
9. THE PLA AND INFORMATION WARFARE

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INTRODUCTION

Among recent discussions of the evolution of Chinese military doctrine, few subjects have received as much attention as information warfare (IW).¹ China is arguably only one of three countries pushing the envelope on IW strategy development, behind the United States and Russia.² It has an active offensive IW program and has devoted significant resources to the study of IW. Chinese military journals are replete with articles that either directly or indirectly address the subject, and a significant number of full books by PLA authors have been published in the past few years.³ Granted, IW's current cachet in both China and the United States can be partly explained by the hip, futuristic, attractively ill-defined nature of the subject, which invites the frenetic pace at which some of the nation's most forward thinkers are attempting to coin the permanent neologisms and concepts of this new type of combat.⁴ At the same time, however, I would argue that behind all the rhetoric and hype, IW presents

¹Two good introductions to the subject are Bates Gill, *China and the Revolution in Military Affairs*, Carlisle, PA: Strategic Studies Institute, 1996; and John Arquilla and Solomon Karmel, "Welcome to the Revolution . . . in Chinese Military Affairs," *Defense Analysis*, 13:3, December 1997, pp. 255–269.

²For an excellent cross-section of U.S. writings on the subject, see John Arquilla and David Ronfeldt (eds.), *In Athena's Camp: Preparing for Conflict in the Information Age*, Santa Monica, Calif.: RAND, MR-880-OSD/RC, 1998. See also Martin Libicki, *What Is Information Warfare?* Washington, DC: National Defense University Press, 1996; John Arquilla and David Ronfeldt, "Cyberwar Is Coming!" *Comparative Strategy* 12, No. 2, Spring 1993, pp. 141–165; Richard Szafranski, "A Theory of Information Warfare," *Airpower Journal*, Spring 1995, pp. 56–65; Alan Campen *et al.*, *Cyberwar*, Washington, DC: AFCEA Press, 1996; Norman Davis, "An Information-Based RMA," *Strategic Review*, Winter 1996; C. Kenneth Allard, "The Future of Command and Control Warfare: Toward a Paradigm of Information Warfare," in L. Benjamin Ederington and Michael Mazarr (eds.), *Turning Point: The Gulf War and U.S. Military Strategy*, Boulder, Colo.: Westview Press, 1995. For the best summary of Russian IW writings, see the work of Timothy Thomas.

³Among books, the most notable are Wang Pufeng, *Xinxi zhanzheng yu junshi geming* (Information Warfare and the Revolution in Military Affairs), Beijing: Junshi kexueyuan, 1995; Shen Weiguang, *Xin zhanzheng lun* (On New War), Beijing: Renmin chubanshe, 1997; Wang Qingsong, *Xiandai junyong gaojishu* (Modern Military-Use High Technology), Beijing: AMS Press, 1993; Li Qingshan, *Xin junshi geming yu gaojishu zhanzheng* (New Military Revolution and High Tech War), 1995; Zhu Youwen, Feng Yi, and Xu Dechi, *Gaojishu tiaojianxia de xinxi zhan* (Information War Under High Tech Conditions), Beijing: AMS Press, 1994; Zhu Xiaoli and Zhao Xiaozhuo, *Mei'E xin junshi geming* (The United States and Russia in the New Military Revolution), Beijing: AMS Press, 1996; Dai Shenglong and Shen Fuzhen, *Xinxizhan yu xinxi anquan zhanlue* (Information Warfare and Information Security Strategy), Beijing: Jincheng Publishing House, 1996.

⁴One can identify a similar dynamic in the early years of the literature on nuclear strategy. See Fred Kaplan, *The Wizards of Armageddon*, New York: Simon and Schuster, 1983.

the Chinese with a potentially potent, if circumscribed, asymmetric weapon. Defined carefully, it could give the PLA a longer-range power projection capability against U.S. forces that its conventional forces cannot currently hope to match. In particular, I would argue that these weapons give the PLA a possible way to attack the Achilles' Heel of the advanced, informatized U.S. military: its information systems, especially those related to command and control and transportation. By attacking these targets, the Chinese could possibly degrade or delay U.S. force mobilization in a time-dependent scenario, such as Taiwan, and do so with a measure of plausible deniability.

This paper seeks to outline the current debate within the PLA over information warfare, emphasizing its remarkably heterogeneous character. It draws upon a sizable number of full-length books and journal articles. What this paper does *not* do, however, is assess PLA capabilities in information warfare, since nearly all of the relevant data resides in the classified realm. Nonetheless, this literature analysis is an important first step in understanding the role of information warfare in the 21st century PLA.

DEFINING TERMS

Before proceeding further, it is necessary to define terms, although this exercise is fraught with terminological, political, and ideological peril. In some ways, however, the Chinese themselves have made the job a little easier. Chinese writings clearly suggest that IW is a solely military subject, and as such, they draw inspiration primarily from U.S. military writings. The net result of this “borrowing” is that many PLA authors’ definitions of IW and IW concepts sound eerily familiar. For our purposes, therefore, we shall use the definition of information warfare found in Joint Pub 3-13, *Joint Doctrine for Information Operations (IO)*:

Information operations conducted during time of crisis or conflict to achieve or promote specific objectives over a specific adversary or adversaries.⁵

“Information operations” are defined in Joint Pub 3-13.1, *Joint Doctrine for Command and Control Warfare (C2W)* as:

actions taken to achieve information superiority by affecting adversary information, information-based processes, information systems, and computer-based networks, while defending one’s own information, information-based processes, information systems, and computer-based networks.⁶

More concretely, the Army in FM-100-6 *Information Operations* defines “information operations” as

continuous military operations within the military environment that enable, enhance, and protect the friendly force’s ability to collect, process, and act on

⁵Joint Chiefs of Staff (JCS) Pub 3-13, *Joint Doctrine for Information Operations (IO)*, October 9, 1998, p. 19.

⁶Joint Chiefs of Staff (JCS) Pub 3-13.1, *Joint Command and Control Warfare (C2W) Operations*, February 7, 1996, p. 13.

information to achieve an advantage across the full range of military operations; information operations include interacting with the global information environment and exploiting or denying an adversary's information and decision capabilities.⁷

The goal of these operations is “information dominance,” or

The degree of information superiority that allows the possessor to use information systems and capabilities to achieve an operational advantage in a conflict or to control the situation in operations short of war, while denying those capabilities to the adversary.⁸

By introducing these definitions, I am not precluding that the Chinese may eventually develop an indigenous IW strategy, and there is limited evidence of movement in this direction. Instead, these U.S. definitions provide a baseline by which to judge PLA writings.

CHINESE INFORMATION WARFARE STRATEGY: HETEROGENEITY AND INNOVATION

This section examines the early-stage Chinese IW literature, offering the following preliminary conclusions.

The literature:

- focuses on disrupting logistics and communications
- understands the U.S. threat and admits their own technical weaknesses, including poor reliability, survivability, and security
- reveals a surprising grasp of U.S. IW doctrine, but borrows concepts inappropriate for the PLA's technological level
- correctly identifies the important lessons of DESERT STORM, but in some cases draws the wrong conclusions
- overestimates Chinese capabilities to develop effective defensive countermeasures.

Evolution of Chinese IW Strategy

In the mythology of PLA IW study, Shen Weiguang, a soldier in a field unit, began writing about information warfare in 1985, publishing a book entitled *Information Warfare* that was later excerpted as an article in *Liberation Army Daily*.⁹ Chinese IW doctrine did not achieve an analytical focus, however, until the Gulf War in 1991. As has been documented in many other places, the Chinese military leadership was very

⁷Field Manual 100-6 *Information Operations*, August 1996.

⁸*Ibid.*, p. 8.

⁹Shen Weiguang, “Focus of Contemporary World Military Revolution—Introduction to Information Warfare,” *Jiefangjun bao*, November 7, 1995, p. 6.

impressed by the performance of U.S. forces in DESERT STORM, especially the ease with which they destroyed the Iraqi's largely Soviet and Chinese equipment. From their writings, it seems clear that PLA theorists believe that IW played a significant role in the U.S. victory. A commonly held belief, for example, is that the U.S. military used computer viruses to disrupt and destroy Iraqi information systems.¹⁰ In their descriptions of DESERT STORM, these authors point to other allied operations and technologies as examples of information war. First, Wang Pufeng singles out superior satellite reconnaissance of strategic sites and Iraqi positions, as well as attacks on Iraqi command and control systems, as key elements of the rapid allied victory against Saddam's forces.¹¹

On the lessons of DESERT STORM for the PLA, however, there is some divergence between those who believe the next war will look just like the Gulf War and those who understand that the Gulf War was a testing ground for advanced weapons and strategy to be used in a future, different war. Most seem awed by the "perfect" [*wanshan*] execution of the attack.¹² One writer described the new changes in information, command and control brought about by the Gulf War as a "great transformation" [*zhongda biange*],¹³ and a second suggested that strategies to defend and attack computers and electronic systems could be as significant in determining the outcome of future wars as strategies to defend and attack citizens were in past wars.¹⁴ Finally, Wang Pufeng called the Gulf War the "epitome" of information war.¹⁵

Since DESERT STORM, Chinese IW research has rapidly proliferated in newspapers, journals, and books. Some of the most prominent IW researchers and their billets are listed in Table 1 below.

Table 1
Important Chinese IW Theorists

Theorist	Billet/Comments
MG Wang Pufeng	Father of Chinese IW field Seminal work: <i>Information Warfare and the Revolution in Military Affairs</i>
Shen Weiguang	State Council Special Economic Zones Office (former PLA)
Wang Baocun	Academy of Military Sciences
Li Fei	<i>Liberation Army Daily</i>
Wang Xusheng	PLA Academy of Electronic Technology
Su Jinhai	PLA Academy of Electronic Technology
Zhang Hong	PLA Academy of Electronic Technology

¹⁰"Army Paper on Information Warfare," *Jiefangjun bao*, 25 June 1996, p. 6.

¹¹Wang Pufeng, pp. 113–116; 123–126.

¹²*Ibid.*, p. 203.

¹³Liu Yichang (ed.), *Gaojishu zhanzheng lun* (On High-Tech War), Beijing: Military Sciences Publishing House, 1993, p. 272.

¹⁴Li Zhisun and Sun Dafeng, *Gaojishu zhanzheng molü* (The Strategy of High-Tech War), Beijing: Defense University Publishing House, 1993, pp. 3–9, 184–201.

¹⁵Wang Pufeng, p. 144.

In addition, it has become increasingly obvious that some IW “centers of excellence” are emerging in the PLA. These centers are listed in Table 2 below.

These researchers began to congregate at a series of high-level scholarly meetings. In December 1994, the Commission of Science, Technology, and Industry for National Defense (COSTIND) sponsored a symposium entitled “Analysis of the National Defense System and the Military Technological Revolution,” which was closely followed by an October 1995 meeting that dealt with “The Issue of Military Revolution.” The alleged high point of Chinese IW research was a 22 December 1995 COSTIND National Directors conference, when Liu Huaqing allegedly stated:

Information warfare and electronic warfare are of key importance, while fighting on the ground can only serve to exploit the victory. Hence, China is more convinced [than ever] that as far as the PLA is concerned, a military revolution *with information warfare as the core* has reached the stage where efforts must be made to *catch up with and overtake rivals*. (emphasis added)¹⁶

More recently, a group of 40 information warfare researchers met in Shenyang for a *Junshi xueshu* symposium on information warfare. The researchers, who were drawn from relevant departments of the army’s general departments, military regions, armed services, scientific research institutions, academies, and units, discussed the “nature, position, role, guiding ideology, principles, modes, methods, and means” of information warfare.¹⁷

Table 2
Major Centers of IW Research

Center	Comments
Academy of Military Sciences Military Strategy Research Center	Main IW research center Developing IW strategies Integrating IW into overall military doctrine Dedicated to “winning information warfare in the information age” Affiliated with the Society for International Information Technologies
PLA Academy of Electronic Technology General Staff Department Third Sub-Department (GSD/3rd) China National Research Center for Intelligence Computing Systems COSTIND University of Electronic Science and Technology (Chengdu)	IW work carried out by Research Institute 61 and Information Engineering Academy

¹⁶“Latest Trends in China’s Military Revolution,” *Hsin Pao* [*Hong Kong Economic Journal*].

¹⁷Li Pengqing and Zhang Zhanjun, “Explore Information Warfare Theories with PLA Characteristics—*Junshi xueshu* Magazine Holds Symposium,” *Jiefangjun bao*, 24 November 1998, p. 6, in FBIS-CHI-98-349, December 15, 1998.

Important Chinese IW Concepts and Terms: Definitions

When examining Chinese IW theories, the logical place to start is Wang Pufeng's seminal work, *Information Warfare and the RMA*. Wang defines information warfare as follows:

Information war is a product of the information age which to a great extent utilizes information technology and information ordnance in battle. It constitutes a "networkization" [*wangluohua*] of the battlefield, and a new model for a complete contest of time and space. At its center is the fight to control the information battlefield, and thereby to influence or decide victory or defeat.¹⁸

Later, the author elaborates his definition:

Information war is a crucial stage of high-tech war. . . . At its heart are information technologies, fusing intelligence war, strategic war, electronic war, guided missile war, a war of "motorization" [*jidong zhan*], a war of firepower [*huoli*]*—a total war*. It is a new type of warfare.

The author distinguishes this new type of warfare from the previous paradigm:

Information and the capacity [to employ it] together release new energy in battle; information's "networkization" opens up a new battlefield of computers. With the "informationization" [*xinxihua*] of the army, agility and speed, mobility, and depth of attack, in a battle without a front line, all create a leap ahead of the traditional methods of warfare. The area [of the battle] grows, its speed increases, the accuracy of the attack is more acute, all of which change past conceptions of space and time.¹⁹

It is important to note that nothing in these definitions conflicts with American military conceptions of information warfare.

