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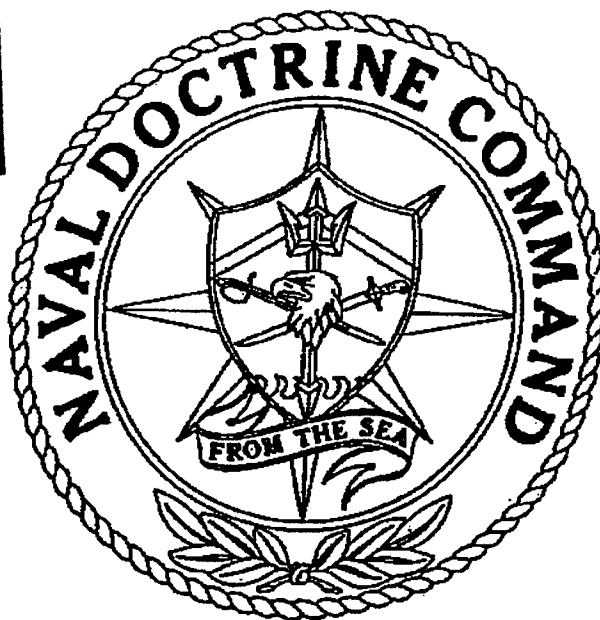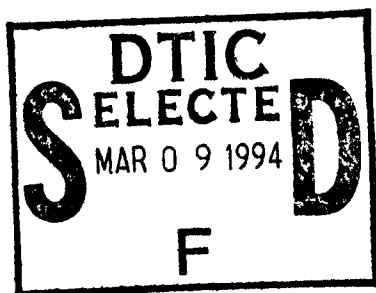
NAVAL DOCTRINE COMMAND
FROM THE SEA

"Revolutions in Military Affairs," Paradigm Shifts, and
Doctrine

by

Dr. James J. Tritten
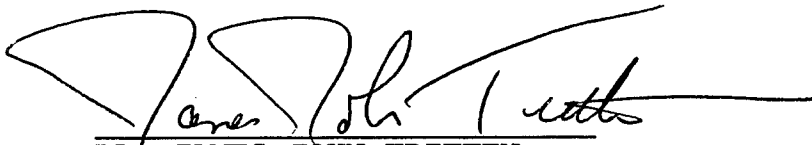
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Rear Admiral F.L. Lewis
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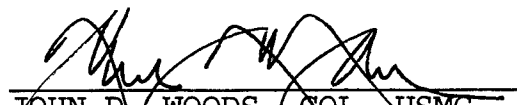
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DESCRIPTION OF THE ROLE THAT MILITARY AND NAVAL DOCTRINE CAN PLAY IN REVOLUTIONS IN MILITARY AFFAIRS (RMAs) AND ASSOCIATED WARFARE PARADIGM SHIFTS. REVIEW OF LESSONS OF PAST RMA's AND PARADIGM SHIFTS. REPORT PROPOSES A NEED FOR THEORY TO BETTER UNDERSTAND THE NATURE OF REVOLUTIONS IN MILITARY AFFAIRS AND PARADIGM SHIFTS. MAJOR CONCLUSION OF REPORT IS THAT THE LEADING ROLE AFFORDED TECHNOLOGY IN REVOLUTIONS IN MILITARY AFFAIRS IS AN INCOMPLETE MODEL. DOCTRINE CAN SHAPE AND DRAMATICALLY AFFECT AN RMA. DOCTRINE DOES NOT ONLY RESPOND TO TECHNOLOGY CHANGES. REPORT ALSO DEVELOPS NAVAL VERSIONS OF THE CLASSIC LAND-ORIENTED RMAs. REPORT SUGGESTS THAT MILITARY ORGANIZATIONS NEED TO BECOME "LEARNING ORGANIZATIONS."

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"Revolutions in Military Affairs," Paradigm Shifts, and Doctrine[1]

By
James J. Tritten

Introduction

The U.S. Navy and Marine Corps have established the Naval Doctrine Command charged with the preparation of multi-Service naval doctrine, Navy Service-unique doctrine, and a multi-Service input to joint and multinational doctrine. As a part of that process, new concepts for the use of naval power are being addressed in the context of the ongoing "revolution in military affairs" that many have claimed is on-going today.

This report will describe the role that military--including naval--doctrine could play in such a "revolution in military affairs" and associated paradigm shifts. It will also look at lessons from historical shifts in past paradigms and "revolutions in military affairs." The report suggests that we need a theory of "revolutions in military affairs" and paradigm shifts. The military today is being asked to embrace a new "revolution in military affairs," or at least a new paradigm of warfare, and cannot do so without understanding how major changes in warfare occur. This report also suggests that "maneuver" warfare is a new paradigm that needs to be managed once we have developed appropriate theory. This report is intended to be suggestive, rather than prescriptive, but it questions the basic model that technology leads doctrine in a "revolution in military affairs."

"Revolutions in Military Affairs"

A "revolution in military affairs" is a fundamental shift in military strategy, doctrine, and tactics that occurs generally-- but not always--due to a change in technology. With a "revolution in military affairs" comes the need to reconsider all existing military theory and a transition to a new process of warfare. For example, the introduction of gunpowder and the firearm in feudal Europe resulted in the end of concentrated troop formations of foot soldiers, which had been used for centuries. New types of military formations caused new types of military organizations, tactics, doctrine, and military strategy. Heavily armored mounted knights disappeared from the battlefield and a new branch of troops, artillery, appeared. Infantry was armed with a new technology--the firearm.

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[1] The views expressed by the author are his alone and do not necessarily represent those of the U.S. government, Department of Defense, or the U.S. Navy.

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At sea, the introduction of firearms resulted in a fundamental shift in the form of combat, from ramming, boarding, and hand-to-hand fighting, as the decisive form, to that of stand-off destruction by artillery. This shift from close to distant combat was initially not well recognized. During the defeat of the Spanish Armada (1588), the Spanish concept of combat operations remained fighting a close-in battle by boarding enemy ships in a general *mêlée*. The English recognized the Spanish sailing skills, numbers, and close-in tactical abilities and, instead, kept their distance using long-range artillery to wreak havoc on the Armada.

The introduction of artillery on warships directly changed both the design of ships and how they would be used in battle. Eventually navies learned how to mass their firepower in the maritime battlespace and introduced the line of battle--similar to lines of battle found ashore. Today we still see surface ships fight distant battles using firepower, although with new technologies and without formal lines of battle.

The shift of paradigms to distant battle with artillery did not occur overnight. Boarding and hand-to-hand combat were initially considered a complement to artillery and lasted for many years. Although boarding and hand-to-hand combat may occasionally occur today, it rarely determines the outcome of a fleet engagement. Ramming also died out, although it resurfaced for a short time following its success at the Battle of Lissa (1866).

The subsequent development of rifled firearms and machine guns contributed to a new "revolution in military affairs" ashore--the demise of lines of battle in ground warfare and their replacement by the infantry skirmish and forms of "maneuver" warfare. The new weaponry increased the spatial and temporal scope of combat requiring better logistics support and planning. Imperial Germany attempted to master this new "revolution in military affairs" with its domination of Europe via the Schlieffen plan, with its assumption of short wars with quick decisive battles. Rather than a quick war of annihilation, however, Germany fought extended wars of attrition in World Wars I and II.

