

TRANSFORMING THE U.S. ARMED FORCES

Rhetoric or Reality?

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The leadership of the Defense Department has enthusiastically endorsed the proposition that the growth and diffusion of stealth, precision, and information technology will drastically alter the character and conduct of future wars, yielding a revolution in military affairs. President George W. Bush campaigned on a pledge to transform the U.S. armed forces by “skipping a generation” of technology. A month after assuming office, he promised in a speech at the Norfolk Naval Base to “move beyond marginal improvements to harness new technologies that will support a new strategy.” He called for the development of ground forces that are lighter, more mobile, and more lethal, as well as manned and unmanned air forces capable of striking across the globe with precision.¹

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Secretary of Defense Donald Rumsfeld stated during his confirmation hearings that his central challenge would be to “bring the American military successfully into the 21st century.”² Soon after assuming office, Rumsfeld commissioned Andrew W. Marshall, the Pentagon's premier strategic thinker, to conduct a fundamental review of American strategy and force requirements. The review reportedly recommended that the Defense Department emphasize forces capable of fighting and winning wars in Asia, with its vast distances and sparse infrastructure, in the face of increasingly challenging threats.³

Speaking at the U.S. Naval Academy in May 2001, President Bush called for “a future force that is defined

less by size and more by mobility and swiftness, one that is easier to deploy and sustain, one that relies more heavily on stealth, precision weaponry, and information technologies.” He also committed himself “to fostering a military culture where intelligent risk-taking and forward thinking are rewarded, not dreaded,” and to “ensuring that visionary leaders who take risks are recognized and promoted.”⁴

The U.S. armed forces themselves have embraced—at least rhetorically—the need to transform so as to meet the demands of information-age warfare. They have fielded new capabilities, such as stealth and precision strike, and explored novel approaches to combat, such as network-centric warfare and effects-based operations. Nevertheless, significant organizational barriers to the adoption of new technology, doctrine, and organizations exist. The services have been particularly reluctant to take measures that are disruptive of service culture, such as shifting away from traditional platforms and toward new weapon systems, concepts, and organizations. The Army’s attempts to field a medium-weight ground force, the Navy’s development of network-centric warfare, and the Air Force’s experience with unmanned air vehicles illustrate such difficulties. In each case, efforts at transformation have faced opposition from service traditionalists who perceive threats in new ways of war. For the Defense Department to succeed in transforming the U.S. armed forces, it must both reallocate resources and nurture new constituencies.

THE CHARACTER OF WAR IN THE INFORMATION AGE

Recent years have witnessed the rapid growth and diffusion of information technology. It is radically changing the structure of advanced economies, the nature of politics, and the shape of society. It is also shifting the ways in which wars are fought. What many refer to as the emerging revolution in military affairs (RMA) is merely the military manifestation of the information revolution. The shape, scope, and strategic impact of the revolution is uncertain. Still, the experience of recent conflicts, together with trends in the development of technology, suggests changes in the conduct of war on land, at sea, and in the air, as well as the growing use of space and the information spectrum for military operations.

One trend that is already apparent is the ability to achieve new levels of military effectiveness by networking together disparate sensors, weapons, and command-and-control systems. Rapid advances in information and related technologies already allow military forces to detect, identify, and track a far greater number of targets over a larger area for a longer time than ever before. Increasingly powerful information-processing and communication systems offer the ability to distribute this data more quickly and effectively. The result is a dramatic improvement in the quantity and quality of information that modern

military organizations can collect, process, and disseminate. In the future, as in the past, forces that can secure a superior understanding of their own dispositions, those of their adversaries, and the features of the battlefield will be at a considerable advantage.⁵

In a number of instances, the U.S. armed forces have attempted to explore how improvements in situational awareness can increase combat effectiveness. From September 1993 to September 1994, for example, the U.S. Air Force con-

It would be wrong to view the services as uniformly opposed to fundamental change. Rather, each service is split between traditionalists and elements who are enthusiastic about new ways of war.

