COME THE REVOLUTION

Transforming the Asia-Pacific's Militaries

Richard A. Bitzinger

Defense transformation has preoccupied the U.S. Defense Department for over a decade. In recent years as well, militaries and governments throughout the Asia-Pacific region have begun to pay attention to the promise and requirements of defense transformation and to the emerging information-based revolution in military affairs (RMA). Increasingly, their conceptions of defense transformation, along with their intentions, efforts, and capabilities to transform their militaries, could have a profound effect upon regional stability and security. These activities could particularly affect future American security interests and military operations in the Asia-Pacific—both due to their potential to influence joint operations and interoperability with U.S. forces and by endowing new capabilities upon potential competitors and adversaries—and therefore could inject new uncertainties and complications into the regional security calculus.

Defense transformation is much more than the "mere" modernization of one's armed forces—that is, being able to fight better the same kinds of wars. Rather, it is the promise of a paradigm shift in the character and conduct of warfare. At the same time, it is more than simply overlaying new technologies and new hardware on existing force structures; it requires fundamental changes in military doctrine, operations, and organization. For these reasons, therefore, transformation is an increasingly loaded issue, with many implications for defense and security in the Asia-Pacific. Moreover, for these same reasons, transformation in the region is beset with considerable challenge.

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This article specifically addresses the process, problems, and prospects of and for defense transformation in the Asia-Pacific region. Basically, it argues that while several countries there are closely studying and assessing the implications of the emerging revolution in military affairs, they have, for a variety of reasons, made little progress so far in actually transforming their armed forces along its lines. In fact, most countries in the region are unlikely, despite their best efforts, to move beyond "modernization-plus," at least not any time soon. Even this process of innovation, however, could still have many repercussions for regional security and stability, and in ways not currently being contemplated.

WHAT DO WE MEAN BY DEFENSE TRANSFORMATION?

"Defense transformation" is an ambiguous but nevertheless bounded term. No strong consensus exists as to what defense transformation exactly means or entails. Some analysts and proponents of defense transformation view it as simply another name for the revolution in military affairs.[1] Certainly the two terms are used increasingly interchangeably. But this still leaves unanswered what we mean by a revolution in military affairs and what the current RMA stands for. To cloud the issue even further, some students of defense transformation define it mainly as a process of implementing an RMA, while others see it as an objective in and of itself.

A revolution in military affairs is generally described as a "discontinuous," or "disruptive," change in the concept and mode of warfare.[2] For example, it has been argued that a revolution in military affairs occurs when "the application of new technologies into a significant number of military systems combines with innovative operational concepts and organizational adaptation in a way that fundamentally alters the character and conduct of a conflict. It does so by producing a dramatic increase . . . in the combat potential and military effectiveness of armed forces."[3] In a similar vein, the RAND Corporation defines an RMA as "a paradigm shift in the nature and conduct of military operations which either renders obsolete or irrelevant one or more core competencies in a dominant player, or creates one or more core competencies in some dimension of warfare, or both."[4]

Most analysts and proponents of defense transformation are in general agreement that the current RMA—and therefore the current process of transformation—has been primarily driven and enabled by dramatic advances in information technology (IT) over the past two or three decades. The information revolution, supplemented by recent advances in new materials and construction techniques, has made possible significant innovation and improvement in the fields of sensors, seekers, computing and communications, automation, range, precision, and stealth.[5] In one sense, therefore, defense transformation is inexorably linked to

emerging concepts of network-centric warfare (NCW, sometimes referred to as "network-enabled" warfare)—vastly improved battlefield knowledge and connectivity through IT-based breakthroughs that create more capable command, control, communications, computing, intelligence, surveillance, and reconnaissance (C4ISR) networks. NCW, according to the Defense Department's Office of Defense Transformation, "generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, high tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization."[6]

The key characteristics of a transformed force, therefore, include:

- Networked C4ISR, weapons, and platforms

- Shared situational awareness

- More accurate and standoff engagement

- Agility, speed, rapid deployability, and flexibility

- Jointness and interoperability.[7]

In a larger sense, too, defense transformation is synergistic—it entails the integration and employment of C4ISR systems, platforms, and weapons (particularly smart munitions) in ways that increase their aggregate effectiveness and capability beyond their individual characteristics. This bundling together is reminiscent of William A. Owens's "system of systems" concept, in that it entails the linking together of several types of discrete and even disparate systems across a broad geographical, interservice, and electronic spectrum in order to create new core competencies in war fighting.[8]

Obviously, defense transformation entails much more than just force modernization. Hardware and technology are obviously crucial and primary components, fundamental building blocks in the modern, IT-based RMA, centered on network-centric warfare and reconnaissance-strike complexes. Transformation, however, is not simply a techno-fix. It entails fundamentally changing the way a military does its business—doctrinally, organizationally, and institutionally. It also requires advanced systems integration skills to knit together disparate military systems into complex operational networks. Finally, it demands elemental changes in the ways militaries procure critical military equipment, and reform of the national and defense technological and industrial bases that contribute to development and production of their transformational systems. All this, in turn, requires vision and leadership at the top in order to develop the basic concepts of defense transformation, establish the necessary institutional and political momentum for implementing transformation, and allocate the financial resources and human capital required for the task of implementation.[9]