At sea, the introduction of rifled artillery, steam propulsion, armor, and modern communications systems all contributed to new combat uses for the fleet--but they did not constitute a "revolution in military affairs." New forms of warships appeared which had combat potential far exceeding their nominal tonnage--giving rise to the French *jeune école* (new school) theory of less capable forces. New designs of ships, such as *HMS Dreadnought*, could make obsolete entire national fleets. Fleet units could be rapidly ordered to temporarily mass for

decisive engagements. Navies were less at the mercy of the seas and could sail where they wanted rather than where the winds took them. Steam-powered transportation could affect the "maneuver" of strategic-level formations of ground forces.[1]

Navies, however, despite all of the infusion of technology, were still about "slugging it out" with an enemy line of battle in artillery duels. The Battle of Jutland (1916) remained the model to be studied at naval war colleges throughout the inter-War years, because fundamentally war at sea had not changed. Therefore, for every "revolution in military affairs" ashore, there is not necessarily a parallel one at sea.

The marriage of airplanes, tanks, and mobile artillery, gave rise to another shore-based "revolution in military affairs." The *blitzkrieg*, a form of "maneuver" warfare which doomed positional warfare, gave rise to the theory that rapid annihilation warfare could again be practiced ashore. Although Nazi Germany succeeded initially, and in many cases continued to at the operational and tactical-levels of warfare throughout the war, she was unable to win an extended <u>war</u> of attrition.

By the end of World War II, allied military forces were engaged in multiple simultaneous strategic-level combat actions in more than one theater of a global war. One of the most successful examples of *blitzkrieg* was the Soviet Manchurian Campaign (August 1945) of annihilation, which achieved the unheard of sustained rates of advance of up to 40-50 kilometers/day--and on individual days between 90-100 kilometers/day.[2] This campaign became a model for the type of "maneuver" *blitzkrieg* warfare that the West considered would be waged by the Warsaw Pact against NATO.

At sea, there was a "revolution in military affairs" that paralleled the *blitzkrieg*, but it was not exactly the same thing. The comparable development to the *blitzkrieg* was the development of the mobile fast carrier task force and its accompanying logistics train. Such forces were able to roam the oceans, virtually at will, in search of enemy battle fleets--which could be engaged by air and/or from under the sea at vast distances from one's own fleet. Alternatively, naval task groups could be formed to penetrate enemy shore defenses in their own form of "maneuver" warfare which bypassed strong points. The battle line and surface ships "slugging it out" finally died at Surigao Straits during the Battle of Leyte Gulf (October 1944), and naval artillery generally yielded to the airplane and the missile. Naval warfare had finally changed from the basic battle line artillery duel to a more complex form of combined arms warfare.

The most recent "revolution in military affairs" occurred when nuclear warheads were married with intercontinental delivery

systems. Due to the massive accumulation of nuclear weapons in the mid-1950s, the main and decisive arm of warfare had shifted from ground forces to nuclear forces. In the U.S., the Eisenhower Administration used the arrival of nuclear weapons as the justification for the "New Look"--a massive downsizing of conventional warfighting capabilities in the 1950s. Similarly, NATO chose to not field a credible conventional warfighting force capable of defeating the Warsaw Pact due to the potential of nuclear weapons as a substitute.

The post-War "revolution in military affairs" also caused nations to fundamentally re-evaluate existing military theory. There were those who said that nuclear warfare could not possibly be war in the Clausewitzian sense--there could never be any political purpose to it. Others questioned the need for any war termination strategy, since nuclear warfare would be totally irrational and therefore devoid of theory. Many disagreed and argued that all wars in the future between nuclear powers were automatically nuclear wars--it was just that the nuclear weapons might not yet have been used. Hence, nuclear weapons required policies, strategy, and doctrine for the continued deterrence of nuclear weapons during the initial conventional phase of future war.

There was a tremendous amount of literature generated in the former Soviet Union over the concept of a "revolution in military affairs" that had occurred at the end of World War II. This was because they had a large army which needed to be modified significantly to fight under the new technological conditions. For example, in 1946, there were still over 1 million horses in the Soviet Armed Forces--indicating a military in that era that still needed to give up the cavalry charge. The term "revolution in military affairs" was selected as a Communist Party slogan that would explain the changes in warfare that were required in the nuclear age.[3] An entire series of pamphlets was prepared by the Soviet Armed Forces in the 1960s-1980s which explained how the "revolution in military affairs" affected each branch of Service and combat arms.

In addition to the nuclear "revolution in military affairs," the Soviet military argued that there was an on-going final stage of the latest "revolution in military affairs"--that was caused by the introduction of radio-electronics and cybernetics. During the last years of the USSR, their military worried that advancements in technology would permit conventional ordnance to perform tasks previously assigned to nuclear weapons--resulting in another new "revolution in military affairs."

There has been a great deal of recent discussion over a "revolution in military affairs" with emphasis on the technical aspects of that revolution.[4] For example, a shift in paradigms

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occurred with the introduction of stealth technology into the air combat environment. Stealth allowed a shift from active to passive defense of individual aircraft. Due to increased costs and fewer numbers of platforms, stealth drove the need for even greater precision in delivered ordnance. With the capability to safely deliver conventional ordnance with increasing accuracy, we might be able to usher in a counter-"revolution in military affairs" in which nuclear weapons could be replaced with modern conventional ordnance--some of which could be delivered via unmanned systems. Such capabilities, in turn, could result in major shifts in doctrine, drastic shifts in military organizational development, and parallel shifts in programmatics.

The Basic Model of the "Revolution in Military Affairs"

The general, or basic, model is that new technological opportunities must be paralleled with organizational and doctrinal development. One very common approach to thinking about a "revolution in military affairs" is for industry, or the research community, to present new technological opportunities to the military--who will then consider development of new capabilities and a doctrine for their employment.[5] From these technological opportunities, major shifts have occurred in the very nature and theory of warfare--requiring new strategy, doctrine, and tactics.

A clear-cut example of technology leading a paradigm shift, and a "revolution in military affairs," was the introduction of artillery at sea. Naval artillery changed the fundamental nature of war at sea from close to distant battle. It also eventually required professional navies to master its potential and resulted in the demise of the privateer. The end of privateering, and the general dual use of commercial ships as warships, was a major paradigm shift for naval warfare.[6] All of these events were caused by opportunities afforded by technology.

"Revolutions in military affairs" also usually cause changes in military organization. In antiquity, the basic branches of combat forces included the infantry, chariot troops, elephant troops, and cavalry.[7] Infantry eventually learned how to defeat chariots and elephant troops, and these exotic formations disappeared from armies. Cavalry, although not as numerous as infantry, was the decisive branch. With time, cavalry became a supporting arm and eventually was replaced by new troops--armor.

As mariners mastered the "revolution in military affairs" that added artillery to ancient sail, navies were able to take on other missions and fleets were soon reorganized accordingly under national command and control.[8] Parts of fleets remained subordinate to the desires of European ground force commanders in need of support on their maritime flanks. Other naval forces,

including ground forces, were organized into distant water expeditionary forces. Some navy units were dedicated to the interdiction of the sea lines of communications and others for the protection of the sea lines of communications. Main battle fleets were retained to deal with the enemy forces.