ducted an experiment that pitted eighteen F-15Cs equipped with Joint Tactical Information Distribution System (JTIDS) terminals against unmodified F-15s. JTIDS provided a datalink that allowed each modified F-15 to share its

sensor and threat data with all the others. Their unmodified opponents were supported by E-3A Airborne Warning and Control System (AWACS) aircraft but could share information only by voice radio. The enhanced situational awareness provided by JTIDS allowed the modified F-15s to achieve an exchange ratio that was in their favor by a factor of around 2.6.⁶

The increasing use of information technology portends a significant shift in the balance between offense and defense, fire and maneuver, and space and time. Militaries that harness the information revolution are already at a marked advantage in comparison to those that do not. The Gulf War hinted at the battlefield advantages that accrue to armed forces that capitalize on stealth, information, and precision weaponry. Nato's air war over Serbia stands out as another demonstration of at least the tactical effectiveness of advanced military technology.

The integration of information technology into military forces is also changing the relationship between fire and maneuver. Networking long-range sensors and weapons allows us to concentrate fire from dispersed platforms on a common set of targets. The U.S. Navy, for example, has examined the "Ring of Fire," a concept for focusing dispersed naval fire on shore-based targets.⁷ Networking thus allows the potential massing of effects without massing forces. It could also reduce vulnerability by denying an adversary the ability to target forces with his own long-range strike systems, while increasing the tempo of military operations by reducing the delay between observation and action.⁸ By operating faster than adversaries, a networked force may effectively deny them battlefield options.⁹ These trends favor networked forces that are small, agile, and stealthy over hierarchical organizations that are large, slow, and nonstealthy. Should the U.S. armed forces exploit these trends, the United States will gain increased

tactical, operational, and—potentially—strategic leverage over potential adversaries.

While the United States currently enjoys a considerable lead in exploiting the information revolution, it is hardly alone in attempting to do so. Indeed, the list of militaries interested in information-age warfare is long and growing. Some may develop strategies to deny foes the ability to project power into their spheres of influence.¹⁰ Others may challenge the United States in space or the information spectrum. Moreover, their ability to do such things is growing. The director of the Defense Intelligence Agency, for example, has testified that Russia and China, as well as other smaller states and nonstate actors, are pursuing capabilities to disrupt, degrade, or defeat American space systems.¹¹ Similarly, one recent article assessed that twenty-three nations have the ability to launch information-warfare attacks.¹² Failure to meet such threats could lead to a military that is increasingly irrelevant to the types of wars that the United States will fight.

Past revolutions in warfare have changed not only the character and conduct of combat but also the shape of the organizations that wage war. The emergence of new ways of war has altered the importance of existing services, and combat arms triggered the rise of new elites and eclipsed previously dominant ones. During the first half of the twentieth century, for example, naval aviation assumed a central role in war at sea. As the aircraft carrier displaced the battleship as the centerpiece of modern navies, naval aviators challenged the traditional dominance of surface warfare officers. During the same period, the advent of land-based aircraft created new elites within armies and eventually spawned new military services. Armored forces usurped the roles of cavalry in armies across the globe. The information revolution portends similar organizational turbulence as the character of war on land, at sea, and in the air changes and as combat spreads to space and the information spectrum.

THE U.S. ARMED FORCES AND THE EMERGING RMA

The Department of Defense has declared its recognition of the need to change radically the structure of the U.S. armed forces in order to embrace the information revolution. The 1997 Quadrennial Defense Review committed the department to transforming its forces. As then-Secretary of Defense William Cohen put it:

The information revolution is creating a Revolution in Military Affairs that will fundamentally change the way U.S. forces fight. We must exploit these and other technologies to dominate in battle. Our template for seizing on these technologies and ensuring military dominance is Joint Vision 2010, the plan set forth by the Chairman of the Joint Chiefs of Staff for military operations of the future.¹³

The congressionally mandated National Defense Panel argued even more strongly in favor of the need to transform U.S. forces. The panel's report urged the Defense Department to "undertake a broad transformation of its military and national security structures, operational concepts and equipment, and . . . key business processes," including procurement reform.¹⁴ It recom-

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mended, among other things, that the department accord the highest priority to a transformation strategy designed to prepare the United States to confront the new and very different threats of the twenty-first century. It also argued

that the department should place greater emphasis on experimenting with a variety of systems, operational concepts, and force structures.