DEFENSE MODERNIZATION IN THE ASIA-PACIFIC

Many militaries in the Asia-Pacific have greatly expanded their war-fighting capacities since the beginning of the 1990s. This modernization effort has gone far beyond merely replacing older fighter aircraft with more sophisticated versions or buying new tanks and artillery pieces; rather, they have over the past decade added capabilities that they did not possess earlier, such as new capacities for force projection and standoff attack, low observability (stealth), and greatly improved C4ISR. Consequently, several armed forces in the Asia-Pacific now deploy or will soon acquire several new weapons platforms, advanced armaments, or sophisticated military systems, including aircraft carriers, submarines, maritime patrol aircraft, air-to-air refueling aircraft, longer-range air-to-air missiles, and modern antiship cruise missiles. For example:

- China, India, South Korea, Malaysia, Singapore, and Taiwan have either expanded or else are in the process of expanding their blue-water navies with modern, foreign-built—or foreign-designed but locally constructed—destroyers, frigates, missile patrol boats, and diesel-electric submarines.

- Thailand has acquired a small aircraft carrier from Spain; India has recently concluded an agreement to purchase a used, refurbished, and reequipped carrier from Russia; and Japan plans to construct two flat-top "helicopter destroyers."

- China, India, Japan, South Korea, Malaysia, and Singapore have all received or will soon acquire tanker aircraft for air-to-air refueling.

- Nearly every Asia-Pacific country currently possesses at least some fourth-generation fighter aircraft—such as the Russian Su-27, Su-30, or MiG-29; the American F-16 or F/A-18; and the French Mirage-2000—capable of firing standoff, active, radar-guided air-to-air missiles like the U.S. AMRAAM or the Russian AA-12.

- India is developing a supersonic antiship cruise missile in cooperation with Russia, while China has purchased such missiles from Russia to outfit its destroyers.

- Australia, India, Japan, and Taiwan have plans to acquire missile defenses, either in cooperation with other countries or through the purchase of off-the-shelf systems.

In particular, most Asia-Pacific militaries are greatly expanding and upgrading their C4ISR capabilities.[10] China, Japan, Singapore, and Taiwan all possess airborne early warning and command aircraft, while Australia, India, and South Korea intend to acquire them in the near future. Australia, Japan, and South

Korea have or will soon have the Aegis naval sensor and combat system deployed on their largest surface combatants, while Taiwan is buying long-range early-warning radar. Nearly every major military in the region is acquiring unmanned aerial vehicles and are increasingly using space for military purposes, including satellites for surveillance, communications, and navigation/target acquisition. Several countries in the region—particularly Australia, China, Japan, Singapore, South Korea, and Taiwan—have also made or are presently making considerable investments in new types of information processing and data fusion, command and control, and the digitization of their armed forces. South Korea, for example, is developing a new tactical integrated communications system, while Taiwan is spending more than two billion dollars on a new military-wide C4ISR network that will link communications, computers, and sensors.[11] China is reportedly working hard to expand and improve its C4ISR and information operations/information warfare capabilities, with particular attention to creating a separate military communications network, using fiber-optic cable, satellites, microwave relays, and long-range, high-frequency radio. Much of the hardware and technology bolstering China's emerging C4I and information operations capability is basically dual use in nature; the military has benefited indirectly from developments and growth in the country's commercial information-technology industry.[12] Singapore already possesses a nationwide secure C4I network, utilizing microwave and fiber-optic channels linked to air and maritime surveillance systems.[13]

Ultimately, "defense transformation" does not adequately describe current efforts by Asia-Pacific nations to upgrade and reform their militaries—"modernization-plus" is more apt.

The acquisition of these new military capabilities has many implications for militaries in the Asia-Pacific. At the very least, they promise to upgrade and modernize war fighting in the region significantly. Certainly, Asia-Pacific militaries are acquiring greater lethality and accuracy at greater ranges, improved battlefield knowledge and command and control, and increased operational maneuver and speed. Standoff precision-guided weapons, such as cruise and ballistic missiles and terminal-homing (such as GPS or electro-optical) guided munitions, have greatly increased combat firepower and effectiveness. The addition of modern submarines and surface combatants, amphibious assault ships, air-refueled combat aircraft, and transport aircraft have extended these militaries' theoretical range of action. Advanced reconnaissance and surveillance platforms have considerably expanded their capacities to look out over the horizon above, below, and on the sea surface. Additionally, through increased stealth and active defenses (such as missile defense and longer-range air-to-air missiles),

local militaries are adding substantially to their survivability and operational effectiveness. Consequently, conflict in the region, should it occur, would likely be more "high-tech" than in the past—faster, longer in reach, and yet more precise and perhaps more devastating in its effect.