Important Chinese IW Concepts and Terms: Principles

The aim of IW in the Chinese literature is information dominance [*zhixinxiquan*], defined as the ability to defend one's own information while exploiting and assaulting an opponent's information infrastructure.²⁰ This information superiority has both technological and strategic components. On the one hand, it requires the ability to interfere with an enemy's ability to obtain, process, transmit, and use information to paralyze his entire operational system. This accords with U.S. military conceptions of information dominance. On the other hand, some Chinese commentators assert that information superiority is not determined by technological superiority, but by new tactics and the independent creativity of commanders in the field, placing much more emphasis on personnel and organization-related components of the conflict.

¹⁸Wang Pufeng, p. 37.

¹⁹*Ibid.*, p. 2.

²⁰This section draws from MAJ Mark Stokes' excellent study, *China's Strategic Modernization*.

The information battlefield itself is transformed in the PLA literature. Concepts of front and rear battlelines blur as the “multidimensional” battlefield space, integrating air, land, sea, space, and the electronic spectrum, becomes the arena of combat.²¹ Within this battlefield, military units conduct “seamless operations” [*feixianxing zuozhan*], integrating sensors with weapons systems. Operational emphasis is placed on deep strike [*zongshen zuozhan*] and over-the-horizon warfare [*yuanzhan*] against command and control facilities, which are perceived to be the “vital points” [*dianxue*] of the system. The objectives of the operation are not the seizing of territory or the killing of enemy personnel, but rather the destruction of the other side’s willingness to resist.

Victory on this information battlefield will shift the focus of operations. In the words of two PLA authors,

the key to gaining the upper hand on the battlefield is no longer mainly dependent on who has the stronger firepower, but instead depends on which side discovers the enemy first, responds faster than the latter, and strikes more precisely than the latter. [The two sides] vie for the advantage in intelligence and command control, i.e. to see which side holds a larger amount of and more accurate information and is faster in transmitting and processing the information. On the other hand, they have to vie for advantage in the precision of the strike, i.e., to see which side can hit the other at a longer distance and hit the other side first at the same distance.²²

As a consequence, detection, concealment, search and avoidance become central goals, pushing the military towards networked command and smaller, modular units.

Something Borrowed, Something Blue

One of the problems in analyzing PLA IW strategy, however, is disaggregating it from translations or outright copying of U.S. doctrinal writings, as well as Russian, German and French sources.²³ From conversations in Beijing, it is clear that the PLA has translated both FM-100-6, *Information Operations*, and JP 3-13.1, *Joint Doctrine for Command and Control Warfare*, along with a myriad of lesser documents, journal articles, and policy papers, including more abstract research on information revolution written by the Tofflers, David Ronfeldt, John Arquilla, and Martin Libicki. PLA writings selectively steal concepts and definitions from these works, though it is rare that doctrine is adopted wholesale. As a result, the terminology, definitions, and even case studies found in most Chinese writings are similar to the debate in the United States. A sample is presented in the next three paragraphs, though one could easily add hundreds of additional examples to this list.²⁴

²¹Wang Jianghuai and Lin Dong, “Viewing Our Army’s Quality Building from the Perspective of What Information Warfare Demands,” *Jiefangjun bao*, March 3, 1998, p. 6, in FBIS-CHI-98-072, March 13, 1998.

²²*Ibid.*

²³Wang Pufeng, p. 141.

²⁴For an article which is almost entirely derivative, see Wang Baocun and Li Fei, “An Informal Discussion of Information Warfare (Parts One, Two and Three),” *Jiefangjun bao*, June 13, 1995.

For example, at the highest level of abstraction, one PLA author describes the information age as the third important age in world history, following the agricultural age and the Industrial revolution.²⁵ Furthermore, he characterizes the defining feature of the latter part of the information age as the exponential increase in “data production, storage, exchange, and transmission.” Both of these ideas are taken without attribution directly from the Tofflers’ seminal futurist books *The Third Wave*²⁶ and *War and Anti-War*,²⁷ respectively.

In an example of direct appropriation of U.S. military operational doctrine, one PLA author defined the aim of IW as “preserving oneself and controlling the enemy,” the core distillation of the U.S. military’s concept of “information dominance.”²⁸ Moreover, the same author asserted that IW included “electronic warfare, tactical deception, strategic deterrence, propaganda warfare, psychological warfare, computer warfare, and command and control warfare,”²⁹ which is virtually identical to the U.S. Air Force’s doctrinal “Six Pillars of IW.”

In conceptions of the information battlefield, the similarities continue. PLA authors discuss “integration” [*yitihua*] and seamless operations [*feixianxing zuozhan*], tying together the five dimensions of warfare—air, land, sea, space, and the electromagnetic spectrum—through the integration of sensors with mobile missiles, air, and sea-based forces. These sensors are meant to facilitate “dominant battlefield awareness,” which in turn permits deep strike [*zongshen zuozhan*] against enemy command and control hubs, communication networks, and supply systems, blurring previous distinctions of a clear battleline.³⁰ For students of U.S. military doctrine, this conception of the battlefield is virtually identical to the core principles of Joint Vision 2010.³¹

The question, therefore, could be posed in the following manner: Is there a *Chinese* IW strategy? There are certainly important differences between the Chinese and American IW literatures. To summarize, PLA writers universally regard IW as a strictly military subject first and foremost, while Western authors largely accept the dichotomy between information warfare waged between states or militaries (i.e., cyberwar) and information warfare waged between substate actors and states (i.e., netwar).³² Second, Chinese IW authors imbed their discussions within familiar ideological frameworks, such as Maoist guerrilla strategy and Sun Zi. In the Maoist

²⁵Cai Renzhao, “Exploring Ways to Defeat the Enemy Through Information,” *Jiefangjun bao*, March 19, 1996, p. 6.

²⁶Alvin and Heidi Toffler, *The Third Wave*, New York: Bantam, 1980.

²⁷Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century*, Boston: Little, Brown and Company, 1993.

²⁸Su Enze, “Logical Concepts of Information Warfare,” *Jiefangjun bao*, June 11, 1996, p. 6.

²⁹*Ibid.*

³⁰Cai Renzhao, “Exploring Ways to Defeat the Enemy Through Information,” *Jiefangjun bao*, March 19, 1996.

³¹Office of the Joint Chiefs of Staff, *Joint Vision: 2010*, available at <http://www.dtic.mil/doctrine/jv2010/jv2010.pdf>.

³²This distinction between cyberwar and netwar was coined by John Arquilla and David Ronfeldt. See *The Advent of Netwar*, Santa Monica, Calif.: RAND, MR-789-OSD, 1996.

vein, IW is referred to as the “New People’s War,” with particular attention paid to the idea of “overcoming the superior with the inferior.” Both U.S. and Chinese authors are guilty of overusing Sun Zi, especially the notion of “winning the battle without fighting.” While most of these references are nothing more than rhetorical flourishes, they do reflect two stark realities: (1) the extent to which Chinese (and U.S.) authors are struggling to find a framework for understanding IW and (2) the continuing pull of more traditional strategic frameworks. Third, Wang Pufeng and others emphasize the nontechnological aspects of information warfare to a much greater extent than U.S. military analysts, especially the need for new strategies and new organizational forms.³³ Fourth, Chinese IW theorists, by virtue of the PLA’s relatively backward state, are forced by circumstance to discuss IW from the perspective of a technologically inferior military, often in opposition to a technologically advanced foe.

This latter point deserves further elaboration. One of the most interesting Chinese IW concepts is the notion of “overcoming the superior with the inferior,” which draws inspiration from both Sun Zi and Maoist “People’s War.” A basic assumption of this line of reasoning is that the PLA will most likely face an opponent capable of achieving information dominance on the battlefield. In response, the PLA has two choices. The first is to adopt nontechnological measures to overcome technological disadvantage, such as camouflage, concealment, and deception techniques. While there is some merit in this argument, the experience of the Iraqi army in DESERT STORM does not foster much optimism that this strategy would be successful against a determined opponent.

The second choice is more interesting, and I would argue, should be much more worrisome to U.S. military planners. PLA writings generally hold that IW is an unconventional warfare weapon, not a battlefield force multiplier. Indeed, many writings suggest that IW will permit China to fight and win an information campaign, *precluding the need for military action*. When this train of thought is combined with the notions of “overcoming the superior with the inferior,” one can quickly see the logical conclusion of the argument: IW as a preemption weapon.³⁴ According to Lu Linzhi,

In military affairs, launching a preemptive strike has always been an effective way in which the party at a disadvantage may overpower its stronger opponent. . . . For the weaker party, waiting for the enemy to deliver the first blow will have disastrous consequences and may even put it in a passive situation from which it will never be able to get out . . .

As a concrete example, he points to the Gulf War, where Iraq’s failure to launch a preemptive attack resulted in their defeat:

³³This is not to say that Western authors do not emphasize the nontechnological aspects of information warfare. In fact, John Arquilla and David Ronfeldt are two prominent examples of American IW theorists who see the profound organizational and societal implications of IW and the information revolution writ large. See John Arquilla and David Ronfeldt (eds.), *In Athena’s Camp*.

³⁴Lu Linzhi, “Preemptive Strikes Crucial in Limited High-Tech Wars,” *Jiefangjun bao*, February 14, 1996, p. 6.

In the Gulf War, Iraq suffered from passive strategic guidance and overlooked the importance of seizing the initiative and launching a preemptive attack. In doing so, it missed a good opportunity to turn the war around and change its outcome.³⁵

This accords with some Western military analysts, who argue that Iraq should have attacked Allied forces in Saudi Arabia at the early stage of the deployment rather than permitting the forces of the U.S. and the other members of coalition to deploy without hindrance over a six-month period.³⁶

To avert this outcome, Lu states that an effective strategy by which the weaker party can overcome its more powerful enemy is

to take advantage of serious gaps in the deployment of forces by the enemy with a high tech edge by launching a preemptive strike during the early phase of the war or in the preparations leading to the offensive.³⁷

The reason for striking is that the “enemy is most vulnerable during the early phase of the war.”³⁸ In terms of specific targets, the author asserts that

we should zero in on the hubs and other crucial links in the system that moves enemy troops as well as the war-making machine, such as harbors, airports, means of transportation, battlefield installations, and the communications, command and control and information systems.³⁹

If these targets are not attacked or the attack fails, the “high-tech equipped enemy” will amass troops and deploy hardware swiftly to the war zone, where it will carry out “large-scale airstrikes in an attempt to weaken . . . China’s combat capability.”⁴⁰

HOW COULD THE CHINESE CREDIBLY USE IW? AN UNSETTLING SCENARIO INVOLVING THE UNITED STATES AND TAIWAN

In his discussion of IW as a preemption weapon, Lu Linzhi lays out a scenario in which China employs a preemptive strike to defeat a technologically superior enemy during the latter’s mobilization and deployment phase. When one reads between the lines, it becomes readily apparent that the author is describing the rough parameters of a potential confrontation between China and the United States. This becomes even more clear in the following revealing passage, where he frankly discusses the technological imbalances between China and its thinly disguised “high-tech enemy”:

Reconnaissance positioning satellites, AWACs, stealth bombers, aircraft carriers, long-range precision guided weapons . . . the enemy has all that; we don’t. As for tactical guided missiles, electronic resistance equipment, communications,

³⁵Ibid.

³⁶A discussion of the coalition forces’ early vulnerabilities can be found in Michael Gordon and General Bernard Trainor, *The General’s War*, Boston: Little, Brown, and Company, 1995, pp. 57–64.

³⁷Lu Linzhi, “Preemptive Strikes.”

³⁸Ibid.

³⁹Ibid.

⁴⁰Ibid.

command and control information systems, main battlefield aircraft, main battlefield tanks, and submarines, what we have is inferior to the enemy's.⁴¹

When one imagines scenarios in which the PLA would be concerned with preemptively striking U.S. forces during the deployment phase for early strategic victory, it is difficult to avoid the obvious conclusion that the author is discussing a Taiwan conflict. For the PLA, using IW against U.S. information systems to degrade or even delay a deployment of forces to Taiwan offers an attractive asymmetric strategy.⁴² American forces *are* highly information-dependent, and rely heavily on precisely coordinated logistics networks, such as those operated by TRANSCOM. If PLA information operators using PCs were able to hack or crash these systems, thereby delaying the arrival of a U.S. carrier battle group to the theater, while simultaneously carrying out a coordinated campaign of short-range ballistic missile attacks, “fifth column,” and IW attacks against Taiwanese critical infrastructure, then Taipei might be quickly brought to its knees and forced to capitulate to Beijing. The advantages to this strategy are numerous: (1) it is available to the PLA in the near term; (2) it does not require the PLA to be able to attack/invoke Taiwan with air/sea assets, which most analysts doubt the PLA is capable of achieving for the next ten years or more; and (3) it has a reasonable level of plausible deniability, provided that the attack is sophisticated enough to prevent tracing.⁴³

CONCLUSION

To sum up, the available evidence suggests that the PLA does not currently have a coherent IW doctrine, certainly nothing compared to U.S. doctrinal writings on the subject. While PLA IW capabilities are growing, they do not match even the primitive sophistication of their underlying strategies, which call for stealth weapons, joint operations, battlefield transparency, long-range precision strike, and real-time intelligence. Yes, the PLA is acquiring advanced telecommunications equipment through its commercial operations, even BC4I gear, but it is not clear that this equipment or subcomponents are being incorporated into PLA units, much less integrated into the military's system as a whole. Therefore, IW may currently offer the PLA some attractive asymmetric options, some of which may be decisive in narrowly circumscribed situations, but the Chinese military cannot reasonably expect anything approaching “information dominance” for the foreseeable future.

⁴¹Ibid.