In 1998, the secretary of defense and the chairman of the Joint Chiefs of Staff designated U.S. Joint Forces Command (or JFCOM, formerly Atlantic Command) as the Defense Department's executive agent for joint experimentation.¹⁵ Since assuming this responsibility, JFCOM has explored the concept of "rapid decisive operations," including attacks against critical, mobile targets—a mission that places a premium on nearly simultaneous sensor-to-shooter data flows and high-speed, long-range weapons.¹⁶ The command plans to hold large-scale exercises to test new operational concepts in 2002 and 2004.

Beyond such initiatives, however, the Defense Department has yet to implement its announced commitment to transform its forces. The American armed forces today look much the same as they did ten years ago, only smaller. They have emphasized improving their ability to accomplish current tasks over exploring new ways of war. Similarly, most major acquisition programs of the last decade have represented incremental improvements to current systems. The services have fielded relatively few new weapon systems; of these, only a tiny fraction, such as the B-2 stealth bomber, could have major impacts on the conduct of war.¹⁷

Advocates of transformation point to the need to shift from a force based upon major weapon systems to one based upon networks. They argue that precision-guided weapons, platforms to collect enormous amounts of information about the enemy, and command and control systems to direct one's own forces will play increasingly important roles in warfare. While the services have invested increasing amounts of money in information technology, budget data on major acquisition programs suggest that the U.S. military services continue to have strongly platform-centric approaches to procurement. More than 75 percent of the Department of the Navy's major-acquisition budget for fiscal year

2002 is committed to large, traditional platforms—for instance, a new class of submarine (SSN 774), carrier-based aircraft (the F/A-18E/F), various surface ships (DDG 51 and LPD 17), and the tilt-rotor V-22 for the Marine Corps. U.S. Army and Air Force programs show comparable emphases upon platforms.¹⁸

Rhetoric about transformation has yet to be reflected in weapons the services acquire, let alone the way they acquire weapons. The Army's attempts to transform itself into a medium-weight force, the Navy's experimentation with network-centric warfare, and the Air Force's investment in unmanned combat vehicles all illustrate the difficulties associated with exploring new approaches to combat.

The U.S. Army and the Medium-Weight Force

The Army faces the challenge of transforming itself from a tank-heavy force designed to protect Western Europe from the armored columns of the Warsaw Pact to one capable of responding to contingencies worldwide on short notice. Operation ALLIED FORCE, Nato's war against Serbia, highlighted the Army's lack of units that are light enough to move quickly yet heavy enough to strike hard. The experience prodded the Army chief of staff, General Eric Shinseki, to launch an effort to reconfigure the Army into a more mobile yet still lethal force. In October 1999 he announced a goal of transforming the service into a "medium-weight" force capable of deploying a five-thousand-man brigade anywhere in the world within ninety-six hours. As he put it, "We must provide early-entry forces that can operate jointly, without access to fixed forward bases, but we still need the power to slug it out and win decisively."¹⁹ He designated two brigades at Fort Lewis, Washington, as test beds for exploring new concepts and organizations. These units have traded in their tracked M1A1 Abrams tanks and M2 Bradley fighting vehicles for wheeled LAV III infantry fighting vehicles leased from Canada. They are also examining innovative new tactics and organizations. In November 2000, the Army awarded a four-billion-dollar contract to build the "Interim Armored Vehicle," a new generation of light, wheeled vehicles with which to equip the new medium-weight units.