More important, many Asia-Pacific militaries are acquiring military equipment that, taken together, forms the kernel of what is required to transform their militaries fundamentally. In particular, those systems related to precision strike, stealth, and above all C4ISR constitute some of the key hardware ingredients essential to a modern RMA. These emerging capabilities, in turn, have real potential to affect strategy and operations on tomorrow's battlefield and hence to alter the determinants of critical capabilities in modern warfare.

DEFENSE TRANSFORMATION IN THE ASIA-PACIFIC REGION

If Asia-Pacific militaries have been amassing much of the hardware necessary for defense transformation, "the acquisition of new technology is only the first and often the easiest step" in realizing an RMA.[14] It is necessary as well, therefore, to develop the "software"—the doctrine, tactics, and organization—necessary to take full advantage of these new technologies. Accordingly, many militaries and governments in the Asia-Pacific region are studying, assessing, and even experimenting with such aspects of transformation.

Much of this speculation and experimentation has been driven by the current debate over the future transformation of the U.S. armed forces. The United States is recognized to be at the forefront, in terms of strategy, operations, and technology, when it comes to conceptualizing and implementing transformation.[15] Consequently, American models of the information technology–based RMA and defense transformation have typically been the point of departure for discussion and evaluation in the Asia-Pacific.

Talking the Talk . . .
Interoperability with U.S. forces has been a key factor, driving much of the current thinking about defense transformation in the Asia-Pacific. U.S. allies and friendly nations in the region—particularly Australia, Japan, South Korea, and Taiwan—appear to be particularly keen on studying and possibly implementing transformations of their respective militaries specifically in order to remain compatible with U.S. forces, particularly as the likelihood of coalition operations with the United States—such as in Iraq or Afghanistan—is expanding. This enhanced interoperability is especially crucial for regional allies as the United States continues to transform its own armed forces, since it would permit their militaries to tie into and take advantage of American progress in transformational warfare. The Aegis combat system could enable Japanese and

South Korean ships to link with U.S. naval forces in cooperative engagements against opposing forces, or, in the case of Japan, to work with the United States in developing and deploying ship-based missile defenses. At the same time, defense transformation on the part of key U.S. allies and other friendly countries in the Asia-Pacific could greatly benefit the United States, by strengthening bilateral military alliances and burden sharing.

Australia. In 1999, having looked at the issue of defense transformation since mid-decade, the Australian Department of Defense established an Office of the Revolution in Military Affairs to review technological developments and explore strategies for implementing an Australian RMA, particularly in partnership with the United States.[16] According to one report, the four key components of the Australian RMA are weapons lethality, force projection, information processing, and intelligence collection.[17] In terms of practical results, Australia stresses developing and enhancing the mobility, firepower, and sustainability of the Australian Defense Forces (ADF) by expanding interservice jointness, increasing logistical support, strengthening amphibious and expeditionary capabilities, and making improvements in precision strike and in intelligence gathering, surveillance, and reconnaissance.[18]

In particular, the ADF places increasing emphasis on network-centric warfare as a way to gain a "knowledge edge" over potential competitors.[19] The knowledge-edge concept is "the effective exploitation of information technologies to allow us to use our relatively small force to maximum effectiveness."[20] NCW is intended not only to provide the ADF a force multiplier that maintains a technological edge over much larger potential adversaries (such as Indonesia) but to enhance cooperation and interoperability with U.S. forces.[21] In this regard, Australia especially looks to leverage its limited indigenous high-technology core competencies—such as its Jindalee over-the-horizon radar network—in collaborative weapons programs with the United States.[22]

China. Beijing has also been particularly influenced by the emerging IT-based RMA. China is currently engaged in a determined effort to modernize its armed forces, the People's Liberation Army (PLA), in order to be able to fight and win "limited wars under high-tech conditions."[23] This doctrine revolves around short-duration, high-intensity conflicts characterized by mobility, speed, and long-range attack, employing joint operations fought simultaneously throughout the entire air, land, sea, space, and electromagnetic battle space, and relying heavily upon extremely lethal, high-technology weapons. PLA operational doctrine also emphasizes preemption, surprise, and shock, given that the earliest stages of conflict may be crucial to the outcome of a war.

In this regard, many in the PLA see considerable potential for force multiplication in such areas as information warfare, digitization of the battlefield, and networked systems.[24] As already mentioned, China is greatly expanding its C4ISR capabilities. At the same time, it sees adversaries who are highly dependent upon advanced technology—such as the United States—as susceptible to low-tech countermeasures or attacks on their own command, control, and communications capabilities. Consequently, the PLA has devoted increasing attention to asymmetric responses that enable "the inferior to defeat the superior."[25] These systems are sometimes lumped together as "assassin's mace" or "trump card" weapons.[26] Some assassin's-mace weapons would be used against an enemy's vulnerabilities, as in computer-network attacks. Information warfare is a potentially critical new development in the PLA's war-fighting capabilities. The PLA is reportedly experimenting with information-warfare operations, and it has established special units to carry out attacks on enemy computer networks in order to blind and disrupt an adversary's C4I systems.[27]