⁴²Two PLA authors explicitly endorse what they call “asymmetric information offensives.” See Wang Jianghuai and Lin Dong, “Viewing Our Army's Quality Building from the Perspective of What Information Warfare Demands,” *Jiefangjun bao*, March 3, 1998, p. 6, in FBIS-CHI-98-072, March 13, 1998.

⁴³The plausible deniability of a PLA IW attack will increase markedly by the end of 1998, when a Trans-Eurasian landline cable will be completed. Currently, all international Internet gateways out of China connect to the North American backbone. When the Trans-Eurasian connection is open, however, Chinese hackers will be able to “wipe” their IP headers in Europe, making it extremely difficult for U.S. information operators to trace their origins.

CHINESE INFORMATION WARFARE TERMINOLOGY

xinxi zhanzheng—information warfare

junshi geming—revolution in military affairs (RMA)

zhixinxi quan—information dominance

yitihua—integration

feixianxing zuozhan—seamless operations

zongshen zuozhan—deep strike

turanxing yu kuaisuxing zuozhan—sudden and quick strikes

dianxue—vital points

yuanzhan—over-the-horizon warfare

bingdu—viruses

wangluohua—networkization

xinxihua—informationization

feixianxing zuozhan—“a war without a front line”

zhiming daji—mortal strikes

xinxi gaosu gonglu—“information superhighway”

ruan shashang—soft destruction

kuayue—leapfrogging

11. SYSTEMS INTEGRATION IN CHINA'S PEOPLE'S LIBERATION ARMY

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In many circles, the People's Liberation Army (PLA) is best known for its obsolescence, shortcomings, failures, and ineptitude. However, among others, especially some circles in the West, the PLA's strengths and successes are highly touted. There is a measure of truth in the exaggerated convictions of both these categories of observers of PLA prowess, or the absence thereof. It is not enough to suggest, as some might, that the PLA does well in areas of low technology and poorly in high-technology areas, although there is certainly a kernel of truth in that oversimplified explanation. The PLA has, of course, excelled in some areas where at least a modicum of modern technology is involved. Success for the PLA, however, has been extremely elusive in areas where integration of systems and technologies is required. This is not to suggest that the whole story of PLA technological successes and failures can be linked to systems integration. The story is far more complex than that. Nevertheless, an examination of the issue based on systems integration capabilities is a useful and instructive one to pursue. This is undertaken in three parts: (1) an introductory look at two prominent examples of PLA modernization programs from the perspective of systems integration, (2) a definition of systems integration and the various levels into which military systems integration may be divided, and (3) an examination of PLA aspirations for systems integration, the status of the effort including problem areas, and conclusions about what the future might hold.

I. TWO METHODS OF COPING WITH SYSTEMS INTEGRATION IN THE PLA

What the PLA Cannot Do Well: The Strategic Rocket Force Story

The PLA has been unable to undertake modernization of all, or even most, of its numerous and diverse forces and units, either simultaneously or seriatim. It simply lacks the wherewithal to do so. This inability to carry out sweeping or steady modernization stems from inadequacies in its research and development facilities,

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sparse funds for equipment acquisition, limited ability to acquire and assimilate technology, and lack of availability of educated personnel, training methods and devices, and more. One preferred solution or work-around has been to modernize selected PLA forces and units. Some of these selective modernization efforts have been referred to as “pockets of excellence.” The pockets vary greatly in magnitude and scope. One of the largest and deepest of the pockets (double-entendre intended) is the Strategic Rocket Force (SRF) or Second Artillery, as it is best known in the PLA.

The example of the SRF is particularly interesting because it is a conspicuous pocket of excellence—arguably the most conspicuous—and an area where systems integration is minimal. In fact, it can be said that the Chinese designed their Strategic Rocket Force in such a way that the force has great utility without reliance on the integration of systems beyond the level of the individual missiles. Unlike the American intercontinental ballistic missile (ICBM) force with its complex structure of warning systems, decisionmaking arrangements, command and control networks, coordination of a triad of platforms, etc., China’s system for its nuclear missiles is extremely simple and unintegrated. The PLA’s SRF is not linked to systems in space for detection of an enemy’s incoming missiles. The execution of a prompt, complex, coordinated nuclear strike is not contemplated by China. Instead a rather leisurely retaliation is envisioned, using a handful of missiles, possibly days or weeks after surviving an attack. The situation is similar for the short-range ballistic missiles (SRBMs) of the SRF, for example the Dongfeng-15s (CSS-6 in American terminology or M-9s, as they are more widely known) used against Taiwan in 1995 and 1996. This is not to suggest that the Dongfeng-15s and China’s other ballistic missiles are not complex systems, requiring many properly operating components to achieve success. Nonetheless, these SRBMs and their TELs (transporter-erector-launchers) can reach a launch point and be fired at a target location without reliance on an integrated system. The point is that China’s most conspicuous military technological success story has a conspicuous characteristic: essential absence of requirements for complex, external systems integration. This suggests that the Chinese have recognized their weakness in systems integration and avoided this burgeoning but complex technological discipline. The structure of the SRF, with respect to both its nuclear and conventional arsenals, takes into account China’s lack of skills in systems integration.

The PLA’s shortcomings in systems integration are no secret, either inside the PLA or among foreign observers. Dr. Paul Godwin of the U.S. National War College has referred to articles, essays, and seminars (taken from the *Liberation Army Daily*, military professional journals, and seminars sponsored by an organ of COSTIND—the Chinese Commission on Science, Technology, and Industry for National Defense) on this subject over roughly five years of this decade. He noted that these essays and seminars reflect that the PLA is unable to aspire to early integration of advanced technologies into their operational systems—and recognizes that inability.² The SRF example seems to take this conclusion one step further. The PLA, out of necessity, can be quite good at making do, at achieving imaginative and

²Paul H. B. Godwin, “Military Technology and Doctrine in Chinese Military Planning,” p. 43.

effective work-arounds. However, in doing so, the PLA knowingly comes up well short of world-class capability, in large measure because of inherent inability to undertake, much less achieve, the sort of systems integration that has become a hallmark of truly modern armed forces, especially nuclear forces.³

What the PLA Can Do: The Tale of Three Ships

It would, of course, be absurd to suggest that the PLA has neither attempted nor achieved any significant form of system integration. Nevertheless, examples are not easy to discover. The logical explanation for the lack of visibility is neither that none exist nor that secrecy has obscured the existing examples, but it is true that the PLA generally makes a conscious effort to hide examples of system integration. There is a full realization by the PLA that disclosure of its efforts and achievements in this area reveals important secrets about its capability—secrets that go far beyond simpler revelations of the identity of all or most of the weapon systems and other obvious equipment on a combatant ship. For example, it is one thing to reveal (essentially unavoidably) that a ship has an air search radar, a fire-control radar, a surface-to-air missile battery, and antiaircraft guns. On the other hand, how those components can operate together, and if that operation is effective, is a much higher magnitude secret. This secrecy is reinforced by the xenophobic Chinese view of control of military information. (It should be remembered as well that PLA secretiveness stems not only from a desire to hide systems capabilities but also from an effort to keep the curious from learning just how embarrassingly rudimentary some PLA systems are compared to those of modern armed forces.)

The PLA Navy, consequently, has been considerably less than forthcoming with respect to the degree of integration of weapon systems that exists on its three most advanced missile-equipped warships: the *Jiangwei*-class frigates, the later versions of the *Luda*-class destroyer (including the single *Luda* III), and the most recently commissioned ships, the *Luhu*-class destroyers. Even after separate visits to the three ships by the author and colleagues over a period of several years and the review of available reference materials, we cannot be confident of what is precisely the case concerning systems integration. However, the correlation of these direct observations on board the ships with reported information on sales and installations leads to considerable confidence in the conclusion that all three classes of ship have combat direction systems installed and operating systems to integrate the sensors and weapons of these ships, at least within the ship.

The fact that relatively new surface combatant ships have combat direction systems may not seem a remarkable conclusion, but the class of frigate built just before the *Jiangwei* program began, the *Jianghu*, does not seem to have had such a system. The author asked during a 1991 tour of a *Jianghu*-class frigate to visit the space where

³The Chinese nuclear missile arsenal serves well under this somewhat strange arrangement: no warning system, no alert status, warheads stored apart from missiles, a minimal force, etc. Its shortcomings, including those brought about by China's lack of skills in systems integration, are acceptable—possibly even desirable—because the utility of that arsenal is directly dependent on its not being used. Arguably, China has not sought an integrated system, or suffered from the lack thereof, because it does not seek to achieve an integrated nuclear capability that fosters reliance on a ready ability to retaliate. Another way of putting this is that China has made a virtue of necessity.

such equipment was located and was told that no such space existed. (Such answers were not unusual at that time and were not always factual, so this could not be considered as conclusive information.) A query by the author in the early 1990s to a Thai Navy officer concerning the *Jianghu*s built by China for his navy resulted in essential corroboration that the ship lacked a facility comparable to the combat information center, as that officer understood the concept. Norman Friedman obtained similar information concerning a *Jianghu*-class frigate delivered in 1990 to Thailand.⁴ These three examples of “negative information” are not conclusive evidence that *Jianghu*s do not, or did not, have some sort of combat information center, but they strongly suggest that remarkable possibility.

Possibly the most that can be concluded from this limited information concerning installation practices and timing is that at some point, not later than early in the 1990s, China began as a matter of course to incorporate what, by that time, was called a *combat direction system* in its warships. (Other inconclusive evidence suggests that this practice may have begun earlier in the *Luda*-class destroyers.) In any event, the system doubtlessly now being installed in Chinese combatants, significantly, is not of Chinese design. It was developed by Thomson-CSF of France. The prototype was assembled in the mid-1970s and is now called TAVITAC (*Traitement Automatique et Visulation TACTique*). According to *Jane's Naval Weapon Systems*, two of the early systems were sold to China.⁵ The Chinese version of the system is called ECIC-1, the existence of which reflects an apparent ability at least to replicate a system for integrating tactical information, displaying the data, and permitting the designation of weapons systems to targets. (Incidentally, China's audacity and ingenuity in unauthorized reverse-engineering may be indicated by the fact that, according to *Jane's*, China is not licensed by Thomson-CSF to produce the system.)

Jane's describes the early TAVITAC (through the early 1980s) as a mainframe system for tactical data handling. The upgraded version, TAVITAC 2000, is said to have a “star” architecture but as still relying on a basic mainframe design structure, short of the superior technology and versatility of the fully distributed architecture of the TAVITAC NT which Thomson has sold to Kuwait. The PLA Navy's newest guided missile destroyers are equipped with either the ECIC-1 or the TAVITAC 2000. This system compiles a picture of the tactical situation using inputs from radars and other sensors both on the ship and from remote sources (another ship, for example). To connect with off-board sensors, it uses a data link, which the U.S. Naval Institute reference book *Combat Fleets of the World* terms Link-W⁶—said to be similar to the Link 11 of Western navies. Several hundred targets can be tracked. The system designates these targets to weapon systems and purportedly provides some measure of assistance in reaching judgments concerning the tactical situation, i.e., assessing

⁴Norman Friedman, “Chinese Military Capacity: Industrial and Operational Weaknesses,” in Arnett, pp. 69–70.

⁵E. R. Hooton, *Jane's Naval Weapon Systems*, Surrey, U.K.: Jane's Information Group Ltd., 1998.

⁶A. D. Baker III, *Combat Fleets of the World 1998–99*, Annapolis, Maryland: Naval Institute Press, 1998, p. 120.

urgency related to developing situations and assigning priorities to engaging targets with various systems (missiles and guns).

The system typically uses five or six vertical or horizontal consoles consisting of keyboards and large displays. The following description compiled from *Jane's Naval Weapons Systems*⁷ may offer the technically inclined some idea of the relative sophistication of the system:

The TAVITAC 2000 system uses the Thomson-CSF MLX-32 computer which is built around the Motorola 68030 and 68040 32-bit microprocessors. Each TAVITAC 2000 system has two mutually redundant computers with six Mbytes of memory, one acting as master and the other as a hot standby, and capable of 3 Mips. The system uses Ada software language, the UNIX System V operating system, and features a duplicated VME bus 10 Mbytes Ethernet-standard local area network. A rugged disk storage offers a database management capability for map displays, ship resources, and management.

Another interesting, if less technical, indication of the level of sophistication of the combat direction system installation in the *Luhu* is that France has installed the TAVITAC 2000 in its impressive, stealthy new *Lafayette*-class frigates. Based on information from several sources,⁸ it appears that this combat data system, incongruously, is also present on the version of the *Lafayette* frigates recently delivered to Taiwan. (As with the PLA Navy, the ROC Navy is not inclined to allow visitors on these new frigates, especially in the combat direction center.)

What We Learn from the SRF and Ship Sagas

The story of the PLA's Strategic Rocket Force and the tale of the PLA's three most modern warships are instructive with respect to the state of systems integration in the PLA. The Chinese know both that systems integration is important in the building of modern armed forces and that the PLA is very weak and inexperienced in this field. This recognition has led them, in the case of the SRF, to avoid their weakness, even if it means having a nuclear deterrent "with Chinese characteristics," implying in this case a need to work around severe limitations. In the case of the destroyers and frigates, recognition of the weakness in systems integration technologies forced China to go elsewhere, to France in this case. It was not feasible to design a workable guided missile destroyer's combat direction system if it had to be done with Chinese characteristics. At a minimum, a modicum of advanced system integration technology was necessary to have a moderately combat-capable warship. It is noteworthy that the evidence derived from these cases and the impression one derives from a broader look at the systems integration picture for the PLA leads to the conclusion that China has gone no further with respect to systems integration than to identify the problem and PLA shortcomings. No significant aptitude has been displayed for successfully attacking the problem indigenously.

⁷Hooton.

⁸Friedman, p. 69; A. D. Baker III, *Combat Fleets of the World 1995*, Annapolis, Maryland: Naval Institute Press, p. 730; Hooton, *Jane's Naval Weapon Systems*, table at end of TAVITAC section.