With the marriage of tanks, aviation, and mobile infantry, other new types of ground force units were formed which capitalized on the doctrine of *blitzkrieg* warfare.[9] We now have mechanized infantry and aircraft in close support of armor. With the introduction of long-range ballistic missiles and nuclear weapons, some nations formed new and independent military Services to field these weapons. In those that did not create new Services, the operational chain of command for nuclear weapons release was distinct and separate from that of conventional warfighting, and new classes of weapons systems were created to carry the new weapons. For the first time, navies were capable of directly attacking the centers of gravity of continental powers and decisively determining the outcome of a global war.

Inadequate Doctrinal Development Can Stifle a "Revolution in Military Affairs"

Case studies demonstrate that there have been many opportunities lost for a "revolution in military affairs" when technologies have been available but military doctrinal development lagged behind. This suggests a rather strong relationship between the need for both technology and parallel doctrine development.

For example, we have the case of the French Army failing to adapt to the Belgian-invented, and French-developed, Montigny *mitrailleuse* (machine gun), first introduced during the Franco-Prussian War of 1870-71.[10] Although the *mitrailleuse* increased the effective firepower on the battlefield over the rifle by an order of magnitude, its introduction during this war failed to turn the tide of the war in favor of the French.[11] Although the introduction of the *mitrailleuse* alone might have swung the war in favor of France, its initial operational employment was judged as ineffective. The machine gun was, on the other hand, rapidly assimilated into the German and Russian ground forces and it was the Germans who were able to capitalize upon the technological opportunities presented by the machine gun and develop new and successful military doctrine.

There is a similar story to be told with the blending of the tank, aircraft, mobile artillery, and the radio into a powerful tool for "maneuver" *blitzkrieg* warfare--or the fast carrier task force counterpart at sea. Yet it was not the individual technological opportunities afforded by any one specific weapons system that constituted a "revolution in military affairs;" the

"revolution in military affairs" occurred when someone put together all of the pieces. Synthesis of how to use individual components occurred during doctrinal development.

Paradigm Shifts

There have also been less dramatic examples of major changes in warfare that do not meet the full criteria of a "revolution in military affairs," but are nonetheless significant. These major changes in how we go to war are more correctly described as paradigm shifts and will be considered next. For the purposes of this report, a paradigm shift is an important change in military policy, programmatics, strategy, doctrine, or tactics which is important, but does not fundamentally alter the nature of warfare.

Some examples of paradigm shifts are related to a concurrent "revolution in military affairs." For example, with the advent of modern aircraft with extremely accurate delivery systems, we no longer needed the capability, or doctrine, for massed bomber formations attacking enemy cities as was done in World War II. This paradigm shift in strategic bombardment was not significant enough to be a "revolution in military affairs," but it nonetheless was important. The bomber paradigm shift was due both to improved conventional delivery systems--creating the capability for precision strikes by single aircraft--and the understanding that strategic bombing would be carried out using nuclear weapons that did not need to be delivered so accurately.

With the nuclear "revolution in military affairs," some nations chose to forgo the manned bomber altogether and to rely, instead, on new long-range missile systems. Forgoing manned bombers required new strategic-level doctrine for the completion of strategic-level tasks. The paradigm shift to forgo the manned bomber and rely, instead, on missiles, was the result both of the nuclear "revolution in military affairs" and due to the qualitative improvements in antiaircraft defenses.

Nuclear propulsion, a by-product of the nuclear "revolution in military affairs," resulted in new opportunities for endurance and stealth, making it possible to deploy long-range missiles with nuclear warheads on submarines. In turn, this resulted in a major paradigm shift where navies were able to directly influence the outcome of general wars by strikes and the threat of strikes by the decisive weapons of war.

The nuclear "revolution in military affairs" spawned other concomitant shifts in existing paradigms; such as, how to best defend Europe, achieve strategic objectives against distant centers of gravity, and fight tactical engagements at sea. The Soviet Union, and subsequently NATO, considered the nuclear

"revolution in military affairs" so successful that it permitted the attainment of strategic tasks at a fraction of the previous cost--itself a derivative paradigm shift to maximizing the benefit/cost ratio. Benefit/cost analysis dominated Western programming during the Cold War. Concurrent with the multitude of paradigm shifts caused by the end of the Cold War was another making affordability as important as military capability.

Yet nations have faced severe budgetary restrictions before and managed to be both innovative and produce prototypes of new and sophisticated hardware--inter-War Germany being the classic case in point. Doctrinal and technological innovation continued in the U.S. even during the Great Depression. In other words, affordability need not stifle creativity. There is no reason that efforts to increase efficiency cannot be a part of a current "revolution in military affairs" or a paradigm shift undertaken during time of severe fiscal austerity.

Other major post-War paradigm shifts, such as the mass introduction of the jet engine into air forces, were not necessarily by-products of the nuclear "revolution in military affairs" and are not sufficiently significant to constitute their own "revolution in military affairs." For example, the jet engine resulted in increased aircraft speed requiring reduction in decision time for the man-in-the-loop. This paradigm shift has had an enormous impact on aviation, but is insufficient to be termed a "revolution in military affairs."

Recent Naval Paradigm Shifts

With the demise of the Cold War and its associated reductions in military expenditures has come a shift in the paradigm of fleet versus shore replacing fleet versus fleet. The most important message contained in ...From the Sea[12] was that the U.S. Navy was now focused on naval operations in the context of a joint task force involved in a major regional contingency rather than as a semi-independent force engaged in global conventional war. With this paradigm shift, the Navy shifted its focus from fleet engagements to power projection ashore, and the Naval Doctrine Command was founded to fully explore the implications of this shift.

The U.S. Navy and Marine Corps have now published their initial centralized multi-Service doctrinal publication, Naval Warfare, NDP-1.[13] This document serves as an overview and introduction to the more substantive follow-on doctrinal publications which will address naval intelligence, operations, logistics, planning, and command and control. Of note is the naval Services' embrace of the three levels of warfare, the concepts of center of gravity and critical vulnerability, and the

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principles of war--none of which are doctrine, but all of which
are major statements of policy.

The doctrine in *Naval Warfare* establishes that naval forces
will be task organized and will favor offensive and "maneuver"
warfare. It reviews the historical and current roles, missions,
and functions of the naval Services and highlights inherent
operational capabilities emphasized under current conditions.
Naval Warfare also commits the naval Services to full partnership
in joint and multinational operations. This commitment to
jointness and multinational operations itself is another example
of a major paradigm shift!

When the new attack submarine was first developed as an
alternative to the *Seawolf* SSN-21, programmatic directives made
it clear that capability was important, but more important was
cost. Similarly, naval aviation's stealth aircraft was doomed, in
part, by the budget cutter's ax because of this new paradigm,
regardless of the capability that the A-12 would have brought to
the fleet. This paradigm is still with us, and the Clinton
administration has made it clear that we need to free resources
if we are to build the "next Navy."[14]

Problems With the Existing Model of "Revolutions in Military Affairs"

Detailed examination of historical examples of "revolutions
in military affairs" suggests that the model of technology
leading a "revolution in military affairs" is inadequate. In some
cases, a new technology has not immediately been recognized as
causing a "revolution in military affairs" or for needing new
doctrine. The failure of knights and infantry during the Middle
Ages to adapt to the firearm is, perhaps, the classic case in
point.[15] The firearm was not initially recognized as having caused
a "revolution in military affairs." It took about four centuries
for these weapons to become perfected enough that the "revolution
in military affairs" was completed.[16]

During the Middle Ages, foot soldiers gradually lost their
ability to fight as cohesive units and were upstaged by the man
on horseback. Infantry continually searched for a solution to the
knight. Initial use of the firearm by both infantry and the
knights did not immediately cause major changes in the
fundamental nature of warfare. The Swiss Confederation
discovered, instead, that infantry could counter the man on
horseback by making improvements to tactical formations alone. In
short, a doctrinal solution was found to counter the threat of
the mounted knight.