A key element of the Army's transformation is the Future Combat System, a network of light—and possibly unmanned—vehicles that would replace tanks and self-propelled artillery in medium-weight units. Planners intend that the new vehicle will weigh no more than twenty tons (compared to the seventy-ton M1 Abrams), so that it can be transported aboard the Air Force's most numerous transport aircraft, the C-130. Because it will lack the armor to slug it out with enemy tanks, its effectiveness will depend on its ability to identify and engage enemy forces before they can engage it.²⁰ The Army's plan for the Future Combat System is quite ambitious: the service plans to choose a design before

Shinseki leaves office in 2003; production is to begin in 2010; and the system is to be fielded by 2012. The General Accounting Office has, however, expressed concern that key technologies may not mature quickly enough to meet such a timetable.²¹

The Army's transformation plan is not without its detractors. The merits of a medium-weight force composed of wheeled vehicles remains to be demonstrated. Moreover, the prospect of a medium-weight force threatens the traditional emphasis upon armor as the centerpiece of ground combat, a notion that has defined the service for the past six decades. Indeed, it challenges the very definition and purpose of armored units. It is therefore hardly surprising that both active-duty and retired armor officers and enlisted men have been vocal in their opposition to the replacement of the tank with lighter wheeled vehicles. Many are particularly uncomfortable with the prospect of trading their heavily armored tanks for more vulnerable, if more mobile, vehicles.²²

Nor is it certain that the Army will maintain its current course. This is not the first time that the Army has attempted to transform itself. Indeed, it has examined the structure and organization of its combat units on twelve separate occasions over the last sixty years, accumulating a track record that is at best mixed.²³ It remains to be seen whether the current effort will survive General Shinseki's retirement.

The U.S. Navy and Network-centric Warfare

The U.S. Navy faces the challenge of transforming itself from a fleet designed to fight in the open ocean to one that can dominate the littorals and project power ashore. Like the other services, it must also define its roles in space and cyberspace. To carry out these tasks, the Navy has sought to link weapon, sensor, and command and control systems—that is, to wage network-centric warfare. The Marine Corps, for its part, is exploring new methods of power projection and attempting to come to grips with the challenges associated with military operations in urban terrain.

The Navy's track record of innovation is checkered. The demise of the Arsenal Ship highlights the barriers to innovation within the service. The Arsenal Ship, a vessel built to commercial standards and manned by a small crew, would have packed enough firepower to stop an armored column. Despite enjoying the support of Admiral William Owens (the vice chairman of the Joint Chiefs of Staff), Admiral Jeremy M. Boorda (the Chief of Naval Operations), and General Charles Krulak (the Commandant of the Marine Corps); the program lacked institutional support within the Navy. Critics raised questions about the utility and effectiveness of the ship. In addition, the ship lacked a constituency within the Navy. Indeed, it appeared to threaten a number of constituencies inside and

outside the Navy. Some surface warfare officers and aviators saw it as a threat to the aircraft carrier, while submariners saw it as stealing a mission they themselves wanted. Still others disliked the idea that the Arsenal Ship's considerable firepower could be at the disposal of a ground commander. These communities

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attempted to undermine the case for the Arsenal Ship. Indeed, Admiral Boorda was forced to move the program from the Navy to the Defense Advanced Research Projects Agency in an attempt to pre-

serve it. The ship's opponents were aided by people in industry and Congress who had stakes in the status quo. As one former congressional aide put it, the Arsenal Ship "was a threat to the carrier, and that was a threat to Newport News Shipbuilding. And that, in turn, was a threat to the Virginia [congressional] delegation."²⁴ In November 1997 the Navy killed the program, which a year earlier it had declared one of its highest priorities, due to "insufficient funds."

