about technology investments. Technologies that might be critical to meeting the enduring challenges faced by the Department of the Air Force (DAF) are proliferating and developing at an accelerating pace. In some cases, these technologies have dual-use applications that are the focus of commercial activity in the United States and abroad. Current and potential adversaries, especially those with near-peer capacity, are developing increasingly robust capabilities to challenge U.S. dominance. U.S. government and civilian organizations face budget constraints that will require choices to be made about which of the gamut of technologies to invest in to meet these challenges. A systematic method of comparing and evaluating technology options to ensure that limited resources are invested wisely is needed.



APPROACH

RAND researchers developed and demonstrated a systematic Evaluation and Comparison Process (ECP) framework that selects and compares potential game-changing technologies (GCTs) based on their importance in addressing the DAF's enduring challenges. The ECP framework uses best available data and subject-matter expertise to estimate and compare individual GCTs and their synergistic combinations with respect to the three metrics needed for investment strategy development: (1) benefit, as measured by operational advantage resulting from analysis, modeling, or simulation in realistic scenarios; (2) feasibility of sustainable implementation, as measured by estimates of remaining technical and implementation problems and progress toward solving them; and (3) estimates of life-cycle costs based on experience with existing and budgeted programs. These three metrics for each GCT are visualized on an enduring challenge "canvas" that allows direct comparison of the absolute and relative benefits, difficulties, and likely cost of developing and implementing these technologies to address this challenge. Canvases for different enduring challenges can be combined or rolled up to identify which technologies are most important in scenarios that involve these challenges in different ways.



STEPS IN THE PROCESS

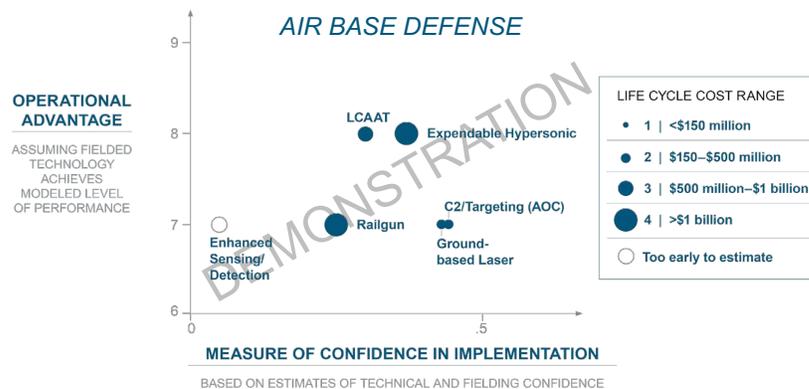
Execution of the ECP framework requires six steps:

1. Decide which potential GCTs to examine in greater detail, assessing each for its proposed role as a game changer. This initial step identifies the full range of GCTs that appear to have potential for new and disruptive effects.
2. For each potential GCT, develop applications that include specific capabilities and concepts of operation or implementation. Each should involve either a step change in existing capabilities or the capability to do something entirely new.
3. Assess the ability of each of the considered GCT applications to address enduring challenges. At this stage, the relative importance of each GCT application (or synergistic combination of GCT applications) under consideration to each mission goal or enduring challenge needs to be evaluated.
4. Conduct a deeper analysis (e.g., modeling or simulations) of a subset of GCTs assessed in the previous step to assess their potential to address major mission objectives or enduring challenges—the actual operational advantage that can be expected in a real-world situation.
5. For each GCT application (or combinations) showing an operational advantage in Step 4, estimate its measure of confidence in implementation (MOCI). MOCI is the product of separate estimates by subject-matter experts of confidence in overcoming technical and implementation challenges specific to that GCT.
6. Display comparable results for GCTs in a two-dimensional canvas also conveying cost estimates for the development, implementation, and sustainment required for each GCT application to achieve the operational advantage in Step 4.



DEMONSTRATION

We demonstrated the ECP framework for the enduring challenge of air base defense, which produced the canvas comparing six GCT applications.



NOTE: LCAAT = low-cost attritable aircraft technology.



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