Other assassin's-mace weapons are existing systems, development or deployment of which have been accelerated because they have proved to be among the most effective weapons in the PLA's arsenal. This category of weapons particularly includes tactical ballistic missile systems—such as the six-hundred-kilometer-range CSS-6 and three-hundred-kilometer CSS-7 missiles—which are being fitted with satellite-navigation guidance for improved accuracy and with new types of warheads (such as cluster submunitions and fuel-air explosives) for higher lethality. Finally, there are the so-called new-concept arms, such as kinetic-energy weapons (such as railguns), lasers, radiofrequency and high-powered microwave weapons, and antisatellite systems.[28]

India. The 1991 Gulf War led India to pay closer attention to the promise and challenges of the emerging IT-based RMA. Many Indians have become increasingly concerned about growing American technological prowess and the near-global dominance of the United States as a conventional military power. Some Indians have called for corresponding, if perhaps asymmetric, capabilities to deal with this new military-technological reality.[29] This response holds that India must in particular exploit the emerging information revolution in warfare if it wants to be taken seriously as a regional and global power, to have a "fighting chance in future conflicts."[30] India's rapidly growing information-technology sector is seen as potentially critical in this effort.[31]

Japan. Japanese interest in defense transformation is largely rooted in the 1998 North Korean Taepo Dong missile test, which alerted Tokyo to the need to reform and reorient its Self-Defense Forces to new threats, particularly ballistic missiles and the proliferation of weapons of mass destruction.[32] Other concerns

driving Japan's interest in transformation include the possibility of cyber attacks on its national information infrastructure, the likely expansion of involvement in international military operations (such as in Iraq), and increased military cooperation with the United States in regional security undertakings (such as the Proliferation Security Initiative).[33] At the same time, the Japanese must cope with severe fiscal constraints and a political need to keep casualties low in the event of conflict.[34]

The Japan Defense Agency (JDA) has designated its transformational concept the "Info-RMA." This Info-RMA is based on the premise that future warfare will be characterized by a huge leap in battlespace awareness, precision-strike engagement, coordinated attack by small, widely dispersed units, the heavy use of cyberspace and unmanned battlefield systems, expansion of the operational theater and increased speed, and a move away from attrition to "decisive" (also called "effects based") warfare. The Info-RMA, which according to the JDA is based on "the application of advanced information technologies to the military sphere," entails information sharing through the creation of an all-inclusive C4ISR network, greater jointness and speed (particularly in command and control), increased combat efficiency and effectiveness, greater organizational flexibility, protection of critical information systems (such as command and control nodes), and expanded interoperability with U.S. forces. The objective of the Info-RMA is "a quantum leap in the efficient achievement of military objectives."[35]

Many of the principles of the Info-RMA can be found in the Self-Defense Forces' future defense capabilities requirements. In particular, the JDA's 2003 defense posture review calls for a joint information-sharing network for ground, sea, and air self-defense forces, a "technology oriented," rather than "scale oriented," force structure (i.e., using technology as a force multiplier), and interoperability with the United States through modernization and digitization.[36] In addition, Japan plans to increase greatly its missile defense initiatives, in part by upgrading its naval Aegis systems to defend against missile attacks and by expanding cooperation with the United States on joint missile defense research and development. In fact, missile defense could become a catalyst for defense transformation in Japan, as it could effect critical policy changes (such as amendment of Article 9 of the constitution to permit expanded U.S.-Japan cooperation in collective self-defense), promote the acquisition of a joint C4ISR network, and help reform Japan's defense research, development, and industrial infrastructure.[37]

New military capabilities of the Asia-Pacific militaries, at the very least, promise to upgrade and modernize war fighting in the region significantly.

Singapore. Interest in defense transformation in Singapore stems both from strategic weaknesses—lack of strategic depth, a small and aging population, and relatively limited defense resources—and economic and technological advantages, particularly a highly educated workforce and strong information technologies. Singapore's Ministry of Defense sees information technologies as critical, perhaps decisive, in future conflict. The IT-based RMA will

> change the nature of warfare. Superior numbers in platforms . . . will become less of an advantage unless all these platforms can be integrated into a unified, flexible, and effective fighting system using advanced information technologies. At the same time, the ever-increasing reliance upon information technology means that protecting one's own information systems and disrupting the enemy's will become a major aspect of warfare.[38]

Accordingly, Singaporean transformational efforts—referred to collectively as "Integrated Knowledge-Based Command and Control" (IKC2) doctrine—emphasize the acquisition, development, and integration of technologies for command and control with intelligence, surveillance, and reconnaissance systems and with precision-guided weapons.[39] RMA-related areas currently receiving particular focus include advanced electronics and signal processing, information systems security, advanced guidance systems, communications, electronic warfare, sensors, and unmanned vehicles.[40] Two new agencies—the Future Systems Directorate and Center for Military Experimentation—have been established to help implement IKC2 in Singapore.