Several aspects of the issue remain quite murky, however. The importation of systems like TAVITAC and even the Chinese copying and production of that system do not necessarily imply that the systems work well on board the PLA Navy ships. For example, the diverse radar and sonar systems and other sensors, some obtained from various countries and others produced in China, undoubtedly present formidable challenges in data interfaces, input coordination, and systems compatibility. Computer hardware and software differences among the various systems and the translation and comprehension of manuals and computer programs offer further challenges. It is hard to imagine that the PLA Navy has succeeded in putting all this together and formed a seamless combat direction system.

II. DEFINING SYSTEMS INTEGRATION AND ITS LEVELS OF APPLICATION

Comprehending the Concept

Like the currently popular terms *asymmetry* and *RMA (revolution in military affairs)*, *systems integration* has become something of a buzzword in defense affairs circles. Further, the term is used or misused widely, often to reinforce whatever point the writer or speaker wants to make, with little concern for consistency or accuracy. Consequently, prior to delving more deeply into the matter of systems integration in the PLA, it is useful to examine informed efforts to define and understand this term. The term is relatively new in its current ubiquitous military usage, especially in the PLA. Few, if any, defense specialists have spent more time and effort on defining the term systems integration and focusing its application than those in the U.S. Department of Defense who are dedicated to the acquisition of systems, development of technologies, and the formulation of the U.S. policies related thereto. The introduction to a definitive document produced by that office, the U.S. Department of Defense publication entitled *Militarily Critical Technologies List (MCTL)*,⁹ states:

Systems integration enables the harmonious and productive working of disparate components and the interfaces that connect them. Each weapon system requires the use of specific hardware and software and the integration of new technologies or advances in existing technology subsets to increase overall system performance, improve manufacturing or reduce costs.

Systems integration is an ongoing process. Good integration includes traceable assurances that the components and functions will fit together and operate in concert. In the past, weapons systems designers have successfully improved both the hardware and software in an interactive process, and then integrated both to effect simultaneous improvements. Excessive integration adds cost and time without yielding a significant improvement in the product or system. Too little integration results in products or systems that do not function as advertised.

⁹Office of the [U.S.] Under Secretary of Defense for Acquisition & Technology, *Militarily Critical Technologies List*, Washington: National Technical Information Service, Springfield, VA 22161, June 1996, p. 2.

Technology integration can be treated as a subset of systems integration. High technology weapons systems are fundamentally driven by availability and integration of technologies . . . *The tools and techniques for preparing, mixing and matching the various components are also critical technologies because they are key to achieving the desired qualities* [final emphasis added].

This careful, if lengthy, description of systems integration and explanation of its importance outlines the purpose and nature of the process of achieving it, points to the pitfalls, and, possibly most important for this examination of the subject, states that the very methods employed in the integration are *critical technologies in themselves*. As has long been recognized, China, and especially the PLA, suffers from technological disadvantages in areas such as electronics, computers, and software. That is difficult enough, but, more tellingly, China, it seems, has yet to begin to grapple seriously with the next very complex step: mastering the critical technologies of systems integration, referred to in the extract from the MCTL.

Paul Dibb, formerly Director of the Australian Joint Intelligence Organisation and Deputy Secretary of the Australian Department of Defense, wrote recently: “Not only is implementation or planning for systems integration almost totally deficient in the [Asia-Pacific] region, there is also a very limited capacity to modify and adapt current combat systems that are vital to operational effectiveness.” Noting that systems-integration technology has eluded even Japan, Dibb asserts that the failures “are even more pronounced in China and India.”¹⁰

The Scope of Systems Integration: Five Levels Applicable to the PLA

For China’s military leaders, contemplating the largely unexplored sweep of systems integration as it applies to China’s armed forces, from the broadest context down to individual units or troops in combat is, undoubtedly, a daunting task—as it is for the outsider trying to grasp the scope of this problem for China. There is, of course, no fixed set of categories or levels for the application of systems integration. However, the following attempt to divide the sweeping problem into five comprehensible levels of applicability may be useful as a device to try to understand both the scope of the problem and its many facets.¹¹

Military systems integration at the regional or global level. The highest plane of the systems-integration challenge that faces China could be termed the *big picture* level. This level of the integration problem is perhaps illustrated well by examining the saga of the U.S. aircraft carrier battle groups deployed to the region in March 1996 as a response to the second round of SRF M-9 missile “tests” and leading up to the first popular election of a president in Taiwan. Put starkly, the Central Military Commission (CMC) in Beijing had to depend on American announcements from Washington and Honolulu and reports from CNN to learn that the carrier battle groups had been deployed and where they might be operating. Then the PLA had no

¹⁰Paul Dibb, “The Revolution in Military Affairs and Asian Security,” *Survival*, Vol. 39, No. 4, Winter 1997–98, pp. 102–103.

¹¹The following scheme of five levels of system integration is an artificial device conceived by the author to facilitate treatment of a complex subject and should not in any way be viewed as reflecting concepts employed by the PLA or the U.S. Department of Defense.

means to verify the presence of the battle groups or to determine their positions. Unknown were even the general locations, much less the latitude and longitude or course and speed of individual ships. It is likely that to this day no one in China knows when the second carrier battle group arrived, where it operated, how its ships and aircraft were disposed, and precisely when it departed the area. From the U.S. perspective, this was a very comfortable situation. Its forces, because they could not be located by China without U.S. complicity or “cooperation,” were operating essentially in a form of sanctuary. Further, there was the luxury, if desired, to announce or leak something about the location and disposition of forces and have that serve almost as well as if it were wholly factual. This example illustrates well China’s predicament should it wish to react to such events more than a few score miles off its coast, lacking an integrated system that can present a dynamic tactical picture over the area of concern.

The character of this problem of location and identification possibly can be even better appreciated by a quick look at China’s existing capabilities to determine the tactical situation in the ocean areas off China and Taiwan. A PLA Navy maritime reconnaissance aircraft, on an extended mission, might, after arriving on station, search an area of 20,000–30,000 square miles using radar and electronic intercept equipment—assuming that the U.S. ships (or other naval units of interest) were not evading detection. Yet the area that might warrant searching (where the carriers could be in positions to close the target area and launch strikes or conduct other missions, for example) is 400,000–600,000 square miles—ten times the optimistic search area of a single aircraft mission. Moreover, the searching aircraft, typically using radar, can be denied the ability to detect the ships of interest by being turned away by intercepting aircraft and through various electronic and spoofing means.

China looks to a future when the PLA can operate its ships and aircraft several hundred miles from its coastlines and, in doing so, protect its maritime interests. This blue-water endeavor may take rudimentary form, ensuring that ocean commerce is not disrupted, or it may attempt something more sophisticated, such as an effort to achieve sea denial or control. Whatever form China chooses, the admittedly rather rudimentary example provided here illustrates that the PLA cannot begin to determine the tactical situation it faces in its surrounding ocean areas, absent an integrated surveillance system. That system should be able to detect threats or other contacts of interest (and discriminate between them) day and night and in all weather, and even under circumstances where the targets are attempting, through sophisticated or simple means, to avoid detection. This system would then have to be integrated with means to identify and evaluate the detected contacts, eliminate false contacts, and correlate the many detections in such a way as to compile target tracks and to be able to forecast future positions—assuming some action with respect to the targets was contemplated. This is but one example of a level of systems integration that would require interfaces and correlation on a grand scale among sensors and other systems widely separated in distance, design, and character.

This level of the “big picture” system integration problem also would apply to aspirations by China to compile a picture of satellites in space that might threaten

China or that China might hope to threaten. Furthermore, as alluded to at the outset, China is severely constrained, whether by design or necessity, in its nuclear deterrent policy by its lack of capability to obtain warning of a nuclear missile attack. All of these examples of the highest level of system integration are almost certainly out of China's reach for the foreseeable future. Beijing may continue to conclude that it will simply have to tolerate this shortcoming in big-picture system integration. Whichever direction China chooses with respect to this very complex technological problem and, especially the systems-integration aspects thereof, will be a critical determinant of the character of China as a major military actor in East Asia. As physicist and security expert Norman Friedman put it after extensive research, "While China's recent history features a number of socio-political set-backs that have crippled the military technology base, the rest of the world has been racing forward at a remarkable rate. As a result China is not only far behind the state of the art in electronics and command and control; Chinese planners may be unable even to conceive of appropriate solutions to the problem of closing the gap."¹²

Integration among platforms in a warfare area. The next level of systems integration involves meshing various platforms and components within a specific warfare area. These areas might include, for example, antisubmarine warfare (ASW) or air defense.

An effective ASW capability optimally would include:

- **aircraft** (fixed-wing and helicopters) dropping sonobuoys and monitoring the radio signals from those buoys for submarine-generated noise or for echoes from explosive charges dropped in conjunction with the buoys, or, in the case of helicopters, using passive and active dipping sonars. Aircraft able to proceed at high speed to investigate suspected contacts generated by other means and deliver attacks with homing torpedoes;
- **surface ships** (probably destroyers and frigates) employing hull-mounted sonars and trailing variable-depth sonar equipment. Ships able to coordinate at least local area antisubmarine operations and to deliver attacks with homing torpedoes;
- **submarines** (preferably quiet nuclear-powered vessels which have faster submerged speeds for unlimited periods) able to occupy the same acoustic water layers as the target submarine and with the ability to communicate contact information to the local ASW coordinator and, critically, to antisubmarine aircraft that are able to close contacts rapidly and deliver attacks, as described above;
- **sea-bottom acoustic arrays** (sets of hydrophones on the ocean floor) positioned in strategic areas of concern and linked to monitoring stations ashore with the capability to detect, identify, and track targets that could then be prosecuted by aircraft or possibly by ships or submarines in some circumstances.

Air defense systems are more intuitively obvious to most readers, but they might include as a minimum:

¹²Friedman, p. 67.

- **land-based, sea-based, and/or airborne radars** that can provide requisite coverage against low-flying aircraft, are resistant to jamming or other electronic deception, can be defended against anti-radiation missiles, and can detect, identify, track, and facilitate intercept and engagement of targets;
- **interceptor aircraft** with appropriate speed, altitude capability (service ceiling), maneuverability, and equipped with engagement radars or other sensors and air-to-air missiles sufficiently capable against the intruding aircraft so that they may be fired effectively before the intercepting aircraft can be evaded or neutralized; and
- **land-based or sea-based surface-to-air missiles**, some of which can engage targets at considerable distances and others capable of short-range engagements.

It must be said forthrightly that the PLA Navy and PLA Air Force have not achieved significant proficiency in any of the component technology areas described for ASW or air defense systems. Moreover, they certainly have not made substantial progress in any form of ASW or air defense system integration, save rudimentary direct communications (e.g., voice radio) between ASW aircraft and surface ships or interceptor aircraft and controlling radar sites as they carry out rather old-fashioned ground-controlled intercepts, for example. At the warfare-areas level of systems integration, there has been essentially none of the “harmonious and productive working of disparate components and the interfaces connecting them,” as described in the U.S. Department of Defense MCTL.

China’s prospects for changing the situation at this level of systems integration were addressed by Erik Baark in his recent examination of science and technology policy and technological innovation in Asia. He wrote, “When the interaction of military and civil sectors in China . . . is evaluated in terms of technological capabilities, it appears that there are still some serious bottlenecks, in particular the lack of innovation networks which, in practice, could serve to link . . . R&D to manufacturing. The networks which formally exist . . . suffer from a fragmentation which leaves little in terms of critical mass for the development of integrated weapon systems.”¹³

Integration of various components to constitute a weapons platform. The next level in the hierarchy of systems integration is that of combining components to constitute a combat aircraft, a combatant ship, a battle tank, or similar platform—not the individual weapon systems on the platform but the overall platform that mounts the various sensors and weapons. Considerable skill and experience are required to combine successfully a fuselage, hull, or vehicle body; a propulsion unit; the electrical and other auxiliary systems required; and the suite of sensors and weapon systems, generally including very sophisticated electronic components and computers and all the linkages needed. The problem is multiplied many times over if the various assemblies are from several countries with varying origins and conforming to different technical standards. (Further, Chinese military aircraft, ship,

¹³Erik Baark, “Military Technology and Absorptive Capacity in China and India: Implications for Modernization,” in Arnett (ed.), p. 109.

and vehicle manufacturers have not generally been able to produce identical versions of units of the same model, even when in serial production. Consequently, in many cases, “black boxes” cannot readily be exchanged from spare-parts bins or among units to troubleshoot, effect repairs, or carry out preventive maintenance, for example.)

The general nature of the problem can be appreciated by considering the PLA Air Force’s (PLAAF’s) proposed future fighter aircraft, something intended roughly to approximate a modernized F-16. Paul Dibb, using this developmental F-10 as an example, refers to these as *hybrid systems*, “combining platforms, radars, avionics, and missiles from different suppliers.” He goes on to write that “China’s next-generation fighter, the troubled J-10 [often referred to as the F-10 in the West], has a Chinese airframe, Israeli avionics, and Russian engines.”¹⁴

The *Luhu*-class destroyer serves possibly as an even more dramatic example. The first ship of that class, *Harbin*, while under construction at the Jiangnan Shipyard in Shanghai, was described reliably (by Chinese sources) as featuring 189 of China’s “achievements in the development of naval equipment,” incorporating *more than 40 advanced foreign technologies*, and fitted with over 50,000 sets of equipment. The ship was described as having “equipment developed or produced by 19 provinces [of China], 11 ministries, commissions and corporations, and 100 manufacturers, research institutes, and entities.” The anti-air missile launcher and its Mach 2.4 missiles (an actual *Crotale* launcher on the first ship and a Chinese version of that system on the second, further complicating things) were developed in France by Thomson and Matra Missiles. An air search radar (TSR3004) and the combat data system (the TAVITAC, described previously) were also developed by Thomson, but the long-range air search radar is Chinese. The A244S homing torpedoes are of Italian origin.¹⁵ The C-801 anti-ship cruise missiles were designed and manufactured in China. The origins of many other advanced components large and small (e.g., electronic countermeasures equipment), and notably including the sonar systems, are unknown to the author.