The knight was countered by infantry squares, resembling the
old Macedonian phalanx, armed with an equally old technology--

very long pikes/spears--which permitted the foot soldier to withstand the charge of mounted horse. Having been kept at bay, the horse was attacked with hand weapons, resulting in the dismounting of the knight who then lay relatively helpless on the ground and vulnerable to attack by infantry.[17] These changes in tactical doctrine alone unseated the knight, although this lesson has been lost on history, and folklore persists that the demise of the man on horseback was due to the invention of the firearm.

The lesson of the study of the end of the age of knights is that improved military doctrine does not necessarily need to have a technological push/pull. Improved combat potential can be had by improving how to fight with existing, or even antiquated, capabilities and procedures. Eventually, however, the firearm was understood for what it was and the fundamental nature of warfare changed resulting in a "revolution in military affairs."

However, paradigm shifts do not necessarily have to come from technologies developed at that time--the knight was defeated by infantry using old techniques and weaponry. Similarly, it was the use of unsophisticated contact mines that caused the U.S. Navy to focus again on mine warfare--a paradigm shift for the U.S. Navy to again be seriously concerned with a lesser technological threat. The Strategic Defense Initiative (SDI) explored the use of optical sighting of incoming delivery systems.

Are there other capabilities and mature technologies that could be resurrected and used in "modern" warfare? Might not some of these "obsolete" methods of warfare result in a new "revolution in military affairs?" If the threat from non-state armed groups continues to develop, what good will be existing theories of warfare? If we are required to address a fundamentally new form of warfare, is this not a "revolution in military affairs?"

Even if we accept the leading role of technology in a "revolution in military affairs," emerging technologies do not necessarily need to be developed from independent original research funded by every Service. We can and should borrow liberally from technologies developed by others, such as existing technologies developed by one combat arm for use by another--or by one nation from another. We should also look at doctrine developed by other types of forces for similar problems. Advocates of a current "revolution in military affairs" appear to suggest the need for major new research programs when existing knowledge might be sufficient if applied in a new manner.

For example, modern stealth bomber doctrine could capitalize on the doctrine for the employment of equally covert submarines searching for and attacking high value and defended targets.

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Similarly, modern submarines planning to operate in closer proximity to underwater terrain might learn from the doctrine and technological needs of infantry. When Karl von Clausewitz stated that the means of protecting long lines of communications were very limited, he considered a standard solution to this dilemma at sea--the convoy--only a special means to be employed ashore.[18] Perhaps Clausewitz might have learned something from studying naval models. In short, rather than focusing attention on emerging technology in the research labs, military Services might better benefit from fielded technology deployed elsewhere.

By focusing on unexploited technologies, nations might skip entire development cycles--thus avoiding the need to develop their own "revolution in military affairs" technology base. For example, there was some degree of "borrowing" of American technology which stimulated the Soviet "revolution in military affairs" brought on by the marriage of long-range delivery systems and nuclear warheads. Furthermore, it is not clear that a military can advance from one basic form of warfare without first passing through the next stage. Could navies have moved directly from boarding and close-in battle directly to fast carrier battle groups without first having passed through the artillery stage? Can navies move from technology-based warfare directly into a fourth generation of idea-based warfare[19] without first mastering "maneuver" warfare?

An underlying assumption about "revolutions in military affairs" and paradigm shifts is that nations will undertake actions to capitalize upon new technologies. Hence, if the technology "genie" gets out of the bottle, we need a technology "fix." A more detailed study of technological opportunities which have been known to nations strongly indicates alternative models of national behavior.

For example, by the mid-1930s, the Imperial Japanese Navy (IJN) recognized that, despite all of the technological and industrial efforts being made to upgrade the fleet, their projected capabilities would not result in a force capable of meeting the rapidly improving U.S. Navy in a decisive battle at sea--both sides preferred doctrine for war at sea. The IJN, therefore, gave impetus to the development of night tactics and eventually formed specialized night combat groupings (*yasengun*) that could weaken the U.S. Pacific Fleet to such a degree that, subsequent to night battle between main fleets, daylight battle would be a foregone conclusion.[20]

Thus a technological threat was met with a doctrinal, and not technological, solution that theoretically negated the new technologies. In fact the IJN fought exceptionally well at night during World War II, frequently bettering the U.S. Navy, until the U.S. Pacific Fleet mastered radar. This prowess, however, was

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insufficient to offset the advantages that the Allied powers brought to the war in the Pacific.

Another example is, as the United States developed new technologies that could be used to enhance long-range nuclear missiles, the preferred solution by the Soviet Union was to ban the new technology with an arms control agreement. We saw similar behavior as the U.S. explored SDI. Most, but not all, nations have agreed to keep the chemical and biological warfare "genie" in the bottle and have not used such weapons.

Another model of responding to new technologies is to ignore them. Nations with the clear ability to participate in a "revolution in military affairs" have not always chosen to do so. Sweden has yet to develop its own nuclear weapons although it clearly has the potential to become a nuclear power.[21]

There are also examples of "revolutions in military affairs" that have probably no foundation in new technologies. For example, Napoleon Bonaparte caused a major paradigm shift in ground warfare when he successfully mobilized citizens to fight for ideas and not money.[22] The shift to mass armies caused a shift in the basic object of warfare ashore from seizure of territory to defeat of the enemy army. We fought under this paradigm in World War II and considered certain parts of the enemy economic base as legitimate military targets due to whole nations generally being mobilized for war.

Did technology have any role to play in causing this major paradigm shift in warfare--a shift to consider the entire nation as being in arms? Certainly, modern industrial capability was required for such an effort. Or did technology merely react to a new vision for warfare? Clearly technology allowed for the attacking of the full breadth and depth of an enemy nation and population. Some consider the Napoleonic nation in arms as a legitimate "revolution in military affairs." It is not at all certain that the Napoleonic "revolution in military affairs" was caused by technology.

There are some cases where technology has been given the opportunity to lead the way in developing new forms of warfare, but this new technology has been hampered because it was developed outside of government without an internal advocate. In such cases of a new vision of a future battlespace advocated by someone outside the "system," associated technology development often is opposed by those inside the government. When there is a lack of an internal constituency for systems for which a doctrinal, or other, need has not been established, paradigm shifts and "revolution in military affairs" take longer to occur.

For example, the technological opportunities afforded by the development of the light-weight radial aircraft engine were not appreciated by the Royal Navy during the inter-War years. Because of this, Great Britain, and the Fleet Air Arm in particular, suffered greatly early in World War II. Indeed, it was not until late in the war that the Royal Navy fully changed its concepts of operations to be centered around the aircraft carrier and changed the paradigm of warfare at sea.