South Korea and Taiwan. The Republic of Korea (ROK) armed forces are aware that future warfare will be quite different from today, that "it will be nonlinear, small-scale, nonconcentrative, and far-separated."[41] Consequently, they acknowledge that future forces will need improved C4ISR, including networked platforms, unmanned systems, and real-time command and control, as well as enhanced capacities for precision strike. Additionally, the ROK-U.S. alliance is undergoing a shift, with South Korea expected to play a larger role in its own defense; Seoul is exploring ways in which it can become more self-reliant (particularly in early warning, intelligence, and surveillance) but remain interoperable with U.S. forces.[42] Nevertheless, it is generally agreed that the Korean RMA is still very much in its early stages.[43]

Taiwan's revolution in military affairs is largely predicated on Chinese threat scenarios and accordingly is very much influenced by Chinese thinking about the RMA.[44] Not surprisingly, Taipei is focused on defending against missile strikes and securing its command and control network from attacks by the PLA, while engaging in offensive information warfare against China. Elements of its approach include early warning systems, reconnaissance capabilities, and

an integrated and secure command and control system, along with antimissile interceptors and possibly retaliatory ballistic missile systems.[45]

In their efforts to implement RMAs, Seoul and Taipei are aided by large and growing information-technology sectors. South Korea and Taiwan are both extensively "wired" in terms of cable and cellular systems, Internet use, and electronics industries.[46] In particular, they possess sizable manufacturing bases in the fields of computers and telecommunications; together they dominate the global production of dynamic random-access memory semiconductor chips.

. . . But Not Walking the Walk

Notwithstanding all the discussion, debate, and evaluation regarding the value and effectiveness of the information technology–based revolution, most Asia-Pacific countries have made little actual progress in transforming their militaries. In particular, there has been little implementation of the organizational, institutional, and doctrinal change that would be needed. Few militaries in the region have moved beyond the initial "speculation" phase of defense transformation, and even fewer are testing new organizations or new methods of warfare, or specifically developing strategies for transforming their armed forces, or directing resources toward this end. An observation made about recent European transformational activities is equally apropos to the Asia-Pacific, that they "have been more about producing PowerPoint slide shows than building demonstrators or pursuing field experimentation."[47] Even of those that have done so, none has yet revised its doctrine or fielded reorganized force structures in line with transformational concepts of the IT-based RMA.[48] In some countries—particularly India, Japan, and South Korea—even the debate is still rather thin and theoretical; any tangible movement toward transformation would appear to be far off.

Even in the case of China—whose "efforts to exploit the emerging RMA arguably are the most focused" of any country in the Asia-Pacific—there is still considerable disagreement as to the significance and potential military effectiveness of PLA force modernization over the past decade.[49] Certainly, the PLA has made considerable progress over the past decade in adding new weapons to its arsenal, and China has noticeably improved its military capabilities in several specific areas, particularly missile attack, air and naval platforms, and information warfare. In addition, the PLA is reportedly experimenting with digitization and RMA-type campaign tactics.[50] Nevertheless, the PLA continues to suffer from substantial deficiencies and weaknesses that limit its ability to constitute a modern, transformed military force, and its pace of reform and change has been slow.[51] "Not all military leaders embrace RMA ideas";[52] consequently the PLA remains overwhelmingly a ground-based army, composed largely of infantry and oriented

toward linear, attrition-based "People's War." Much of its weaponry is still of 1960s- and 1970s-era vintage. In particular, the PLA still lacks the logistical and lift capacity—either by sea or by air—for projecting force much beyond its borders.[53] Finally, China's capabilities in the area of C4I architectures, information warfare, and surveillance and reconnaissance are still very much in the early stages of research, development, and deployment. Consequently, China has a long way to go in terms of defense transformation and of acquiring and applying the state of the art.[54]

Ultimately, "defense transformation" does not adequately describe current efforts by Asia-Pacific nations to upgrade and reform their militaries. If defense transformation entails a fundamental and disruptive change in the concept, character, and conduct of war fighting, then most Asia-Pacific nations are engaged not so much in transforming as in basically modernizing their armed forces—that is, adding new capabilities and new capacities for warfare but without necessarily altering their fundamental modes of warfare. "Modernization-plus," therefore, is perhaps a more apt descriptor of what is currently transpiring in most Asia-Pacific militaries. Many militaries in the region, by buying new types of precision-guided munitions, airborne early warning aircraft, submarines, air-to-air refueling aircraft, data links, and improved command and control systems, are certainly acquiring capabilities that they did not possess earlier, such as new capacities for force projection and standoff attack, low observability, and greatly improved C4ISR. Nevertheless, this modernization-plus effort is in general evolutionary, steady state, and incremental, and the innovation seen here is less a disruptive than a *sustaining* process.[55]

IMPEDIMENTS TO DEFENSE TRANSFORMATION IN THE ASIA-PACIFIC

Several factors currently inhibit defense transformation among the Asia-Pacific militaries. The first comprises costs and resource constraints: transformation, it turns out, doesn't come cheap, despite assertions made early on by some proponents that the exploitation of commercial off-the-shelf (COTS) technologies would greatly reduce costs.[56] Rather, even to make a start requires the acquisition of many new and expensive types of military-unique systems. Even many dual-use COTS information and communications technologies are not easily (or cheaply) adapted to military use, as they often require substantial modification, such as ruggedization or additional capabilities.[57]