At a deeper level, it appears that the Arsenal Ship challenged the Navy's traditional notion of command. The vessel was essentially a truck designed to bring ordnance within firing range of targets. It would have lacked the sensors to target its own weapons, and it would have possessed only a minimal self-defense capability. Officers who had for years aspired to command destroyers, cruisers, and aircraft carriers likely did not relish the thought of becoming truck drivers.

Nonetheless, in recent years the Navy has begun exploring concepts that would replace large platforms with a network of smaller and less vulnerable systems. The Navy Warfare Development Command (in Newport, Rhode Island) and the Naval Postgraduate School (in Monterey, California), for example, have examined STREETFIGHTER—a family of small platforms designed to gain and sustain access to the littoral region in the face of a strong resistance, or "access denial"—as well as CORSAIR, a small aircraft carrier.²⁵ Further, the Navy Warfare Development Command, stimulated by the performance of HMAS *Jervis Bay* in East Timor, is exploring the use of fast catamarans to deploy and sustain amphibious forces. Other Navy innovators have proposed converting *Ohio*-class SSBNs to carry special operations forces and large numbers of land-attack cruise missiles.

Such ideas have predictably drawn fire from officers who see them as a threat to existing surface ship programs. STREETFIGHTER in particular represents a challenge to the Navy's current approach to force structure, which emphasizes a relatively small number of large, highly capable ships.²⁶ Rather than conducting rigorous analysis of the benefits and limitations of such platforms, STREETFIGHTER's detractors have tended to engage in ad hominem attacks. Vice Admiral Dan Murphy, the commander of the Sixth Fleet, was remarkably blunt

in his criticism of STREETFIGHTER: It is “a wild idea. . . . There is nothing behind it. There is no analysis. You know, [Vice Admiral Cebrowski] dreamed up a bumper sticker, but in fact what he is talking about, to go into the littorals to get into the tough situation, to fight your way through and deliver power is exactly what we are doing [with DD 21].”²⁷ More recently, big-ship admirals have begun deriding STREETFIGHTER vessels. As one admiral put it, “If the next major naval battle is fought in [Newport’s] Narragansett Bay, Streetfighters will be decisive.”²⁸

Nor have the Development Command’s efforts influenced the Navy’s acquisition plans in any concrete way. Navy programs are currently dominated by incremental improvements to existing surface ships and aircraft. The service has yet to allocate any funds to procuring small, highly maneuverable ships such as STREETFIGHTER. Nor is that situation likely to change in the near future. In 2006, the Navy plans to begin building the CVX, a new aircraft carrier. It is therefore not surprising that the Defense Department’s top strategist has chided the Navy for failure to field experimental platforms.²⁹

The U.S. Air Force and Unmanned Air Vehicles

The Air Force, a service historically defined by the technology of manned aircraft and dominated by fighter pilots, now faces the challenge of unmanned aerial vehicles, as well as military operations in space and cyberspace. In each case, the dominance of fighter pilots within the service has stymied innovation.

Rhetorically, at least, the Air Force sees itself in the vanguard of the RMA. As one recent article proclaimed triumphantly, “During the past decade, the U.S. Air Force has undergone a major transformation—a series of revolutionary changes so profound they have altered the face of modern warfare.”³⁰ It has been a world leader in the development of stealth, precision-guided munitions, and the use of space to support military operations. As the official Air Force report on Operation ALLIED FORCE put it:

The air war over Serbia showed that the Air Force has embraced the RMA—not only in its acquisition strategies for emerging technologies, but in the way it used those technologies during this conflict. . . . The United States Air Force . . . showed that it is a leader in the revolution in military affairs by leveraging new concepts to support future joint and coalition efforts. . . . The air war over Serbia offered airmen a glimpse of the future, one in which political leaders turned quickly to the choice of aerospace power to secure the [Nato] Alliance’s security interests without resorting to more costly and hazardous alternatives that would have exposed more men and materiel to the ravages of war.³¹

Like the other services, the Air Force has begun to adapt conceptually and organizationally to the needs of the new security environment. It has reorganized itself into “expeditionary air forces” to project and sustain combat

power more efficiently. It has also developed the “Global Strike Task Force” concept, as a way of countering an adversary’s strategy for denying access to a combat theater.³² Along with the Navy, it is exploring such innovative concepts as “effects-based operations,” an idea that endeavors to link explicitly the application of military force to strategic objectives.