On the other hand, the development of the light-weight radial aircraft engine was capitalized upon by the U.S. Navy and inter-War peacetime doctrinal development for carrier warfare greatly outpaced all other nations.[23] In the 1920s and 1930s, the U.S. Navy changed its view of operational art from decisive battle centered around the battleship to the ability to engage the enemy battle fleet as well as to affect the shore with the aircraft carrier. This change was permitted by the development of the radial aircraft engine and the development of new concepts of operations by a group of heretical officers who believed in the potential of naval aviation.[24]

Paralleling the technological innovation was a series of organizational developments that permitted the upward mobility of aviation officers into positions that allowed them to be in command during World War II. Similarly, the Bureau of Aeronautics was created to sponsor conceptual and technological development. These organizational changes facilitated fleet experimentation with the new technology. Fleet exercises were paralleled by development of concepts of operations and testing of those concepts at the Naval War College. The main battle fleet was sunk on December 7, 1941, but the U.S. Navy was able to quickly respond to the requirements of war with a new Pacific Fleet centered around the aircraft carrier. This reconstituted Pacific Fleet used the airplane as its main striking arm--because of the pioneering work done between the wars by a few believers in naval aviation. The "revolution in military affairs" at sea that paralleled the *blitzkrieg* arrived first in the U.S. and was then transferred to the Royal Navy.

The lesson here from the study of major military change, of course, is that doctrinal rigidity can have a marked negative influence on a military Service's appreciation of new warfighting opportunities afforded by a "revolution in military affairs."[25] One of the reasons that a "learning organization" can overcome the tendency to sidetrack new ideas into oblivion is that such organizations have a shared vision of improving an ability to create desired end states. Hence we need to explore the relationship of doctrine to new technologies that might cause a "revolution in military affairs."

The Need for a Theory of "Revolutions in Military Affairs" and Paradigm Shifts

Since "revolutions in military affairs" and paradigm shifts are not instantaneous, they need some theory to help them reach fruition. Perhaps we do not have centuries anymore, but we probably do have decades to understand, and to shape, any current or future "revolutions in military affairs." At a minimum, a theory of "revolutions in military affairs" and paradigm shifts should assess the integration of different and emerging technological opportunities on the horizon into existing bureaucratic organizations. Military Services should understand the general method by which they change and the role that various groups and organizations play in causing successful change.

New theory will need to address cases where new technologies are countered by doctrinal solutions alone--absent a "revolution in military affairs" or even a major paradigm shift. A theory of change in military Services needs to also address the many cases where they benefit from new and visionary approaches to warfare by gifted specialists, contributing to a "revolution in military affairs" or paradigm shift. A theory will also have to make use of case studies of failed paradigm shifts in addition to successful "revolutions in military affairs."

For example, a very interesting case study is that of the inter-War development of the dirigible. The Navy first developed concepts for warfare in the Pacific under the then-revolutionary organization of a "joint" Army-Navy war planning staff. The story of the brilliant work done in developing War Plan Orange and the subsequent Rainbow Plans is well known. As a part of that overall effort, the Navy recognized the need for long-range reconnaissance and surveillance of Japanese home waters. The inadequate technology of the time--dirigibles with onboard fighters, however, did not meet the needs of the fleet. Fulfilling the requirement for distant surveillance had to await the development of long-range patrol aircraft, subsurface, and space assets.

The excellent ideas developed by Major Earl H. Ellis, USMC, for expeditionary amphibious operations across the Pacific in support of War Plan Orange languished on the shelf until the intervention of Commandant of the Marine Corps General John Russell. General Russell retired senior officers not willing to make the shift in paradigm to amphibious warfare. The Marine Corps needed only to borrow the technology from Japan that permitted the development of modern amphibious landing craft and ships.[26] This case represents both a failure to change the paradigm and subsequent success.

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Another case study example of a changed paradigms involves the World War II U.S. Navy submarine service. Although a group of submarine officers explored alternative concepts of operations for their combat arm prior to the outbreak of the war,[27] submariners generally entered the war: prepared to be integrated with the battle fleet; to be used against combatants; and with a doctrine that assumed their antisubmarine adversary would be able to sink them if he attacked. During the initial period of the war in the Pacific, each of these three conditions changed. The submarine operated on its own on long and distant patrols. The targets for submarine attack shifted to merchant ships that generally did not fight back. Finally, submariners learned that enemy antisubmarine capabilities were not as good as expected and their own ships stood up well to attack. The sum total of each of these three major changes was that the submarine could be used in a manner not necessarily well exercised before the war--boldly, on the surface at night, with immediate re-attacks rather than attack and hide. The submarine service officer corps had to go through a major internal catharsis during the war itself-- commanding officers who were unable to adapt to the new bold wartime paradigm were cashiered.

There are three major concepts included in a paradigm shift: (1), the idea; (2), the messenger; and (3), a senior officer who would permit its development. The first American to understand that the striking power of aircraft at sea could equal that of the battleship was Lieutenant Commander Henry C. Mustin, USN. Both Mustin and Ellis needed senior flag and general officers within the established organization to protect their new ideas and allow them to grow.[28] The two officers found their protectors in the form of Rear Admiral William Moffett, USN, in the case of naval aviation, and General John Russell, USMC, for amphibious operations.

The experiences of Spanish Vice Admiral José de Mazarredo Salazar strongly suggest that just having the good idea is simply not enough. De Mazarredo was the author of excellent doctrinal works and many good recommendations for improvement of the Spanish fleet prior to the defeat at Trafalgar (1805). Although de Mazarredo was never defeated at sea, and thus had the credibility of a proven warrior, his outspoken criticism of the state of the fleet, and its lack of combat preparedness, as well as his audacity in questioning Spanish foreign policy, doomed all of his good ideas to the history books. Despite his good ideas, de Mazarredo did not cause any actual improvement in the combat potential of the Spanish Navy.[29]

Even with gifted personnel in the various levels of the bureaucracy, it is often the organizational climate and position within the bureaucracy itself which can doom good doctrinal development, and therefore advancements in "revolutions in

military affairs" or changes to paradigms. For example, the
distinctly secondary place afforded to the IJN directly led to
the lack of sound navy warfare capabilities development. Coupled
with a number of missed opportunities, this lack of good
doctrinal development eventually led to the defeat of Japan in
World War II.[30] Had the IJN, or similarly the Royal Navy in the
case of carrier aircraft development, been allowed to pursue what
warfare specialists knew were important mission areas, the
performance of both of these Services during World War II might
have been better.

Changes to military doctrine, new combat paradigms, and
recognition of "revolutions in military affairs" will always be
somewhat difficult due to the inherent personality types
attracted to senior government and military service.[31] The average
army colonel or navy captain is, by his very nature, less
perceptual than judgmental as well as more analytic than
concerned with human issues. That will make him or her less
likely to respond well to innovation which threatens to upset the
established order and structure. Yet innovation in military
doctrine and paradigms is needed if we are to avoid the negative
lessons of history. That would imply that psychological traits of
senior military officers are at least as important as their
tactical and combat experience and their education and training.

Relationship of Military Doctrine to "Revolutions in Military
Affairs" and Paradigm Shifts

The basic model of a "revolution in military affairs," with
its leading role afforded to technology, is incomplete.
"Revolutions in military affairs" and paradigm shifts are not
wholly responsive to technology--they can also be stimulated by
doctrinal development. New doctrinal concepts can create a kind
of "vortex," or they can start a cycle, during which doctrine
pulls on the future development of technology. Advances in
technology would then, in turn, result in subsequent alterations
to organization and doctrine.