At the same time, funding for transformational systems must generally compete with large and expensive "legacy" programs—such as fighter aircraft, tanks, and large warships, as well as huge manpower costs usually associated with sizable ground forces.[58] In fact, in the case of most Asia-Pacific militaries,

such legacy spending continues to siphon off money that could pay for transformational systems.[59]

Ironically, defense transformation is lagging in the Asia-Pacific despite the fact that most countries in the region have actually increased defense spending over the past decade. Military expenditures in the Asia-Pacific market grew by nearly 27 percent in real terms over the past decade, and an extra $126 billion was added to regional defense budgets between 1992 and 2002. India's defense budget has doubled since the early 1990s, for example, while Chinese military expenditures have increased more than threefold in just the past seven years (1997–2004).[60] Even the Asian financial crisis of 1997 appears to have only temporarily dampened regional military expenditures; nearly every major country in the Asia-Pacific had by 2002 sufficiently recovered to raise their defense budgets above 1992 levels.

Nevertheless, even these rising military expenditures may not be sufficient to fund both legacy and transformational systems or to acquire new systems in sufficient quantities so as to be transformational in their effects. Many Asia-Pacific countries—such as India and South Korea—still spend less than twenty billion dollars on defense, and most—including Australia, Singapore, and Taiwan—spend less than ten billion.[61] In the case of Japan—perhaps the only country in the region with the indigenous technological and industrial capabilities for exploiting the IT-based RMA for transformation—defense budgets have been stagnant for years.[62] Only China has been able to maintain substantial and sustained increases in military spending over the past decade.

In some cases, military expenditures are expected to rise over the next few years. South Korea, for example, plans to invest more than twenty-eight billion dollars in modernizing its armed forces over the 2004–2008 time frame. Taiwan intends to spend an additional fifteen billion dollars over the next decade on new military equipment, including eight diesel-electric submarines and an anti–ballistic missile system. It is probably too soon to tell, however, how much of this extra money will underwrite transformation.

Second, the organizational and institutional cultures found in most Asia-Pacific militaries impede transformation. Militaries in the Asia-Pacific are often extremely conservative, risk-averse, and highly bureaucratic organizations. Of course, large organizations anywhere, certainly militaries and defense ministries, are typically resistant to change—especially disruptive change, since it can threaten the stability of normal day-to-day operations, standard operating procedures, war plans, and even career paths. Armed forces are especially hierarchical, with heavily top-down command-and-control structures.[63] In the Asia-Pacific, however, the conservative and hierarchical nature of military organizations is often compounded by Confucian principles of harmony, seniority

over merit, respect for elders (age is often synonymous with rank or leadership), and concern with face. Consequently, local militaries may be resistant or even hostile to the disruptive, leveling, and decentralizing nature of transformation and the information technology–based revolution in military affairs.[64]

Another implication of the decidedly conservative nature of regional defense establishments is a characteristic preference for traditional systems. Local militaries often prize large and conspicuous weapons platforms—such as main battle tanks, modern fighter aircraft, and aircraft carriers—more than less visually striking but transformational systems, such as UAVs, C4I networks, and precision-guided munitions. In addition, high-ranking military officials seeking to advance their careers have tended to prefer immediate, high-profile hardware acquisitions over longer-term software fixes.[65] Finally, ground forces predominate many Asia-Pacific militaries (this is particularly evident in China, India, South Korea, and Taiwan), marking their entire defense establishments with their penchants for mechanized armor, large ground forces, and force-on-force warfare.[66]

In many cases too this conservative and risk-averse behavior is exacerbated by "old boy" networks in defense decision making. Throughout the Asia-Pacific, critical decisions and policies pertaining to national security—particularly arms procurement, doctrine, and force structure—are commonly made by small, insular groups of military officers, career civilian defense officials, defense industry representatives, and private advisers (many of whom are ex-military men or former bureaucrats, a pattern known in Japan as *amakudari,* or literally "descent from heaven").[67] This insularity—often coupled with corruption and bribery—reinforces a "business as usual" approach, limits linkages to centers of innovation in the commercial and business worlds, and thereby makes it harder to implement transformation.[68]

Many militaries in the region also lack any tradition of joint operations and instead possess strong single-service cultures and severe interservice rivalries. In such a state of affairs it is doubly difficult to introduce ideas of jointness, interoperability, and combined-arms operations as basic war-fighting concepts, or to create common C4ISR and logistical support systems.[69]