If these statistics and lists, many of which were cited publicly by PLA Navy representatives with the intent to impress the Chinese public and foreigners as well, were not stunning enough, it should be noted that only two ships of this class were built. There was little if any time and opportunity to profit from lessons learned in this extremely complex area of systems integration. Certainly much of the effort that went into achieving some level of compatibility and devising interfaces for all these disparate components can be applied in varying degrees to the upcoming new class of destroyers, (*Luhai*, previously known as the *Dalian-C*) but those new ships, the first of which is already on the way, will incorporate new technologies that China has been able to develop and acquire.¹⁶

¹⁴Dibb, p. 99.

¹⁵Tseng Hai-tao, “Commander Jiang Wants to Accelerate Naval Construction, China’s Newest Warship Emerges,” *Kuang chiao ching*, August 16, 1996, in FBIS-CHI-96-209, October 29, 1996, pp. 2, 5; information on the identity and origin of the long-range air search radar is from Baker, p. 120.

¹⁶Conversations between the author and knowledgeable PLA Navy officers in 1997.

This illustrates yet another aspect of the problem. The PLA has great difficulty forecasting what systems and technologies can be obtained, when they will become available, and which of those available it wishes to use. There are several reasons: (1) China's own research and development effort is spotty and inadequate, (2) many countries restrict what they sell to the PLA (and are prone to change their minds), (3) foreign equipment is expensive and suppliers often demand payment in hard currency, (4) China is reluctant to repeat the experience of becoming overly dependent on foreign suppliers (as it was on the Soviet Union in the 1950s and on several Western countries in the 1980s before Tiananmen interrupted that episode of technology transfer), and (5) the PLA has difficulty assimilating and incorporating new technologies. Once more, the *Luhu* class and its follow-on are illustrative. Looking at the critical matter of ship propulsion, the new follow-on destroyer, although similar to the *Luhu*, has a wider hull (broader beam) to accommodate a different, somewhat larger and bulkier marine gas-turbine engine. That is because post-Tiananmen sanctions imposed by the U.S. have precluded acquisition of additional GE LM 2500 engines like those in *Harbin* and her sister ship.¹⁷ The follow-on ships will have Ukrainian G525000 gas turbines, said to be selected using "a combination of technical and political factors."¹⁸

Dr. Paul Godwin, an experienced and recognized specialist on the PLA at the U.S. National War College, summed up a part of China's plight at this level of systems integration as follows: "The simple fact that all the PLA's advanced weapon platforms depend on imported technologies for their power plants, weapons, and electronics is a clear indicator that China's research centers have yet to produce weapon platforms based on indigenous technology that match those the advanced industrial states were manufacturing by the 1970s. For such a military technology and industrial base, advancing into the technologies required for the 21st century is a daunting task. This task is made even more intimidating by China's continuing quest for military self-sufficiency."¹⁹

Furthermore, the path to integrating these technologies is almost never direct and efficient. The sagas involved in obtaining the avionics and engines for the J-10 chronicle more than a decade of frustration, dashed expectations, disappointments, engineering changes, schedule and cost overruns, and failures. All these have done far more than delay the progress of this seemingly plagued fighter aircraft program. They have also severely taxed Chinese aeronautical designers and engineers in an area that is already their near nemesis: the challenge of integration into a single tactical airframe of all these diverse systems from international sources. A similar situation exists with respect to the *Luhu* and many other areas where China has undertaken the daunting task of combining components from diverse suppliers in an effort to deploy a system far more advanced than that which China is able to design and build indigenously.

¹⁷*Ibid.*

¹⁸Tseng, p. 3.

¹⁹Godwin, "Military Technology and Doctrine in Chinese Military Planning," p. 59.

Unless one cynically attributes it all to a quality of stubborn persistence in those who guide these PLA programs, it must be concluded, from the frequent and repeated resort to these methods, that no better method appears feasible to them. There is no question that the encumbrances of this erratic and uncertain method are not trivial. They are a critical factor in limiting China's successes in producing ships, aircraft, and other platforms that even approach or approximate the level of modern weapon systems. The *Luhu*-class destroyer is a ship that Western navies and the Japanese Maritime Self-Defense Force would have been proud to put to sea 20 or more years ago. The J-10, if it gets past the prototype stage, will likely hold its own against the F-16, an aircraft that first flew in the U.S. Air Force about a quarter of a century ago. But the designers and builders of tactical aircraft and combatant warships for the PLA are stymied by the problems of integrating systems to constitute a modern fighting platform.

Integrating components from diverse sources that form a weapon system. This level of systems integration involves the use of components to comprise a specific functional weapon system—an individual weapon system on a platform, not the overall platform (ship or aircraft). The classic case of this level of integration is the combining of a detection system (a radar, for example) with a system to aim the weapon (a fire-control system, for example) and one or more devices that deliver lethal fire on a target (missiles and the associated launcher and/or guns and the projectiles they fire). The air and missile defense system of the *Luhu*-class destroyer is a good example. The components of that system were described above.

As mentioned, the long-range air-search radar is of Chinese origin (although it probably is derived from earlier radars developed in other countries). The *Luhu* has no means of engaging air and missile targets at the ranges (up to a hundred miles or more) that this *Sea Eagle* radar could gain contact. It would be desirable to have an automatic interface between the Chinese radar and the French systems that can provide a tactical display, track the targets, and assign missile batteries or guns to the target (TAVITAC 2000). The Chinese have probably at least attempted to install such a linkage, but, for the PLA, trying and succeeding to the degree that combat reliability is attained may be two quite different things.

The *Luhu*'s missiles and launcher are French (the *Crotale* system or the Chinese version thereof, as mentioned previously), probably facilitating the interface between the combat direction system and the anti-air missile system, both designed by Thomson. However, the long-range 100mm and short-range 37mm guns are Chinese, as are the Type 347G (*Rice Lamp*) fire-control systems²⁰ for the guns. (The unmanned, wholly automatic 100mm gun, with a firing rate of 30 rounds per minute per barrel,²¹ closely resembles an Italian main-battery gun. The 37mm guns are rapid-fire weapons—760 rounds per barrel per minute,²² although the weapon resembles another Italian gun, the PLA Navy has expressed great pride in its

²⁰A. D. Baker III, *Combat Fleets of the World 1997-98*, p. 120.

²¹Conversation between the author and a PLA Navy captain on board the *Luhu*-class destroyer *Harbin* (but not normally assigned to the ship) while on a port visit to San Diego.

²²Baker, p. 115.

development.) The establishment of an extremely reliable and effective interface between the combat direction system and the rapid-fire 37mm guns, two systems of widely differing origins, is especially crucial. These guns and their fire control system, something like the *Phalanx* close-in weapon system (the Gatling-gun-like CIWS) developed and used extensively in the U.S. Navy,²³ are the last resort to down anti-ship cruise missiles that leak through other air defenses. Failure of this complex sequence of target designation, precise fire control, and then faultless fire of a fusillade of projectiles from the guns would be devastating, likely resulting in heavy damage or the disabling of the ship. So, the PLA faces the need to resolve this extraordinarily difficult integration problem in a situation where there is no second chance or backup for that crucial system in combat.

Other crucial examples of systems integration problems at the level of a specific weapon system include melding the radar in the Russian Su-27 interceptor aircraft and the Chinese air-to-air missiles (AAM). The PLAAF would seek the capability to employ its PL-series missiles in addition to the Russian missiles purchased as part of the Su-27 sales arrangements. PLAAF leaders must ponder the likelihood that Russian-made missiles might be subject to easy defeat by Russian pilots, if there were once more frictions over the northern border—or that the Russian designers might have revealed missile-countering secrets to Americans or others. In the obverse of this example, the PLAAF may wish to make its Russian-made heat-seeking and radar-guided AAMs compatible with the J-10 or other Chinese-built fighter aircraft. To illustrate how far the PLAAF may have to go to be able to achieve these complex meldings, one need only recall the observations by some knowledgeable observers that the PLAAF apparently has not yet achieved a consistent capability with the Su-27s, acquired early in this decade, to employ air-to-air missiles in all-weather conditions and beyond visual range. The PLAAF does not have a good record or reputation for success in endeavors such as this, or even in much less complex tactical integration.

However, despite problems and gaps, there has been some progress in this level of systems integration by the PLA, even if spotty, as amply illustrated by the presence of the TAVITAC systems in the three latest PLA Navy warships. This example of limited success brings to the fore other critical questions: Will the PLA expend the effort and consistently provide the resources needed to keep these (largely foreign) systems operative? Will the advanced skills required for operation and maintenance be taught on a continuing basis? Will preventive maintenance and repairs of casualties be undertaken promptly and correctly or will these things be ignored, as has so often been the case in the PLA? Is there a full understanding by PLA operators and technicians of the detailed workings of the systems and the complexities of the

²³The U.S. CIWS, incidentally, has been sold to Taiwan for use on frigates. The fact that this system is available as last-resort protection for Taiwan's frigates makes it all the more imperative that the PLA Navy strive to feel confident in its own systems. In any sort of confrontation at sea that may come about between the PLA Navy and ROC Navy, the relative effectiveness of the anti-ship cruise missiles of the two sides is almost certain to be the crucial factor. These two systems are likely to be major determinants in the matter of defense against cruise missiles.

systems integration? Most Western observers believe that the answers range from no to maybe, at best, for questions such as these.

The existing systems integration efforts at this level are important for reasons beyond the successes with individual weapon systems. These efforts are likely to reveal the pace and trend of PLA systems integration—whether it will be slow or rapid, and whether it will tend toward failure and epidemic frustration or success and contagious enthusiasm.

Integration of high-tech systems with obsolescent and low-tech equipment. The final of the five levels of systems integration is of special applicability to China, and a situation where success of the integration may not be nearly so dependent on crucial interfaces, automaticity, and the like. For decades to come, the PLA will continue to have a very large inventory of old equipment and a much smaller inventory of advanced systems. The effort to employ selected high technology as a force-multiplier or enhancer for obsolescent equipment will surely receive a great deal of attention and may even become a very important and widespread aspect of PLA systems integration, even if the PLA (prudently) accelerates retirement of obsolete equipment. Lieutenant Colonel Lonnie Henley wrote in April 1996 that China is likely to pursue “the integration of high-tech conventional forces with guerrilla, militia, and paramilitary forces. There is already considerable discussion of this approach, generally under the rubric of ‘people’s war under high-tech conditions’.”²⁴

PLA leaders and writers on military affairs have indeed suggested this concept in an even broader sense than that described by Henley, albeit somewhat obliquely. They look to certain advanced or innovative means as a way to leap-frog over their technological backwardness and to find chinks in the digital armament that the U.S. and other modern armed forces tout as the way battles of the future will be fought. A PLA major general wrote:

We must use a practical combination of information warfare and Marxist and Maoist military thought to guide information warfare and issues in military construction [building of the force] . . . [T]he military [PLA] must emphasize the study of ways to use inferior equipment to achieve victory over enemies with superior equipment.²⁵

We must use all types, forms, and methods of force, and especially make use of nonlinear warfare and many types of information warfare methods which combine native and Western elements to use our strengths.²⁶

A PLA senior colonel offered:

²⁴Lonnie Henley, “China’s Capacity for Achieving a Revolution in Military Affairs,” an unpublished paper prepared for the Annual Strategy Conference at the U.S. Army War College concerning the status of China in the 21st century held 23–25 April 1996. Lieutenant Colonel Henley, U.S. Army, has considerable experience related to the PLA.

²⁵Wang Pufeng, “The Challenge of Information Warfare,” in Michael Pillsbury (ed.), *Chinese Views of Future Warfare*, p. 319. Major General Wang is a former Director of the Strategy Department, Academy of Military Science, Beijing. His paper was excerpted from *Zhongguo junshi kexue*, Spring 1995.

²⁶*Ibid.*, p. 325.

The basic way to defeat a powerful opponent with a weak force in a high-tech war is to bring the overall function of [the weaker force's] operational system into full play . . . and, through the integration of the above two aspects, attain the goal of turning the inferior into the superior and finally defeat the enemy.²⁷

Another major general provided this perspective:

Large quantities of high-tech weapons on battlefields pose serious challenges to traditional methods of operation . . . On the other hand, traditional methods will be reinvigorated and adapted to new operational conditions. With technical development of precision all-weather targeting, stealth weapons, precision guidance, and night fighting, traditional warfare can also be enhanced.²⁸

Open to debate is how seriously these concepts should be taken. Is there substance behind the words? Are these largely just examples of PLA writers who feel the need to tackle concepts they have read about in Western military journals and apply them to the PLA? Henley's experienced analysis of various writings on this issue includes the thought that there is a "bit of a 'me too' tone" to it all. Certainly that is an aspect of this concept that should not be ignored. Peripheral (unmodernized) PLA units naturally want to believe that they are, or can become, part of an effective fighting force, and their leaders desperately need something hopeful to tell their troops to keep morale from collapsing under the realization that their ill-equipped units would be little more than cannon fodder on the modern battlefield—or its naval or air warfare equivalent. As things stand now, we simply do not have solid evidence that the PLA is, as a matter of doctrine, pursuing this method to enhance the effectiveness of less-capable forces. Available evidence (other than the type of rhetoric cited above) points in the opposite direction, that the PLA is concentrating new systems and the integration (however rudimentary) of those systems in its "pockets of excellence": the elite rapid-reaction, or "fist" (*quantou*) units, as well as the naval and air equivalents thereof.

