Past RMAs, Future Transformations
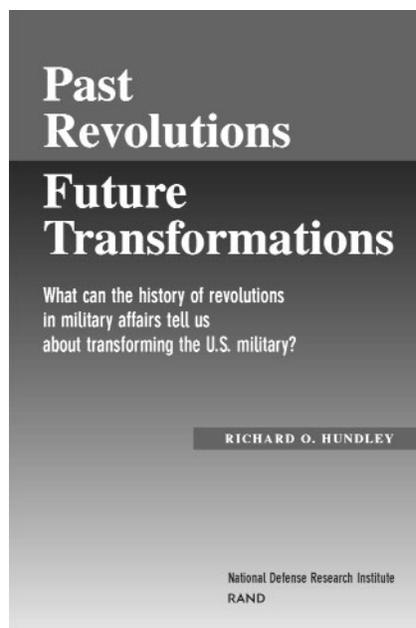## What Can History Tell Us About Transforming the U.S. Military?

Technology-driven revolutions in military affairs (RMAs) have been occurring since the dawn of history, will continue to occur in the future, and will continue to bestow a military advantage on the first nation to develop and use them.

Given this reality and the Department of Defense's (DoD's) effort to bring about a technology-driven transformation of the U.S. military to achieve the operational goals outlined in Joint Vision 2010, this study answers three interrelated questions: (1) What can we learn from past RMAs? (2) How can we prepare for RMAs carried out by others? and (3) What does it take to successfully carry out our own RMAs?

Central to the study is the definition of an RMA, defined here as *a paradigm shift in the nature and conduct of military operations that either renders obsolete or irrelevant one or more core competencies of a dominant player, creates one or more new core competencies in some new dimension of warfare, or does both*.

WHAT DOES HISTORY TELL US ABOUT PAST RMAs?

When we examine the historical record of military technology and military "revolutions," we find that RMAs are rarely brought about by dominant players (a finding confirmed in the business arena) and are often adopted and fully exploited first by someone other than the nation inventing the new technology. We also find that although not all RMAs are technology-driven, those that are are usually brought about by combinations of technologies rather than by individual ones and involve essential doctrinal and organizational changes along with the new technology. Finally, we find that there are as many failed RMAs as successful ones, that RMAs often take a long time to come to fruition, and that their military utility is frequently controversial until they are proven in battle.

History also shows us that RMAs move through a chain-like process of multiple innovations that culminate in a new military reality. They start with a new technology (or several new technologies) and then involve a new device based on the technology, a new system based on the new device, a new operational concept that describes how the system is used in some military situation, and a new doctrine that codifies the principles governing the use of the new system and a force structure that provides the military organization to fully realize the system's potential. Unmet military challenges are an essential element driving creativity at each step in the process; the various innovations in the chain sometimes occur out of order; and obstacles at any step in the chain can lead to failure. In the past, these obstacles have included new devices that prove impractical or cannot be turned into viable systems, mistaken or incomplete operational concepts, and prevailing military cultures and organizations that resist change.

HOW CAN WE PREPARE FOR RMAs CARRIED OUT BY OTHERS?

Since history tells us that RMAs are rarely brought about by dominant players, the DoD must be prepared for future RMAs carried out by others. Being prepared

means three things: (1) collecting information, (2) assessing the collected information, and (3) responding to the emerging RMA.

Much of the RMA process can be observed and anticipated through a number of venues, including various press organs, the worldwide arms market, inferior military establishments trying to leapfrog the dominant players, dominant players trying to discredit new ideas that threaten their core competencies, and military research, development, test, and evaluation activities.

However, collection is not enough; a multistep collection and assessment process that moves from an initial, wide-area search collection process through a more careful assessment is also required. Utilizing such a process requires patience, since future RMAs cannot be scheduled and may take years.

While critical, being aware of emerging RMAs is not enough; one must also be responsive. A responsive military organization should have a "productive paranoia" about the future; a continually refined vision of how war may change; an organizational climate encouraging vigorous debate about the organization's future; mechanisms to experiment with new ideas, even ones that threaten core competencies; and support from the top—senior officers willing to sponsor new ways of doing things and provide promotion pathways for junior officers practicing a new way of war.

HOW CAN WE SUCCESSFULLY BRING ABOUT RMAs OF OUR OWN?

As mentioned above, the DoD is making a concerted effort to "transform" the U.S. military. This effort includes the development of future visions of warfare, the establishment of a number of battle laboratories and warfighting centers dedicated to exploring new ways of warfare, the conduct of wargames, developmental and field experiments exploring these new ways, and new organizational arrangements. These activities are pursuing technology/ device/system/operational employment concept combinations, with several concepts proposed as the kernel of an RMA, including long-range precision fires, information warfare, a "systems of systems," "network-centric warfare," and a "cooperative engagement capability."

Given what we know about RMAs, is this effort missing anything? The table below—which measures the DoD's current situation against a set of RMA criteria— indicates that the answer is "yes."

RMA Checklist	DoD's Current Situation
A fertile set of enabling technologies	Yes
Unmet military challenges	Yes, but may not be compelling enough
A receptive organizational climate	Maybe, but not in all Services
Support from the top	Yes, but not in all Services
Mechanisms for experimentation (to discover, learn, test, and demonstrate)	Yes, but may not cover entire spectrum and may not encourage risky experiments
A challenge to someone's core competency	Not so far
A focus on a definite thing or short list of things	Not so far
Positive ways of responding to successful experiments (in terms of doctrine, acquisition, and force structure)	This could be a problem: The DoD "system" often has difficulty responding positively to risky new ideas

To deal with the three missing elements in the table, we recommend that the DoD (1) set up "concept groups" and "experimental groups" to identify and experiment with new systems and operational concepts that challenge current Service core competencies, thereby increasing the focus of current RMA efforts; (2) establish "provisional operational units" to participate in experiments with new systems and operational concepts; and (3) establish a "branch" in its acquisition system that tolerates substantial uncertainties about military utility to a much later stage in the acquisition process.

One final concern: The DoD appears to be planning to "transform the force" by replacing old elements with new RMA elements before "the RMA" is proven in battle. This flies in the face of history: In most past RMAs, the new elements were treated as add-ons to existing force structures until proven in battle.

RAND

1700 Main Street, P.O. Box 2138, Santa Monica, California 90407-2138 • Telephone 310-393-0411 • FAX 310-393-4818
1333 H St., N.W., Washington, D.C. 20005-4707 • Telephone 202-296-5000 • FAX 202-296-7960

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