Third, most defense technology and industrial bases in the Asia-Pacific are ill equipped to contribute much to defense transformation. Most regional defense research, development, and industrial bases—even in Japan—lack the design skills, technological expertise, or links to advanced commercial technology sectors (particularly local IT industries) needed to develop and manufacture transformational systems.[70] In particular, these countries' defense industries do not possess sufficiently advanced systems-integration capabilities to link together highly complex systems of systems, such as C4ISR networks. Most of these firms

are simply not set up to function as "lead systems integrators"—such as a Lockheed Martin or a BAE Systems—building and leading large teams of disparate subcontractors in a systematic program to design, develop, and manufacture a system to customer specifications.[71] Defense industries in the region tend to be primarily "metal bashers" as opposed to innovators; local arms manufacturing typically involves production either under license or of relatively simple indigenous systems, such as artillery pieces or small arms. In addition, heavy emphasis in most of these countries on self-reliance in arms production means that resources are often wasted on duplicating the development and manufacture of weapons systems already widely available on the global arms market.[72] Local arms manufacturers push their governments to buy systems they are already capable of producing or that offer prestige and global presence—again, mostly legacy systems, such as fighter aircraft or large surface combatants—rather than potentially transformational ones, such as advanced precision-guided weapons and joint, networked C4ISR infrastructures.

Should a country choose to acquire transformational systems, it will likely have to buy them off the shelf from foreign suppliers (particularly the United States) or develop them collaboratively with foreign partners (again, the United States). Such programs will have to compete with locally built systems, around which strong political lobbies often cluster, both for the sake of jobs and in order to preserve so-called strategic industries.

Fourth, militaries and defense industries in the Asia-Pacific region have few strong linkages to innovative local industries, such as the information technology sector, limiting the potential for "spin-on"—that is, from commercial to military. Most regional arms industries are state owned and insulated from both market forces and the private sector. This demarcation, however, makes it more difficult for the defense sector to benefit from cross-fertilization with commercial technologies, as well as making it harder and less attractive for civilian industries to participate in military research, development, and manufacturing.[73] At the same time, local militaries in general remain distrustful of commercial off-the-shelf technologies and prefer "mil-spec'ed" equipment.[74]

Fifth, the capabilities of local commercial high-technology industries—particularly local IT firms—may be overrated and actually of little use to defense transformation. While many Asia-Pacific countries boast sizable information-technology sectors, the emphasis has largely been on production engineering, not innovative research and development. The science and technology bases of most countries in the region are still weak; like local arms manufacturers, they particularly lack the necessary systems-integration skills to adapt and incorporate commercial technologies in military systems. Hence, with the exception of Japan, most regional IT production has been at the decidedly low end of the

technology spectrum.[75] Most of Taiwan's and China's IT industries are still oriented toward production and assembly according to original-equipment-manufacturer specifications, for example, rather than indigenous design and manufacturing.[76] Huawei and ZTE, two of China's much-vaunted telecommunications vendors (the former has indirect ties to the PLA), have prospered by occupying generally the low end of the telecoms sector—producing basic cable and wireless systems—keeping prices and production costs low, and selling to the developing world.[77] Even India's software industry is still largely geared toward delivering highly specialized programs according to strict customer specifications or toward the "grunt work" of the global IT industry (such as debugging Y2K software or handling technical-support calls).[78]

As previously noted, South Korea and Taiwan are the world's leaders in the design and manufacture of memory chips, but this is in effect the exception that proves the rule. Dynamic random-access memory chips have practically become a commodity product, and their manufacture is increasingly being sent offshore to countries where production costs can be kept low (such as China, which is becoming an important producer—again, to original-manufacturer specifications—of semiconductors). At the same time, much of the technology found in South Korea's and Taiwan's semiconductor industry does not seem to be making its way into military systems; even locally produced defense electronic systems rely heavily on imported designs and components.[79]

Defense transformation is much more than the "mere" modernization of one's armed forces.

Consequently, exploitation of dual-use technologies for defense transformation is unlikely to occur to any large degree in the Asia-Pacific. While nearly all countries in the region see the great promise of advanced commercial technologies for military uses—particularly information technologies or space—few have made actual, deliberate, and concerted efforts to engage in such spin-on. Most exploitation of dual-use technologies in the region has so far been serendipitous and modular—that is, simply "piggybacking" on existing or emerging commercial systems (such as nationwide fiber-optic telecommunications networks) rather than adapting commercial technologies to military purposes.[80] Even then, dual-use efforts have not always found success, as witnessed by Japan's recent setbacks in its space program.[81]

Finally, certain Asia-Pacific militaries face country-specific impediments to defense transformation. Japan, for example, is still greatly constrained by its constitution, which bars the country from possessing an offensive armed force; this restriction could be interpreted as applying to transformation.[82] For its part, India, given the likely threats it perceives from Pakistan and China, appears to be

more interested in acquiring an effective nuclear strike capability than in engaging in an IT-based RMA.[83]

WHERE IS THE ENDGAME?