Michael Pillsbury has shed light on another shadow lurking in this concept, at least as it is described in Chinese military writings. In commenting on an article concerning the potential enhancement of Chinese airpower along these lines, Pillsbury wrote, "This peculiar misperception seems to mean that obsolete 30-year-old fighter aircraft (the majority of China's air force) can be made effective by adding a few AWACS aircraft and electronic jamming aircraft, which China is in the process of acquiring." (It is not possible to determine with confidence whether the writings on which Pillsbury comments are in fact an example of a PLA misperception. They may instead be wishful thinking, or an attempt to mislead potential adversaries—possibly Taiwan more than the U.S.—to believe that the PLAAF will soon be much more potent.) The point here is that there is a tendency among developing armed forces, to which the PLA is not immune, to believe, all too optimistically, that the

²⁷Shen Kuiguan, "Dialectics of Defeating the Superior with the Inferior," in Pillsbury (ed.), *Chinese Views of Future Warfare*, p. 217. In 1997, Senior Colonel Shen was a professor at the [PLA] Air Force Command Institute in Beijing. His paper originally appeared in *Zhongguo junshi kexue*, Winter 1994.

²⁸Wu Guoqing, "Future Trends of Modern Operations," in Pillsbury (ed.), *Chinese Views of Future Warfare*, p. 349. In 1997, Major General Wu was Director, Department of Operations and Tactics, Academy of Military Science, Beijing. His paper was originally published in *Zhongguo junshi kexue*, Summer 1994.

addition of this or that advanced system will catapult it into modernity. Although the record is full of examples where that sort of effort has failed, hope springs eternal.

Of course, there will be specific situations where the integration of advanced systems with far less sophisticated equipment will produce enhancements, or where some very capable modern systems can provide cover and protection for older, more numerous, less capable platforms. There will be situations where obsolete and modern equipment will be present during the same engagement, with benefit accruing in some instances and confusion the likely result in others. However, it is much more likely in most cases that systems integrated in such a manner, whether by design, necessity, or inadvertence, will be no stronger than their weakest links.

Indeed, in many cases the attempt may prove counterproductive because valuable high-technology systems will be adulterated, wasted, or even sorely jeopardized. Various levels of technology can, of course, be integrated, but assurance of an outcome that is likely to succeed under combat conditions is quite another question. The success of such an integration effort is much more probable with components that are balanced and compatible. This level of systems integration, the concept of combining advanced systems to give new life to the PLA's "military museum," would seem to hold very limited promise for the PLA. Given the plight of the PLA, these dim prospects for success are unlikely to discourage isolated attempts to bring about miracles. However, widespread efforts along these lines are highly improbable.

III. DREAMS, REALITY, AND PROSPECTS

PLA Aspirations for Systems Integration: Hopes and Dreams

The concept of systems integration and its complexity are, no doubt, understood and appreciated by many of the more perceptive and better-educated officers of the PLA. Their insights are being passed along to many others through articles in *Jiefangjun bao* (*Liberation Army Daily*) and various Chinese military journals. A 1996 article is illustrative.²⁹ The writer describes the trend toward integration of military intelligence, tactical decision-making, and attack against opposing forces, recognizing the contradiction between the modern demand in combat for near-real-time actions and manual operations. (His reference to crude manual operations is, of course, one of the devices used by such writers to point out the situation in the PLA without having to do so directly.) He observes that such unautomated systems that exist independently, even if operated manually at the upper limit of human capability, cannot satisfy the requirements of modern warfare. Quoting from the article: "The resolution of these contradictions is certain to be the setting up, with computers as the nucleus, of an integrated system of intelligence, decision-making, and attack; forming an organic whole of automated information processing, computer-automated judgments or auxiliary decision-making and automated weapon operation; reducing information links; and having machines replace manual

²⁹Wei P'ing, "Trend Toward Integration of Intelligence, Decision-making, Attack," *Hsien-tai chun-shih*, No. 229, February 11, 1996, pp. 49–51.

operations.” There is further explanation in some detail of the characteristics of intelligence reconnaissance technology, the development of the science of decision-making, and the features of modern precision weapons. The author asserts that the Aegis system on U.S. and Japanese warships is representative of one type of integrated system and the German Cheetah motorized antiaircraft artillery system typifies another. The author concludes that such systems lower the requirements for weapons and equipment and offer better prospects for “big victories.”

Many Chinese writings on subjects similar to this one are largely regurgitation of articles in U.S. or other Western military journals—a point often made by Westerners examining the state of PLA progress in this area. The use of the Aegis and Cheetah examples surely raises that specter in this case. Whether that is the case here is interesting to speculate about, but does not detract from the issue at hand. The point here is that the PLA, and certainly the PLA elite, is fully acquainted with the jargon and concepts of systems integration, at least at the level of detail of such newspaper and journal articles. There can be no remaining question as to whether the PLA recognizes that victory in future conflicts against modern forces will be virtually unachievable unless it can attain a goodly measure of the system integration goals to which it aspires.

The PLA Navy (PLAN) has not lagged behind in *conceptualizing* integrated systems within individual ships, between ships, and even more broadly. The expression frequently employed by PLA Navy writers is *digitized naval warfare*. They define this term to include digitized communications and information systems, computer data processing systems and terminals, and links to combat platforms. The vision is of a digitized chain of command and control to sharply increase the combat performance potential of all naval warfare platforms and weapons. As a 1996 article by two PLA Navy officers in the journal *China Military Science* stated:

Single-ship and unit offensive-defensive capability, single-unit coordination capability, and inter-unit joint operations capability are all growing sharply [meaning in modern naval operations, not necessarily in the PLA]. And as to coordinated naval operations, with submarine, aircraft, and surface ship communication systems being linked up, mutual information transmission problems being solved, and the current joint operational difficulties and problems within and among units being overcome, all combat platforms can be effectively linked into one operating entity, to strike enemies with maximum combined force [again, hardly a description of today’s PLAN] . . . Such comprehensive operating systems can link the whole establishment together. So we can predict that the naval C³I system grounded in satellite and computer technology will become the priority of soft systems development in the tide of the new military revolution, as well as being linked up and made compatible with air force and army C³I systems.³⁰

PLA writers often reveal more in their writings than the literal meaning of the words. They apparently are constrained in candidly addressing the shortcomings of the PLA

³⁰Shen Zhongchang, Zhang Haiying, Zhou Xinsheng and Shi Yukun, “The Impact of the New Military Revolution on Naval Warfare and the Naval Establishment,” *Zhongguo junshi kexue*, No. 1, February 20, 1996, pp. 57–60. Senior Captain Shen is Director of the Science and Technology Department, Naval Military Academic Studies Institute; Lieutenant Commander Zhang and Lieutenant Zhou are affiliated with the Institute. Mr. Shi edited the article.

Navy. One method of getting around these constraints and raising the issue of PLAN inadequacies is to write about what is happening to navies generally as they modernize. That technique has been employed liberally in the article cited above. Put another way, the developments described in this article will be recognized by PLA Navy officers, the principal readers of this journal, as capabilities that the PLA does not have or concepts that the PLA is just beginning to come to terms with. Consequently, the authors do not have to state directly that their navy is lacking in the types of equipment described and the integration thereof. When they write about the conduct of future naval warfare, their purpose is clear: They are sending the message that the PLAN is behind and needs to catch up. The final sentence of the excerpt is illustrative; it should not be seen primarily as a prediction of the future of naval warfare but should be interpreted as a call to action. Stripping away the artifices of PLA writing, its meaning might be as follows: *The PLA Navy must turn its attention to the acquisition and integration of C³I based on satellite and computer technology. This should be a priority in PLAN soft systems development and should be compatible with air force and army C³I systems.*

The following excerpt from the same article uses this technique once more and pointedly employs a description of U.S. Navy practices to suggest what he considers the proper direction for the PLAN:

All soft systems [sic] have become a key indicator of ship combat performance. So in the modern warship development process, all soft systems, particularly communications equipment, target detection equipment, and electronic warfare systems, are growing not only ever more numerous but also increasingly complex, becoming the key components of weapon systems. The U.S. Navy, when designing and building navy vessels, gives priority consideration to electronic equipment, equipping many of its ships with electronic jamming units to increase their defensive capability. Tactical intelligence data systems are comprehensive operating systems that the U.S. Navy has developed to a high degree of perfection on most of its surface ships. They not only can direct all weapon operations of a ship but also can use data links with other ships in the fleet to coordinate and command the weapon control systems of friendly ships and planes.³¹

Indeed, we can trace these types of rhetorical devices to the highest levels of the PLA. The Director of the Commission on Science, Technology, and Industry for National Defense (before COSTIND's reorganization in 1998), Cao Guangchuan, wrote in 1997 of the Central Military Commission's stress on scientific and technological development for national defense:

[I]t is necessary to effect the change from aiming to win limited wars fought under ordinary conditions to winning limited wars fought under conditions of modern technologies, especially high technologies. Second, in terms of army building, it is necessary to effect the change from quantitative expansion to qualitative improvement, from building labor-intensive forces to building technology-intensive forces We must persist in putting scientific research before actual development, keeping track of the development of high technologies in the world, mainly relying on

³¹*Ibid.*

our own efforts, and attach importance to the digestion and assimilation of imported technologies and on innovation.³²

It seems safe to assume that Cao's words reflect real CMC and COSTIND priorities and the state of technology in the PLA, and that they were not words written to influence or mislead a Western audience. This conclusion seems all the more plausible because many other officers and officials have written along similar lines in various journals and other publications, including some to which foreigners do not normally have access. Several conclusions might be drawn from his revealing words, but the fact that he and others, in 1997, were offering such elementary advice and guidance on such things as the sequencing of research and development may be the most interesting features. The tone of his pronouncements makes it clear that the PLA is still at a very early stage in assimilating advanced technologies, much less integrating these technologies into sophisticated systems. This is, of course, no surprise to those who follow and analyze the PLA's modernization efforts. However, it does provide confirmation and a richer context for understanding where the PLA stands today with respect to systems integration and how far it has to go. Reliance on foreign technology is evident, as is the conflicting (and understandable) desire for self-reliance. The final sentence makes clear not just the need to acquire "imported technologies" but also, by attaching importance to digesting that technology, the writer reveals (not surprisingly) that this matter of usefully assimilating such imports (and integrating them into combat systems) is an abiding concern.

The views are also shared by representatives of the defense industries that are charged with producing the systems. The President of China Ordnance Corporation wrote in 1997 in the *People's Liberation Army Daily* about integration efforts:

Over the next few years, the ordnance industry will persist in integrating the development of new equipment with the revamping of existing equipment and in integrating development of our own efforts with the import of advanced technologies.³³

In the same group of 1997 articles in the *People's Liberation Army Daily* as the two pieces cited above, the Supervisor of War Military Projects under the Ministry of Electronics Industry wrote:

The year 1997 is a crucial year in the Ninth Five-Year Plan for the development of military electronics. The tasks are very arduous . . . In this year we will continue to conscientiously implement the spirit of the instructions of the Party Central Committee and the Central Military Commission by . . . strengthening basic research and anticipatory research, *improving the ability of systems integration . . . and striving to achieve a giant leap in the development of military electronics . . . We have come to soberly realize that making a success of this key project will involve many difficulties*

³²Cao Gangchuan, "Enhance Sense of Strategy, Elevate Level of Science and Technology for National Defense," *Jiefangjun bao*, February 24, 1997.

³³Zhang Junjiu, "Take Military Production as the Foundation, Make New Breakthroughs in Ordnance Industry," *Jiefangjun bao*, February 24, 1997.

because this gigantic system is unprecedented in terms of scale and matters involved [emphasis added].³⁴

These two officials, as they wrote these apparently obligatory articles for a PLA newspaper feature entitled “Accelerate Development in Scientific and Technological Industries for National Defense, Meet Challenge of World Military Development,” were forced by the lack of previous PLA achievements in this area to look solely to the promise of future progress. They did not have the option of, instead, describing previous signal successes. One suspects that, were these officials or their successors to be called upon in 1998 to write similar articles, similar words of hope for future progress would still fit best. Beyond the judgment that substantial progress is, in many regards, a hope rather than a fact, there are the inescapable conclusions drawn from these words that tasks of this nature, certainly including systems integration, are truly formidable obstacles for the PLA. The writers’ description of the scope of the task is, indeed, not couched in optimistic terms but rather in a way that appears more to offer an excuse for why success will not be achieved in the foreseeable future.

Where the PLA Stands on Systems Integration and Technological Innovation: A Reality Check

Although China, and especially the PLA, would prefer to be self-reliant in both the acquisition of technology and systems integration, the inadequacy of China’s research and development infrastructure has presented a major obstacle to realization of that goal, despite efforts to reform the scientific and technological sectors. China has tried to foster this process by treating technological know-how as a commodity and having its exchange and diffusion controlled by market forces. The unhappy result, however, has been essentially a failure (based on several complex factors) to create a demand for domestic technology by industry. Among the reasons for the failure was the lack of useful technological flow from Chinese domestic sources. The counterproductive result has been heavy demand for foreign technology and excessive reliance on that source.³⁵

Chinese research and development successes are rare. As described at the beginning of this paper, China has achieved success in its nuclear weapons program and in the development of ballistic missiles with both nuclear and conventional warheads. This success, it must be said, has gone well beyond simple expansion of the technologies obtained from the Soviets in nuclear warhead technology and missilery. However, in virtually all other areas, China’s achievements in the employment of advanced military technologies and systems integration have been sharply limited by the absence of indigenous technology and by the inability to acquire and incorporate

³⁴Wang Jingcheng, “Concentrate a Superior Force to Fulfill Key Tasks of Scientific Research,” *Jiefangjun bao*, February 24, 1997.