In such an alternative case, military leaders have first
outlined a vision, concepts, or doctrine for warfare that a
nation would like to fight, and then, secondly, refined this
vision in terms of capabilities desired--a concept-based
requirements system. The role of industry, under this approach to
a "revolution in military affairs," is to respond to these
visions, concepts, and doctrinal development. President Ronald
Reagan's visionary speech on the SDI is a classic example of such
an approach.

In this type case of a vision from a leader, the
conservatism of the bureaucracy often engenders a significant
risk of missed opportunities to exploit emerging technologies.

Hence, if we are to use visions from leaders, we must also have a theory for how visions are translated into actual change within large bureaucratic organizations. Our theory should draw upon the excellent work that has been done with business schools in their investigation of "learning organizations" and the special skills required of leaders in such organizations.[32]

An excellent example of military doctrine leading technology is that of Japan during the inter-War years. The IJN had a doctrine for deep ocean battles, preferably within a short war of annihilation. The IJN generally insisted on technological superiority in each individual weapons system that it produced. This resulted in a search for new technological opportunities to carry out the preferred vision of the future battlespace. As a result of this leading role of doctrine, the IJN fielded the *Yamato* class super-battleship and the Mitsubishi Zero fighter-- two of numerous examples of good doctrine leading to excellent fielded technology that was useful in war.[33] Is this not essentially the same model for the relationship of doctrine to technology that governed U.S. Navy programming since World War II?

The U.S. Army appears to accept this exact model of doctrine leading "revolutions in military affairs." The U.S. Army Training and Doctrine Command [TRADOC] recently issued a new pamphlet, *Force XXI Operations*, TRADOC Pamphlet 525-5, which attempts to use doctrine to shape the on-going "revolution in military affairs" with a visionary statement of the future battlespace.[34] This pamphlet was followed by a more authoritative one, with an "Introduction" signed by the Chief of Staff and the Secretary of the Army, which also makes this point.[35]

The basic model of a "revolution in military affairs" is also flawed in its fundamental assumption that doctrine depends upon technology as its major input/output. For example, the Napoleonic "revolution in military affairs" was probably more a product of political, social, and economic conditions than it was due to any specific military technology. Hence, we need to look at these other type of factors which have an impact on doctrine in order to understand how doctrine influences "revolutions in military affairs" and paradigm shifts.

How Doctrinal Inputs Influence "Revolutions in Military Affairs" and Paradigm Shifts

When reviewing where doctrine originates, or what influences doctrine, we learn that technology is merely one of many possible inputs.[36] These other inputs include: current policy, available resources, current strategy and campaigns, current doctrine, threats, history and lessons learned, strategic culture, geography and demographics, and types of government. If doctrine

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merely follows the push or pull of new technology, then it will miss the opportunity to develop new concepts of combat operations--and new doctrine--based upon all other inputs. Let us consider some good examples of other factors, besides technology, which have recently changed doctrine.

First, nations often make major changes to doctrine and organization after reviewing newly published policy and strategy--without any consideration of new technology. This is exactly what happened when the U.S. Navy and Marine Corps founded the Naval Doctrine Command (NDC) after they published a major white paper, ...From the Sea. The United States shifted its interests in the world from a primary focus on containment of communism and the USSR to more diverse and regional interests. With this change in interests came alterations in focus on different types of warfare. Similarly, the U.S. Navy has changed its focus from open-ocean deep water operations to joint operations in the littoral and "maneuver" warfare. With changes to policy alone came new doctrine and organizations, such as NDC, and interest in new technologies to support new warfare interests. If there is an on-going "revolution in military affairs," it will be affected by the current interests of the U.S. Navy and Marine Corps in "maneuver" warfare doctrine.

Normally, when a new type of technology is introduced in the military, some existing organization acts as its initial sponsor. Later, as the technology is refined and a doctrine is formulated for its use, a separate organization is created whose central identity is that new technology. Witness the evolution of offices responsible for naval aviation during the inter-War years. Such new offices need to evaluate new technologies within the framework of a doctrine for their intended use.[37]

In cases where a doctrinal concept precedes a demonstrated technology, an organization may come about to manage both doctrine and technology development. A good example of this is the Strategic Defense Initiatives Office (SDIO) which was forced to develop the doctrine for war in space absent any other organization charged with such doctrine development. Today, we have seen the U.S. armed forces create a series of doctrine organizations, centers, and commands that are all charged with the improvement of how we fight. None of these new organizations came into being due to the need for the management of new technology. All of these new organizations have the license to develop new doctrinal concepts which can shape the development of new technology.

Second, there is ample evidence that nations have made major changes in doctrine after understanding the latest decisions of resources to be made available to the military Services--resource decisions that are not dependent upon new technologies. The 1993

changes in U.S. Army doctrine from the AirLand Battle version of FM 100-5[38] came directly as a result of a drastic change in the amount of resources that were going to be applied to the Armed Forces and not any technological opportunities. Similarly, the U.S. Air Force is exploring the concept of "maneuver" warfare as a result of similar budget decisions.[39] Hence each of these other two Services have changed their doctrine due to budgetary reasons--and this new doctrine influences their view on any on-going "revolution in military affairs." Simply put, if we cannot afford much new technology, will we have to postpone any on-going "revolution in military affairs?"

Third, another trigger for changes to doctrine is newly published military doctrine and campaign concepts--some of which are resultant from existing and not new technology. As the Naval Doctrine Command publishes its multi-Service doctrine for the U.S. Navy and Marine Corps, it will have a direct impact on Service-unique doctrine issued by each of those military Services. A case in point is the "maneuver" warfare doctrine found in NDP [Naval Doctrine Publication]-1, *Naval Warfare*. First adopted as part of multi-Service naval doctrine, the concept of "maneuver" warfare will next find itself articulated in doctrine for the U.S. Navy.

Similarly, new joint doctrine will impact on multi-Service naval doctrine. As joint campaign concepts are developed by the new U.S. Atlantic Command (USACOM), they will affect all forms of joint, multi-Service, and Service-specific military doctrine. The doctrine of the U.S. Air Force has been directly influenced by the exploration of "maneuver" warfare concepts by the U.S. Army. Should the U.S. Army succeed in development of their vision for mobile strike forces, such new doctrine would obviously again affect air power doctrine. Hence doctrine from outside one's own military Service can have an enormous effect on the desire for a "revolution in military affairs."

As long as the Services have primary control over programmatics, they will retain the development of programmatic doctrine, i.e. doctrine which supports programming and is not necessarily reflective of how they will actually fight. Operational combat doctrine, however, is the province of joint doctrine. For example, the U.S. Marine Corps has fully embraced "maneuver" warfare doctrine, but such doctrine is not yet a part of joint or multinational doctrine for actual warfighting. If only the Services embrace a "revolution in military affairs," we will not necessarily see a change to operational combat doctrine.

Recent attempts to make the Chairman of the Joint Chiefs of Staff more directly responsible for a military programmatic input to the annual budgetary debate will constitute a major paradigm shift and will directly enhance the influence of joint doctrine.