In fact, and notwithstanding its innovative concepts, the Air Force has as a whole been slow to embrace new ways of war. The hurdles it has faced in integrating unmanned airborne vehicles (UAVs) into its force posture are illustrative.

The service has, at least superficially, welcomed unmanned vehicles. It currently operates two squadrons of RQ-1A Predator medium-altitude-and-endurance UAVs. Controlled by ground-based operators, these aircraft transmit electro-optical, infrared, and synthetic-aperture-radar imagery via satellite

Because revolutions in military affairs disrupt long-standing norms and structures, it is not surprising that organizational resistance to change is one of the most formidable barriers to innovation.

to ground stations in the United States or the theater of operations. It is also acquiring the RQ-4 Global Hawk, a high-altitude, long-endurance unmanned airborne vehicle designed to fly 12,500 nautical miles at an alti-

tude of up to sixty-five thousand feet and remain aloft for thirty-six to forty-two hours. Advocates of the system argue that it is capable of replacing the venerable U-2 reconnaissance aircraft. The Air Force has formed a UAV Battle Lab to explore a number of novel operational concepts for the employment of unmanned vehicles. Perhaps more telling is the fact that in 1997 the Air Force awarded a UAV operator the Aerial Achievement Medal—roughly on a par in prestige with the Air Medal—for safely landing a damaged UAV at the Mostar air base in Bosnia-Herzegovina.

Last fall, the Air Force rolled out the first prototype “unmanned combat air vehicle” (UCAV), the X-45A. The aircraft, to be controlled by a ground-based operator, is designed to fly as high as forty thousand feet, have a thousand-mile range, and carry twelve miniature bombs.³³ Its primary mission will be to attack enemy air-defense sites and pave the way for manned aircraft. The Air Force has also tested a weaponized version of the Predator as a rudimentary unmanned combat air vehicle.

Support for unmanned vehicles within the Air Force has, however, been lukewarm. The service’s modernization focus is upon a new generation of manned, short-range fighters to replace its existing ones; unmanned vehicles (and manned bombers as well) are being shortchanged. For comparison, the Air Force plans to spend nearly seventy billion dollars on the F-22 fighter aircraft and (along with the Navy and Marine Corps) at least two hundred billion more on the Joint

Strike Fighter; theUCAV budget stands at a mere \$126 million.³⁴ In response to perceived foot-dragging on the part of the Air Force, Congress has passed legislation requiring that one-third of the nation's deep-strike capability be unmanned by 2010.³⁵

The cultural barriers against embracing unmanned vehicles are substantial. UAVs have been in use for decades, but the Air Force has yet to exploit them fully. Over the past two decades, the Defense Department has spent two billion dollars on unmanned airborne vehicles—roughly the cost of a single B-2 bomber, one-tenth the money it spends on manned combat aircraft in a single year. As a result, UAV technology remains far short of its potential.³⁶ Indeed, in 1993 Congress created the Defense Airborne Reconnaissance Office to manage unmanned-vehicle programs after unsuccessfully prodding the Pentagon to take them more seriously. The Air Force formed its UAV squadrons only after the Army threatened to take the mission—and the associated resources—away from it.

The pilot culture that dominates the Air Force is another obstacle. While Air Force UAV operators must be pilots, tours with UAV squadrons are designated as nonflying assignments and are thus less than desirable. As an incentive for serving two years with a Predator squadron, the Air Force has been obliged to give pilots the subsequent opportunity to fly a new type of aircraft, which would improve their career chances.³⁷

The emergence of UAVs andUCAVs has created growing tension between pilots and supporters of unmanned systems. Many pilots see theUCAV as a threat. As one officer put it, no one “has ever succeeded in picking up a woman in a bar by saying he commanded a wing of drones.”³⁸ While humorous, such sentiment illustrates the barriers to adopting new approaches to combat. This situation is analogous to that in the 1950s, when the advent of intercontinental ballistic missiles threatened the manned-bomber community.