³⁵Erik Baark, “Military Technology and Absorptive Capacity in China and India,” pp. 94–97.

advanced technologies from other countries,³⁶ primarily European nations and Russia. Dual-use technologies and spin-offs therefrom have produced surprisingly little benefit to the Chinese military technology base,³⁷ especially in light of the mixing in recent years of military and commercial industry through defense conversion efforts and other methods to strive for efficiencies and profits.

There is little reasonable prospect for short-term rectification of these problems with respect to the low technology base for Chinese military industry. As one careful observer put it, "China's ability to develop military technology indigenously is limited by the poor organization of the military industry, which can be improved only by revamping its organization—a step which may be possible only in the context of political reform."³⁸ Others are even less optimistic concerning Chinese attainment of advanced technological and systems integration skill, feeling that somehow there are cultural or societal barriers that have produced the current situation and that will perpetuate it indefinitely. Obviously, such assertions are essentially impossible to prove or disprove. Some observers point to examples of success among other similar societies, but those who believe that China has irreconcilable problems remain unconvinced and have probably persuaded some Chinese that China is far better off simply to make do as best it can with foreign systems, particularly in those areas where systems integration and other esoteric skills are most prominent.

The scope of the problem, if not the possible underlying factors, seems fully appreciated by the PLA leadership. CMC Chairman Jiang Zemin issued directions (apparently in early 1997) that the armed forces must undertake a sweeping program to improve the knowledge of cadres at all levels with respect to science and high technology. To implement the direction, the General Staff Headquarters distributed a document entitled "Three-Year Plan for Cadres of the Whole Army to Study High-Tech Knowledge."³⁹ The official Xinhua News Agency reported an announcement by the General Political Department of the PLA about six weeks later that the army would increase the recruiting of college graduates. The change in officer procurement practices was described as "one of the important measures . . . to implement the strategy of relying on science and technology to build up the army and to accelerate the modernization process."⁴⁰ These initiatives suggest the depth of the frustration that the PLA is experiencing in dealing with the technological revolution in warfare.

Many Westerners question the efficacy of policy pronouncements such as those described above. They argue that Chinese leaders fail to recognize that truly innovative science and technology are highly unlikely to thrive in today's China—in

³⁶Eric Arnett, "Beyond Threat Perception: Assessing Military Capacity and Reducing the Risk of War in Southern Asia," in Arnett (ed.), p. 9.

³⁷*Ibid.*

³⁸*Ibid.*, p. 13.

³⁹Gu Boliang, "General Staff Headquarters Distributes Three-Year Plan for the Whole-Army Cadres to Study High-Tech Knowledge," *Jiefangjun bao*, February 6, 1997, p. 1.

⁴⁰Xiao Pu, *Xinhua Domestic Service*, March 19, 1997, in FBIS-CHI-97-082, March 23, 1997.

other words, that these policies are empty rhetoric. In any case, it is clear from Chinese statements made at very senior levels that the Chinese technology base, especially that applicable to military systems, and the ability to integrate such technology into the systems of modern warfare are woefully lacking. These inescapable conclusions are prompted by the words of Chinese officials who, somewhat inadvertently, reveal the depth of the problem by the very sweep of the solutions they propose.

American specialists have arrived at similar conclusions. The *Militarily Critical Technologies List (MCTR)* published by the U.S. Department of Defense (referred to earlier in this paper) contains assessments of foreign capabilities in various technology areas. These assessments represent the consensus of a technical working group composed of members from U.S. industry, government, and academia, including selected members of the U.S. intelligence community.⁴¹ In the field of electronics technology, China is evaluated by this group as possessing only limited or “some” capability (the two grades at the low end of the *MCTR* assessment scale) in each of six areas of evaluation. (For example, China is credited with limited capability in the technology associated with electronic components and with some capability in microelectronics.) The *MCTR* evaluation states: “China has been slowly developing capabilities during the past five to ten years and will probably accelerate the rate of development during the next five to ten years in an attempt to catch up militarily and commercially with others.”⁴² In the subsection on microelectronics, including integrated circuit design and the electronic packaging technologies required to achieve the needed high speed, high power, and ability to function in severe environments for basic building-block microcircuits, China is said to trail Russia and to be generally on a par with the East European countries.⁴³

In the area of information systems technology, China is assessed in the *MCTR* to have only limited or some capability in ten sub-areas and no capability in the modeling and simulation sub-area. The sub-areas in which China is comparatively deficient include high-performance computing, intelligent systems, networks and switching, signal processing, software, and transmission systems.⁴⁴ In the area of information warfare technology, a field with which the PLA is infatuated, the U.S. specialists’ evaluation is particularly damning. China is assessed as having a limited capability in the sub-area of electronic attack and no capability in the other three militarily critical sub-areas of IW.⁴⁵ The picture is only slightly better with respect to space systems technology.⁴⁶ Perhaps the most revealing aspect of these evaluations is that in all the areas that are directly pertinent to integration of military systems to produce effective combat systems, China consistently receives assessments in the

⁴¹Office of the [U.S.] Under Secretary of Defense for Acquisition & Technology, pp. iv., 2-3.

⁴²*Ibid.*, p. 5-2.

⁴³*Ibid.*, p. 5-12.

⁴⁴*Ibid.*, p. 8-2.

⁴⁵*Ibid.*, p. 9-2.

⁴⁶*Ibid.*, p. 17-2.

lowest categories of capability, failing to receive a ranking in the top two categories of capability in even one of the many sub-areas.

An experienced analyst of PLA modernization summed up China's position this way: "The Chinese lag even further behind [than in other military areas] in circuit design, system integration, networking, operating systems, and development of software applications . . . [T]he American armed forces are moving rapidly along a path that China is not prepared to follow . . . It is not just a matter of available technology, or even of creativity in the application of technology. The greatest impediment to China achieving an information-based revolution is its authoritarian political system."⁴⁷ This analyst points out that in Chinese publications there is "virtually no discussion of intelligence processing and fusion systems such as the U.S. All-Source Analysis System (ASAS), or of dedicated communications links for intelligence dissemination . . . This requires high-capacity, robust communications links, standardization of data formats and transmission protocols, interoperability of intelligence communications among different systems and services, powerful information processing systems at the lowest command levels, and a commitment to the free flow of intelligence information to tactical commanders . . . [A]vailable sources do not indicate any effort by the Chinese to implement such an elaborate and open intelligence environment. So the overall prognosis is that the PLA may achieve the kind of capabilities demonstrated by U.S. forces in the Gulf War [almost a decade ago], though it is likely to take at least ten and probably twenty years for it to do so." Dr. Paul Godwin of the U.S. National Defense University seconded this when he wrote: "The PLA also lacks both the logistical support systems and command, control, communications, and intelligence (C³I) infrastructure necessary to sustain combined-arms operations."⁴⁸

The American consensus as described above is corroborated by a Russian analyst, Viacheslav A. Frolov. Given the intimate connections with China with respect to technology transfer, the Russian perspective is particularly worthwhile. Frolov wrote in 1998:

The vulnerability of the PLA's C³I system is its obsolete command and communications links and lack of any measures for anti-electronic warfare. For the former, the strategic C³I system has effective coverage of the PLA ground forces only up to divisional level. The system is heavily reliant on radio and security telephones. Only recently have satellite communication channels been created at the Group Army level, and computerized links at the divisional level. The tactical C³I is carried mainly by semiconductor [UHF] radios, providing only limited communication capability, usually within a range of 2.5 to 10 kilometers. Space-based communications systems and global positioning systems are seen as a crucial step to enhance the PLA's C³I system. Currently China's six communication satellites have allocated very limited channels to the PLA. To rectify this situation, a proposal has been tabled to create a network of defense satellite communications.⁴⁹

⁴⁷Henley, p. 11.

⁴⁸Paul H.B. Godwin, "Military Technology and Doctrine in Chinese Military Planning," p. 60.

⁴⁹Viacheslav A. Frolov, "China's Armed Forces Prepare for High-Tech Warfare," *Defense & Foreign Affairs Strategic Policy*, January 1998, p. 7. Frolov appears particularly well suited to offer this evaluation. He is

Systems integration is, of course, not restricted to computers and weapon systems. As Paul Godwin mentioned (cited just above), the PLA has severe shortcomings with respect to logistical support systems. Paul Dibb notes that the integration of complex information systems in real time depends critically on a new approach to maintenance and the support in a combat environment of systems capable of remaining operational full time and in all weather conditions. He goes on to remark that very few Asian countries seem to acknowledge the vital nature of integrated logistic support (ILS).⁵⁰ As with other areas of technology assimilation and systems integration, there is acknowledgment (but little more) in PLA writings of sweeping new requirements for integrated logistic support. A mid-1996 article in the *Liberation Army Daily* states:

On a digitized battlefield, a combat unit, combat support unit, combat duty support unit, and other combat systems have become an integrated whole with functions like battlefield intelligence, command, control, telecommunications, attack, damage and casualty evaluation, and so on, and this has promoted logistical support integration. On the one hand, an integrated logistical support system is capable of breaking through boundaries between logistical support systems of different services; comprehensively optimizing the disposal and utilization of logistical resources; raising logistical resources utilization efficiency; and preventing duplicate disposal and waste of logistical resources, thus comprehensively enhancing logistic support capability and efficiency and making logistical support conform with integrated combat operations.⁵¹

As has been seen in many other such writings, the author is obviously describing something the PLA does not have. The article seems to advocate PLA adoption of a sophisticated integrated logistic system. There are, however, several reasons to question whether the PLA will or should undertake such sweeping logistical reform at this early stage of force modernization. Not only is the task daunting and enormously expensive (as well as costly in other resources), but there is also the question of whether such a system, modeled along Western lines, is truly appropriate to the PLA's likely missions and circumstances. Not to be ignored is the realistic consideration of whether such a system in the PLA, even if instituted, would simply collapse of its own weight in a short time—an example of too much, too soon.

Certainly logistic enhancements are needed in the PLA. The question is whether the grander ILS schemes envisioned by Chinese writers, who are largely paraphrasing the logistics literature of the U.S. and other Western armed forces, are appropriate to the circumstances. The PLA, according to most outside observers, might first come to grips with the less grandiose (yet still complex and critical) concepts of logistic support, preventive maintenance, timely and efficient repair and rework, etc. This does not apply solely to support of indigenously produced equipment. The PLA does not provide adequate logistic support and maintenance of imported military equipment and systems, generally opting not to procure sufficient and appropriate

described as a Sinologist by background and as Project Manager at MAPO Military Industrial Group, the manufacturer of MiG fighter aircraft, in Moscow.

⁵⁰Paul Dibb, p. 94.

⁵¹Gong Fei, "Digitization and Logistical Reform," *Jiefangjun bao*, August 27, 1996, in FBIS-CHI-96-209, August 27, 1996.

training, spare parts, and maintenance systems for the weapon systems and other military equipment it purchases abroad. One reason for giving these areas short shrift is, of course, to save money. However, neglect in these areas seems also to reflect a deeply ingrained lack of recognition that these are key elements of a combat capability.

Put succinctly, the real question is whether there will be good reason, adequate will, and sufficient resources within the PLA to sustain such an integrated logistic system. The likely answer is that the system, if it evolves, will be riddled with “Chinese characteristics,” raising the further question of whether, with such encumbrances, it can function at all. As with other aspects of the systems integration problem, it is far from a foregone conclusion that recognition of the problem followed by (probably token) efforts to effect a solution will lead to effective results. There is the strong prospect that attempts at developing an integrated logistic system at this stage of PLA modernization may become costly excursions into a nether world.

There are other serious underlying problems, arguably more fundamental than those described above. Chinese research and development is immature, isolated, fragmented and unfocused, all of which have stymied the gathering of needed momentum for the development of advanced military technologies and integrated weapon systems.⁵² With respect to computer technology, China has until recent years emphasized hardware rather than software development, and currently domestic Chinese collaboration in software development remains deficient because of both technical and economic barriers. Contacts between developers and users, especially military users, are lacking. The capability to produce the complex and flexible programs needed for military applications is limited. Software development is proceeding apace elsewhere in the world, often leaving China behind, even with the recent attention there to software development.⁵³ Among the many reasons is the problem of adapting programs to the Chinese language, using Chinese-language processing, or training operators to use applications written for native speakers of other languages. This is further complicated by individual systems using different languages that must be integrated into a functional combat system. The language problems are significant and not restricted to the software area.

The author and others with whom he has spoken have seen on Chinese ships and in Chinese naval and military training facilities and simulators that manuals and equipment are frequently in English or another language other than Chinese. Chinese officers have remarked about misunderstandings, badly translated manuals and operating instructions, and decried the amount of training time that must be spent in learning or improving English comprehension to be able to maintain and operate these systems.

Other areas present formidable problems for China as well as for other countries. For example, the provision to sophisticated and delicate equipment of electrical

⁵²Erik Baark, “Military Technology and Absorptive Capacity in China and India,” p. 109.

⁵³*Ibid.*, p. 103; also, extensive treatment of software problems in China is provided in Erik Baark, “China’s Software Industry,” *Information Technology for Development*, Vol. 5, No. 2, June 1990, pp. 117–136.

power of the needed stability, voltage, frequency, and phase is not a simple problem even for advanced militaries. It is certainly not one that the PLA can ignore. Of course, when one is considering combat applications there must be redundancy in many areas, including that of stable electrical power. The PLA has given little attention to redundancy and to other provisions so that its ships and other platforms could continue to fight after sustaining combat casualties or even “normal” malfunctions. The simple, if not sole, reason for this deficiency is that the PLA has not mastered keeping the first-line systems operating, much less worrying about redundancy, back-ups, work-arounds, and coping with combat damage or other casualties.