It may be premature or even irrelevant to talk about defense transformation in the context of the Asia-Pacific militaries. Most countries in the region—despite their best efforts—are unlikely to transform their militaries to the extent made possible by the information revolution and the emerging revolution in military affairs, at least not any time soon. There are simply too many factors hindering or impeding the ability of even the most technologically advanced or motivated militaries in the Asia-Pacific—including Australia, China, India, Japan, South Korea, Taiwan, and Singapore—to move beyond modernization-plus. These factors particularly include budgetary constraints; cultural, organizational, and bureaucratic resistance; the effect of legacy systems and preexisting procurement commitments; weaknesses in national defense technology and industrial bases; and underappreciation of the complexity of adapting commercial dual-use technologies to military purposes. Overall, defense transformation may simply be too disruptive and too threatening to military and civilian elites, too expensive, and technologically too demanding.

Of course, it is easy to criticize. Change—especially radical change inherent in the RMA—is always hard, and it is human nature to be suspicious of and hostile toward the unknown. It should not be surprising to see so much organizational, institutional, and cultural resistance to the idea of transformation. Even in the United States and Europe there still exist considerable skepticism and foot-dragging with regard to defense transformation.[84] Moreover, transformation as a concept suffers from the fact that it is basically an open-ended, continuous process—since there will always arise new technological innovations that can affect the character and conduct of warfare, and therefore military doctrine and organization, where is the endgame? When does a military decide that it has finally and successfully transformed itself? In point of fact it never can, and so to fault a country for being at "only" a certain level of transformational capability or for making "only" a certain degree of progress toward implementing a revolution in military affairs is perhaps unfair.

As a leading scholar has succinctly noted, "hardware may be easily acquired but the accompanying software (e.g., doctrine, tactics, organizational form, and macrosocial change) [of defense transformation] is far more difficult to develop and implement."[85] At the same time, however, transformation along the lines of the U.S. model may not be necessary to "get the job done." A modernization-plus strategy—that is, evolutionary and sustaining innovation—alone may be sufficient to meet most of these countries' defense requirements, particularly

with respect to their strategic context (that is, their immediate threat perceptions and defense requirements) and their available resources. These countries do not need to emulate the American transformation paradigm in order to derive valuable new capabilities and other benefits from their current modernization efforts—a partial solution could be, if not revolutionary, more than adequate. In particular, even overlaying a more capable C4ISR infrastructure on existing forces could greatly improve these militaries' fighting effectiveness.

In addition, it may be enough for friends and allies of the United States in the region to modernize sufficiently for greater interoperability with U.S. forces—especially with respect to network-centric warfare—rather than attempt to acquire a complete set of transformational systems, in order to fill important niches in coalition operations. For example, it would be mutually beneficial were these countries able to cooperate with the United States on missile defenses, such as establishing joint capabilities for early warning and cooperative engagement in order to bring both U.S. forces and friendly nations under a single defensive shield. In addition, missile defenses, particularly if implemented collaboratively, could catalyze the development and deployment of advanced (and shared) C4ISR infrastructures.

On the other hand, simply settling for modernization-plus could mean that Asia-Pacific militaries—especially those friends and allies of the United States—will be unable to take full advantage of the potential and synergy of the advanced systems they are currently acquiring. A particularly pertinent criticism made of American efforts in 2003 to fight a network-enabled war in Iraq was that it "fatally grafted" advanced sensors and communications onto "old-fashioned command and control systems." Intelligence had to go up and then down the chain of command, resulting in delays and "magnification of individual communications failures."[86] Such glitches could only be worse for countries that are even less prepared than the United States to exploit NCW.

In addition, should a country not transform its forces, what recourse might it have against adversaries who do? In such a case, a country might pursue offsetting asymmetric responses, such as WMD capabilities (along with their delivery systems, such as ballistic missiles) or low-intensity insurgency and guerrilla tactics; either could result in new threats undermining regional stability. Finally, the ability of nontransformed countries to participate in joint campaigns with the United States or operate with American military forces could be greatly limited. Many of these countries (along with America's allies in Europe and North America, by the way) are already worried about a growing capabilities gap with respect to U.S. forces and how it might affect future joint operations and, in turn, their national security.[87] Failure to keep pace with U.S. transformation

could only widen this gap and reduce these countries to "tool box" status, playing only minor roles in coalition operations.

At the same time, the prophets and advocates of defense transformation need to do a better job of translating their broad, abstract visions into tangible and practical realities. What, for example, does network-centric warfare demand in terms of both hardware and software? What do we mean, operationally speaking, by jointness, interoperability, and networking? For that matter, what do we mean by "disruptive" innovation, and how do we know when we have truly arrived at a "paradigm shift" that "fundamentally alters" the character and conduct of warfare? If these questions cannot be answered in ways that are meaningful to war planners, defense transformation will remain an empty concept.

The issue of defense transformation in the Asia-Pacific region will likely remain a legitimate subject for discussion and debate for some time to come. In particular, transformation will continue to be a contentious issue, as it is increasingly linked to a number of already critical regional security concerns, including alliance relationships and interoperability, regional competition and cooperation, arms sales and arms procurement, civil-military relations, internal security and stability, and the impact of technology and economic development on comparative advantage. Despite the many challenges of implementation, therefore, the enormous potential and promise of transformation will continue to drive regional militaries to explore and experiment with concepts of the emerging revolution in military affairs.

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