Efforts being made by the current Vice Chairman include an enhanced role for the Joint Requirements Oversight Council (JROC) to actually set overall military programming priorities.[40] In the programmatic world up until now, Service doctrine was dominant. If joint doctrine is to take predominance over Service doctrine, then we will need major changes in joint doctrine--to address future, and not just current, warfare concepts.

Fourth, a major cause of revised military doctrine can be reviews of actual and emerging threats--especially those not foreseen during the previous programmatic year. Before any war, there is an expected enemy against which military doctrine is designed. When the intelligence community has misrepresented the capabilities of the enemy, it is likely that prewar doctrine has suffered. For example, prior to World War II, naval intelligence rated Japanese antisubmarine warfare capabilities much greater than subsequently demonstrated during the war. Naturally there are always difficulties with capability versus intentions estimates. Paralleling this misunderstanding, however, the U.S. submarine force thought that its submarines were extremely vulnerable to fielded antisubmarine warfare weapons--again proven false under combat conditions.

Put together with the inherent conservatism demanded by peacetime exercises, the submarine force developed a stealthy and cautious doctrine which had to be discarded upon analysis of combat lessons learned. It also meant that the submarine force had not extensively practiced for long combat patrols, and they had not developed tactics for the types of attacks which would become commonplace during the war. Hence, it is likely that we will not develop the correct doctrine for actual warfighting, and thus miss opportunities for "revolutions in military affairs," unless the military Services fully support programming in support of intelligence.

Today, the nature of the expected enemy has changed dramatically. We no longer face the Soviet Union and cannot treat all other threats as lesser included cases. Our threat challenge is extremely complicated today as is the challenge of attempting to model the behavior of the wide diversity of potential actors with which we will have to interact in the future. In the past, we had the luxury of a well-developed concept of operations by the expected enemy and the benefit of campaigns and operations planned by a long-standing alliance structure.

Today, we lack the internal resources to accurately predict the behavior of every potential enemy. Our commanders will have to deal increasingly with non-governmental organizations, including private volunteer organizations, and an aggressive and technologically sophisticated media not dependent upon government for information. In such an environment, will we develop doctrine

based on old threats that we know, generic new threats, or threats based on someone's estimate of the "most likely" future threats? If we judge the most likely enemies of the future, is it safe to assume that the real new "revolution in military affairs" is that we can generally plan to be able to do almost anything militarily that we want against any Third World enemy? If that is the case, then why do we need a "revolution in military affairs?"

A _fifth_ way that doctrine changes is by a review of the lessons of history. For example, the doctrine for military planning was changed in many nations of the world once they reviewed the victories of Prussia in the Seven Weeks War (1866) against Italy, Austria, Hanover, and Bohemia and in the Franco-German War (1870-1871). Dramatic and rapid campaigns of annihilation caused intense analysis of the Prussian victories with a consensus that the General Staff had been to a large degree responsible.[41] This in turn led to a world-wide imitation of the Prussian General Staff--a major paradigm shift.

Although one might assume that nations first review military history and lessons learned, it is plausible that doctrine has been developed prior to the full analysis of such studies. When nations start up new doctrine centers and commands, it is likely that they will take a comprehensive look at previous doctrine history--which may not have been done. When full appreciation of prior lessons is available to doctrine writers, this can lead to a new vision of future warfare which, in turn, can stimulate a "revolution in military affairs."

Sixth, one would expect that doctrine writers have made full use of prior studies of the strategic culture of existing nations prior to the preparation of their doctrine. In recent time, we have seen newly emerging nations created out of old nations, with the strategic culture of that new nation not necessarily reflecting immediate history. In such cases, the new nation has the opportunity to make significant doctrinal changes because of the change in make-up of the population, geography (borders) and/or government. Even changes in government alone have afforded nations the opportunity to make major doctrinal changes. One of the best examples of this is the change in navy doctrine in France following the replacement of the Vichy regime by that of the Fourth Republic.[42]

In the days when the Soviet Union faced NATO and saw itself essentially encircled by imperialism, it had military doctrine appropriate for the high technology adversary. Today, Russia can afford to develop a series of parallel military doctrines assuming they have technological inferiority in the Western theater of military operations and alternately with themselves with technological superiority in the Southern theater.[43] This change in the threat has afforded new doctrinal development and

perhaps a doctrinal "revolution in military affairs" similar to that proposed above.

Formal navy doctrine suffered a setback with the introduction of new technologies and the end of the Anglo-Franco wars during the age of sail. Navy doctrine was developed and frequently refined during the wars between Britain and France over hundreds of years. During the age of sail, there were long periods of warfare with essentially the same technology--hence improvements to navy warfare came via other avenues of advancement. Additionally, modern recruitment techniques had yet to be discovered--hence improvements in personnel and leadership was not yet the way to improve combat potential. Advances in the naval art had to come in the area of doctrine. Debates over navy doctrine and the existence of written doctrine was normal practice. As navy doctrine advanced, so did combat potential.[44]

Since the early part of the 19th century, two events have had a profound effect on the nature of navy doctrine: technology and the frequency and participants of war itself. From the time of the introduction of the ironclad, navy technology has changed so fast and so often that navies have not had the time to deal with doctrinal issues for forces on hand. By the time of the Battle of Lissa (1866) between Italy and Austria, warship designs were advancing before navy doctrine could be re-evaluated and re-written. Navies turned more of their attention to dealing with improvements to naval art and combat potential by improvements in technologies, programming, rather than how to fight "smarter."

Conclusions

Many non-technological factors can result in new concepts for military doctrine which would have a major impact on "revolutions in military affairs." All of these issues need to be considered by doctrine commands and centers if there is to be a true doctrinal renaissance as an integral part of a "revolution in military affairs." As navies get more comfortable with the concept of centralized written doctrine, they will have many opportunities to develop new doctrinal concepts with ideas that originate outside of the realm of technology.

More often than we would like to admit, new technologies have been introduced for which there was no accepted military doctrine for their use. Hence, improvements to combat potential increasingly came to be seen as the result of effective programming skills rather than skills in assessing warfighting doctrine. Today, we need to shift our focus to other, less expensive ways of improving combat potential, other than with the introduction of new technologies--in short, Navy doctrine as a force builder. The continued search for "silver bullets" in new

technology threatens to distract us from perfectly good solutions without "revolutions in military affairs."

The difficulty in changing paradigms, doctrine, and recognizing "revolutions in military affairs" can be best studied with detailed and fully developed case studies that result in specific lessons learned. For example, Stephen Rosen's *Winning the Next War: Innovation and the Modern Military* is about change in military organizations.[45] This excellent book has a number of cases which provide the military doctrine supervisor with a quick overview of the problems of change during peacetime, during war, etc.

To really get into the heart of change, however, more in-depth book-length individual case studies need to be consulted. An excellent example of an in-depth analysis of one organization and its attempt to come to grips with a new technology can be seen in Harold R. Winton's, *To Change an Army: General Sir John Burnett-Stuart and British Armored Doctrine, 1927-1938.*[46] After studying such in-depth cases, one can more easily accept the need for recommendations contained therein, such as: support at the top, a mechanism for the building of consensus, and a "learning organizational" climate that accepts rational analysis as the basis for doctrine and force structure.