WHAT IS TO BE DONE?

The services have so far failed to match the rhetoric of transformation with action. While each claims to embrace new ways of war, none has yet demonstrated a sustained commitment to fundamental change. Nothing shows this more clearly than their acquisition budgets. Service funding is still dominated by incremental improvements to traditional systems; radically new technology, doctrine, and organizations have received smaller resources. None of this should be surprising. Large bureaucracies such as the U.S. armed forces are designed to minimize uncertainty, including that brought on by large-scale change. And new is not always better. Yet the U.S. armed forces face the imperative of adapting to the new and different challenges the United States will face in coming

years. Should they fail to do so, they could find themselves becoming increasingly irrelevant.

It would be wrong to view the services as uniformly opposed to fundamental change. Rather, each service is split between traditionalists and elements who

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are enthusiastic about new ways of war. One recent survey of the U.S. officer corps revealed significant splits over the character and conduct of future wars as well as over the urgency of change.³⁹ The

Defense Department needs to identify and nurture forward-looking constituencies. The starting point should be an intellectual map of the services, one that identifies and locates both support for and opposition to new mission areas. Such a map could assist the Defense Department's leadership in channeling resources to those portions of the services that are most enthusiastic about emerging warfare areas. It could also assist the department in evaluating the adequacy of military career paths.

The Defense Department also needs to devote additional resources to experimentation. In particular, the services should advance from the stage of war-gaming innovative concepts to acquiring small numbers of the weapon systems involved and developing concepts and organizations for their use. The Navy, for example, should purchase a squadron of STREETFIGHTERS to form an operational test bed for network-centric warfare. The Marines, for their part, should establish experimental units dedicated to projecting power in the face of capable access-denial defenses and to conducting military operations in urban terrain.

More generally, the Defense Department should begin redistributing resources away from legacy systems of declining utility and toward new ways of war. The Pentagon should scale back or cancel weapons that are heavy or have limited mobility, highly detectable signatures, and limited range; it should increase funding for long-range precision strike, stealth, and C4ISR* systems. The department should also increase substantially the funds it devotes to research and development.

Today's defense budget is split fairly equally between the services. While such an arrangement minimizes interservice friction, it is not particularly conducive to innovation. Indeed, there is a strong argument to be made that interservice competition can be an engine of change. One way to promote innovation would be to force the services to compete for funds based upon their ability to meet current and anticipated operational and strategic challenges. These challenges

* Command, control, communications, computers, intelligence, surveillance, and reconnaissance.

would include the need to assure access to regions of critical importance to the United States; gain and maintain information and space superiority; protect against nuclear, biological, chemical, and information attack; and conduct military operations in urban terrain. In order to ensure that the American armed forces meet these emerging challenges, the secretary of defense should set aside a significant portion of the military's procurement budget for innovative programs.

The service secretaries are a potentially powerful but generally underutilized constituency for change. They have it within their power—through control of promotion boards and officer assignments—to have enduring impacts on their services. They should wield this power to ensure that officers associated with emerging warfare areas, such as space and information warfare, enjoy opportunities to rise to senior leadership positions.

The United States leads the world in many of the technologies that are driving the information revolution, as well as many of the weapons that the revolution has spawned. Transforming the armed forces will require the Defense Department not only to continue to acquire advanced weapons but to develop the organizations and doctrine needed to employ them effectively. That attempts to do so have encountered resistance is not surprising. Change is by definition a disruptive process, one that creates winners and losers. Still, the U.S. armed forces must change radically—adding new capabilities and shedding old ones—if they are to meet the challenges of the emerging security environment.

NOTES

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