"Learning organizations" are those where the individuals within "...continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together." "Learning organizations" also have a shared vision of the future--indeed a shared vision is one of the five cornerstones necessary for such organizations.[47] The German Army was a "learning organization" during World War I when they assessed recent combat experience and then made changes to their combat doctrine while the war progressed. Must an organization be a "learning organization" if it is to successfully adopt "maneuver" warfare as its doctrine?

Whether there is a current and on-going "revolution in military affairs" is still being debated. What will be the next paradigm has yet to be decided. What we do know, however, is that "revolutions in military affairs" and paradigm shifts will occur. We need to manage these changes and create process and organization to deal with such issues. Naval Doctrine Command is such an organization that is concerned with managing change. Good doctrinal development can create "revolutions in military affairs."

We need to change the Navy into a "learning organization" that has a shared vision of the future--as well as a shared

vision to continuously improve. Leadership in such organizations is more like that required of process designers, stewards of the vision, and teachers who foster learning. The new type of leader is charged with building an organization "...where people continually expand their capabilities to understand complexity, clarify vision, and improve shared mental models...[48]

The next paradigm is what we must now consider. Will it be a logical outgrowth of the ongoing "revolution in military affairs" and the recognition of the importance of affordability or the opportunities permitted by stealth? Will this paradigm be a result of new technological opportunities, such as unmanned air and subsurface vehicles? Unmanned systems allow distant decision making, reduced costs, and subsequent changes in cost versus risk calculations. Will a new paradigm be oriented on speed--hypersonic vehicles? Increased speed will again reduce decision times and make fundamental changes in basing requirements. Increased range affords the more grandiose theories of air power once advocated by Alexander DeSeversky and Billy Mitchell. Or on the other hand, is the new warfare paradigm framed by ideas and the information explosion? It is very likely that fourth generation warfare, idea-driven or information-based warfare, is indeed a major paradigm shift away from warfare based upon technologies. Whatever the new paradigm, one must not overlook the leading role that can be played by doctrine in stimulating technological development.

The model for doctrinal development in support of paradigm shifts and "revolutions in military affairs" is to first communicate a vision of the future battlespace, then to develop concepts for operations, then to test those operations by interactions with the fleet and analytic community, and then to develop prototype doctrine. From approved doctrine can come hardware and software requirements as well as direct improvements in combat potential irrespective of technological change.

The introduction of new ideas within the military and the management of change to a new paradigm is a difficult task requiring both combat leadership skills and experience as well as the administrative and bureaucratic skills of the Washington infighter. We need the good ideas, the temperament of combat-experienced leaders, and the administrative skills to ensure the new ideas are accepted and implemented by the Navy.

Notes

1. During World War I, France transported by sea a half-million colonial soldiers and two hundred thousand workers to aid her in her hour of need. This was in addition to two million U.S. troops received by sea from North America.

2. General-Lieutenant P.A. Zhilin, ed., *The History of Military Art*, Moscow, *Voyenizdat*, signed to press 23 January 1986, (JPRS-UMA-87-004-L, 27 March 1987, p. 233); and V. Larionov, et. al., *World War II: Decisive Battle of the Soviet Army*, Moscow, Progress Publishers, 1984, p. 510.

3. Harriet Fast Scott and William F. Scott, *The Armed Forces of the USSR*, 3rd. ed., Boulder, CO: Westview Press, 1984, p. 48.

4. Colonel David Jablonsky, USA (Ret.), "US Military Doctrine and the Revolution in Military Affairs," *Parameters*, 24, no. 3 (Autumn 1994): 18-36. In April 1994, the U.S. Army War College and the Strategic Studies Institute (SSI) hosted a conference called "The Revolution in Military Affairs: Defining an Army for the 21st Century." A number of papers presented at this conference have now appeared as SSI monographs. for example, see: Jeffry R. Cooper, "Another View of the Revolution in Military Affairs," July 15, 1994; Paul Bracken and Raol Henri Alcalá, "Whither the RMA [revolution in military affairs]: Two Perspectives on Tomorrow's Army, July 22, 1994; and Steven Metz and James Kievit, "The Revolution in Military Affairs and Conflicts Short of War," July 25, 1994; all published by the U.S. Government Printing Office, 1994.

5. Lieutenant General Philip D. Shutler, USMC (Ret.), "Thinking About Warfare," *Marine Corps Gazette*, 71, no. 11 (November 1987): 18-20; Captain John W. Bodnar, USNR, "The Military Technical Revolution: From Hardware to Information," *Naval War College Review*, 46, no. 3 (Summer 1993): 7-21; Paul Bracken, "The Military After Next," *The Washington Quarterly*, 16, no. 4 (Autumn 1993): 159; and Commanders James R. FitzSimonds and Jan M. van Tol, USN, "Revolutions in Military Affairs," *Joint Force Quarterly*, no. 4, Spring 1994, p. 24-31.

6. The parallel ashore to privateering was the *condottieri*. Originating in Italy during the 14th and 15th Centuries, the *condottieri* were a mixture of entrepreneurs and warriors. They eventually spread to France, Spain, Alsace, and Switzerland. Their ultimate demise came about with the formation of standing mercenary armies and not due to some technology. See: Karl von Clausewitz, *On War*, O.J. Matthijs Jolles, trans., New York, NY: The Modern Library, 1943, p. 577; and Hans Delbrück, *History of the Art of War, Volume III: Medieval Warfare*, Walter J. Renfroe, Jr., trans., Lincoln, NE and London, UK: University of Nebraska Press, 1985 [original German version published in 1923], p. 506-508; and *History of the Art of War, Volume IV: The Dawn of Modern Warfare*, Walter J. Renfroe, Jr., trans., Lincoln, NE and London, UK: University of Nebraska Press, 1985 [original German version published in 1920], p. 16-17, 224.

7. General-Lieutenant P.A. Zhilin, ed., *The History of Military Art*, Moscow, *Voyenizdat*, signed to press 23 January 1986, (JPRS-UMA-87-004-L, 27 March 1987, p. 6-7).

8. General-Colonel F.F. Gayvoronskiy, ed., *The Evolution of Military Art: Stages, Tendencies, Principles*, Moscow: *Voyenizdat*, signed to press 4 May 1987 (JPRS-UMA-89-012-L, 12 October 1989, p. 32).

9. General-Major K.V. Zababashkin, "The Structure and Organization of Formations, Units, and Subunits of the Armed Forces," *Scientific-Technical Progress and The Revolution in Military Affairs*, Colonel-General N.A. Lomov, ed., Moscow, USSR: *Voyenizdat*, signed to press November 15, 1972, translated and published under the auspices of the U.S. Air Force, Washington, DC: U.S. Government Printing Office, 1980, p. 113-115.

10. *Generalmajor* Frederick William von Mellenthin and R.H.S. Stolfi with Colonel E. Sobik, *NATO Under Attack: Why the Western Alliance can Fight Outnumbered and Win in Central Europe without Nuclear Weapons*, Durham, NC: Duke University Press, 1984, p. 12-16.

11. The reason for its failure on the battlefield was primarily that the French Army guarded their new capability too well and they were caught up in the technical details of development. The French Army failed to devise an effective doctrine for the new weapon or to test various tactics. Furthermore, the *mitrailleuse* was assigned to artillery units where it was viewed as a rather short-range weapon that was extremely vulnerable to counter-battery fire.

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