PROSPECTS FOR THE PLA: SOME CONCLUSIONS

Is the PLA gaining or losing in the race? Many observers of the PLA and analysts of PLA modernization assert that the PLA is anywhere from ten years to two generations behind modern armed forces in technological acquisition, assimilation, and systems integration. One should not be surprised at this variation in estimates. It is not reasonable to insist on any sort of precision or even accuracy in making generalizations of this sort. But there is no doubt that the PLA is not in the same league with truly modern armed forces, that it has a long way to go and is not getting there very quickly. An important question not often asked is whether the PLA is gaining or losing in this competition. Certainly there are elite PLA units that are making progress; some of these units may even achieve minor successes in systems integration. However, modern armed forces, especially those of the U.S. (which for various reasons the PLA uses as a standard for its progress), are developing at a rate that most of the world, including the Chinese, little appreciate.

Advanced technologies viewed as vulnerabilities. Some PLA writers hold out the prospect that the advent of armed forces dependent on the most advanced computer technologies and the complexities of systems integration will produce vulnerabilities for the more modern militaries and, concomitantly, opportunities for the PLA to exploit this inordinate dependence on exotic technology. The far more likely situation, albeit hardly assured, is that China will be unable or unwilling to devote the attention and resources required to develop the advanced technologies and systems integration capabilities needed for such exploitation and that this will continue to be a profound shortcoming of the PLA for the foreseeable future.

In a broader context, China is not likely to catch up with the U.S. or advanced countries in the region, like Japan and Australia. Taiwan is a different issue. The jury is out on whether Taiwan can, with U.S. assistance, achieve advances and systems integration in key areas, even if not across the board. On the other hand, with respect to the other countries of the region, China will be able to hold its own because the other countries are experiencing similar problems with technology and systems integration, although in some cases for other reasons.

For all the reasons described above, the increasing importance of extremely advanced technologies and the sweeping scope of systems integration are likely to produce an environment in which China, as the years pass, will be even more

disadvantaged than at present. Put colorfully, the PLA may rely on its dream of leapfrogging through technology exploitation and yet awaken ten years into the next century to find itself still somewhere between ten years and two generations behind. To make its dream a reality, China would have to change much more than most consider feasible and would have to embrace concepts of change far more sweeping than Chinese leaders seem willing to risk.

The PLA will certainly attain some limited success in systems integration. Some of those areas may be significant, even troublesome, in the delicate balance of forces with Taiwan in certain warfare areas and the ability to cause consternation for U.S. forces in other areas. However, overall, the odds are very high that systems integration will prove, for the foreseeable future, to be yet another area where the PLA will suffer from the problems with which China as a whole has not been able to come to closure. The PLA is not likely to be able to take advantage of this or other sea changes in technology to overcome its shortcomings compared to truly modern armed forces. It will likely slip further behind in that regard. However, China's armed forces will likely apply a mix of indigenous and imported technologies to achieve a greater comparative advantage with respect to most other regional armed forces, with the notable exceptions of Russia, Japan, and Taiwan, including the crucial area of systems integration.

13. A NEW PLA FORCE STRUCTURE

Dennis J. Blasko¹

In 1995, the Military Commission of the CPC Central Committee had further decided that in building the army, it is necessary to pay more attention to quality instead of quantity and scale and attach greater importance to scientific and technological development instead of manpower. The formulation of the military strategic guideline in the new period and the decision to effect the “two transformations” in army building are explicit characteristics of the times. They reflect the objective need of army building in the new period . . . We have no existing examples to follow in ensuring quality army building.

Chen Bingde
Commander, Nanjing Military Region²

Our objectives are to develop the PLA into a revolutionary, modernized, and regular army with Chinese characteristics. We believe: A streamlined army of a reasonable size will be helpful to improving the international environment for arms control and disarmament, be conducive to enhancing mutual trust among countries, and be more beneficial for us to concentrate our energies to properly develop the economy.

Defense Minister Chi Haotian
Speech to the Japanese National
Institute for Defense Studies,
February 4, 1998³

As the modernization of the Chinese armed forces continues into the 21st century, changes in its force structure will be inevitable. Newer, more modern weapons and a new doctrine emphasizing joint operations necessitate that the size, organization, and command and control structure of the force be adapted to meet the new circumstances. A new force structure will seek to integrate the force's new

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²Chen Bingde, “Intensify Study of Military Theory to Ensure Quality Army Building: Learning From Thought and Practice of the Core of the Three Generations of Party Leadership in Studying Military Theory,” *China Military Science*, No. 3, August 20, 1997, pp. 49–56, in FBIS-CHI-98-065, March 6, 1998.

³Le Shaoyan and Gang Ye, “China: Chi Haotian on PRC Defense Policy,” *Xinhua Domestic Service*, February 4, 1998, in FBIS-CHI-98-035, February 4, 1998.

capabilities, maximize the performance of its new weapons, and effectively execute its new doctrine.

Because of domestic conditions and constraints that make China different from other nations, Nanjing Military Region Commander Chen Bingde correctly observes that there is no example for China to follow as it reshapes its forces. The Chinese military is constantly reminded of its role in society and its place among national modernization priorities. It is well aware that military modernization will be severely limited by funding constraints. In March 1998, President Jiang Zemin reiterated these realities in a speech to the military delegation at the Ninth National People's Congress:

The level of China's productive forces is still not high, and our economy is not that strong. Therefore, we must concentrate our energies on economic development. Without a highly developed economy, it is also impossible to promote the modernization of national defense and the army. We must always insist on taking economic development as the central task while paying adequate attention to modernizing the national defense, and seek coordinated development for both the economy and national defense. We must blaze a trail of modernizing national defense and the army with Chinese characteristics.⁴

From this passage it is clear that "paying *adequate* attention to modernizing the national defense" is a condition that Chinese military planners will have to live with. Therefore, by structuring their military organization more efficiently, the Chinese may be able to put to better use the limited funding available. Force structure reform thus becomes an integral part of military modernization.

Overall, it is important to note that the ultimate objective of modifying the Chinese military force structure is to better organize itself to achieve China's national military objectives. These national military objectives may be summarized as:

- Protect the Party and Safeguard Stability
- Defend Sovereignty and Defeat Aggression
- Modernize the Military and Build the Nation.⁵

Although the senior Chinese civilian and military leadership has outlined the general trends and directions that changes in the force structure will take, a detailed blueprint has not been made public, if one has been fully developed. Such a plan would certainly be considered sensitive or classified information. However, based on Chinese writings and speeches, it is possible to speculate about what the Chinese military of the early 21st century will look like. But first, a brief description of the current force may be useful as a point of reference.

⁴"China: Jiang Zemin on Army Building at NPC," *Xinhua*, March 10, 1998, in FBIS-CHI-98-070, March 11, 1998.

⁵See David Finkelstein's chapter in this volume.

THE CURRENT FORCE STRUCTURE

Article 22 of the PRC Law on National Defense adopted on March 14, 1997 states “The armed forces of the People’s Republic of China are composed of the active and reserve units of the Chinese People’s Liberation Army (PLA), the Chinese People’s Armed Police Force (PAP), and the people’s militia.”⁶ The missions of this three-tiered force are defined as:

The active units of the Chinese People’s Liberation Army are a standing army, which is mainly charged with the defensive fighting mission. The standing army, when necessary, may assist in maintaining public order in accordance with the law. Reserve units shall take training according to regulations in peacetime, may assist in maintaining public order according to the law when necessary, and shall change to active units in wartime according to mobilization orders issued by the state. Under the leadership and command of the State Council and the Central Military Commission, the Chinese People’s Armed Police force is charged by the state with the mission of safeguarding security and maintaining public order. Under the command of military organs, militia units shall perform combat-readiness duty, carry out defensive fighting tasks, and assist in maintaining the public order.⁷

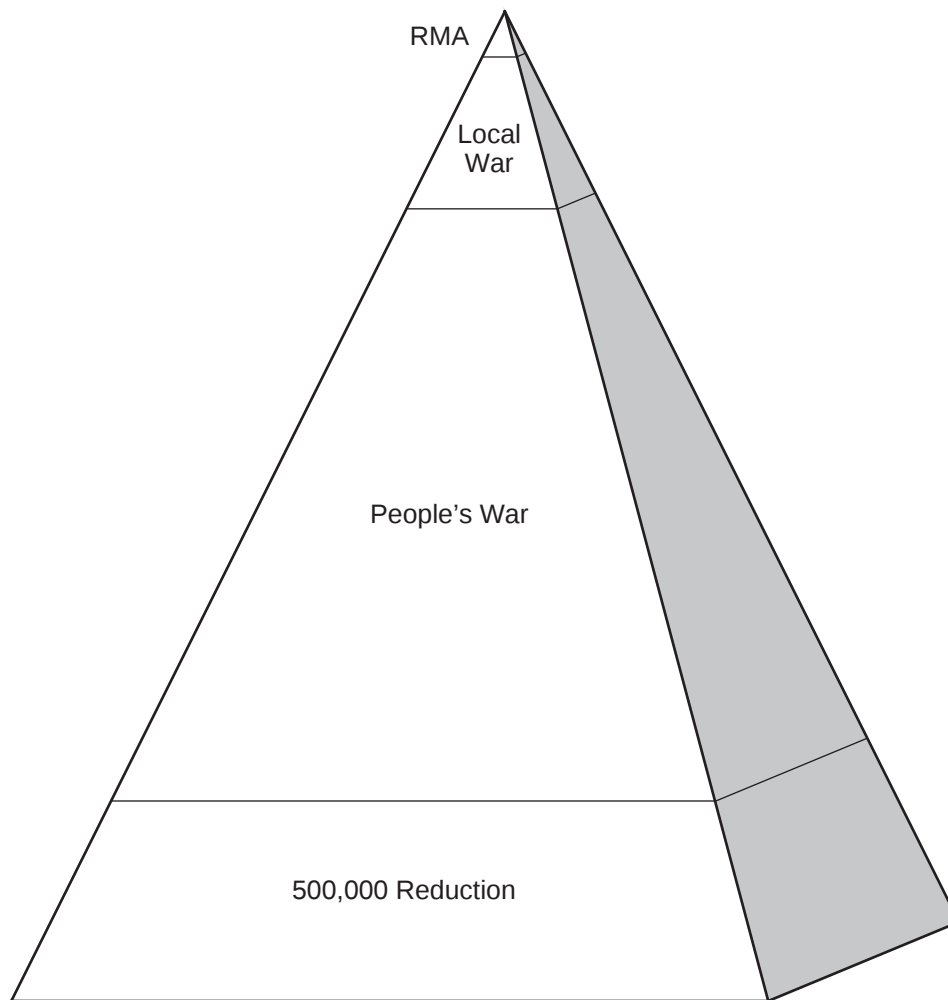
The active duty PLA consists of ground forces (army and the Second Artillery, also known as the Strategic Rocket Forces), the navy (including marines and some aviation units), and the air force (including airborne forces and some antiaircraft artillery units). Reserve forces are mostly ground forces, although a limited number of navy and air force units reportedly have been formed. The above passage would suggest that the primary mission of the active duty force is external defense, while the PAP is tasked with internal or domestic security. As a secondary mission, the active duty and reserve PLA forces and militia may assist the PAP in maintaining domestic security.

Apart from mission, the force structure also reflects the three schools of military thought prevalent in the PLA today: People’s War, Local War, and the Revolution in Military Affairs (the RMA school). These three schools are reflected in the PLA’s doctrinal development, equipment, and scenario planning. The relationship of the three schools to one another and Chinese force structure can be visualized as a triangle or pyramid composed of three tiers.

The base of the pyramid consists of the People’s War school—the vast majority of the PLA today. The military thought of Mao Zedong provides the theoretical foundation for this school. This doctrine has little utility beyond the borders of China, but a considerable portion of all Chinese military writing still must pay homage to the heritage of People’s War. Probably about 80% of the PLA ground forces, navy, and air force is best suited to fight a People’s War and is equipped with weapons designed in the 1950s and 1960s that would be museum pieces in many countries. This school relies upon the use of “existing weapons to defeat an enemy equipped with high

⁶“Law of the People’s Republic of China on National Defense,’ Adopted at the Fifth Session of the Eight National People’s Congress on March 14, 1997,” *Xinhua Domestic Service*, in FBIS-CHI-97-055, March 14, 1997. All quotations of the law are from this source. Hereafter cited as “National Defense Law.”

⁷*Ibid.*



Figure—Pyramid

technology weaponry.” These forces are trained to defend the mainland, its adjacent seas, and air space from invasion. They would fight along side the militia and swallow up an invader using concepts devised by Mao 60 years ago, now modified slightly to account for “modern conditions.” The tactics these units practice are similar to those used in the War Against Japan, the War of Liberation, the Korean War, and the 1979 conflict with Vietnam.⁸

The second tier of the PLA pyramid is the Local War school—maybe 15% of all army, navy, and air force units. Deng Xiaoping provided the critical strategic direction for this school. Local War is understood to be a limited war on the periphery of China

⁸The campaign against Vietnam was the PLA’s last major engagement against a foreign foe and its shortcomings provided the stimulus for military modernization efforts of the 1980s.

that will be short but intense, utilizing advanced technology weapons, with units fighting in joint and combined arms efforts. It envisions an element of force projection (i.e., the ability to transport combat forces beyond China's borders), but by definition is regional, not global, in nature. China usually regards Local War as its "next war"; the Persian Gulf War is often a point of reference for this school. China has no combat experience in this type of conflict. At this time, the development and dissemination of doctrine on how the PLA will fight such a war are in progress. The number of units actually prepared to live up to these modern standards is problematic. In the 1980s, the PLA began its current modernization program, focused on rapid reaction units and experimental forces. Some of these units, but by no means all, have received numerically limited imports of Russian hardware. Many units in this category still are equipped with outdated indigenous equipment and, like the People's War school, must devise ways to use their existing weapons to defeat a high technology opponent. This segment of the PLA probably does, however, receive more training opportunities than do units dedicated to fighting a People's War. This portion of the PLA is expected to grow in the future as the People's War segment shrinks in size.

The RMA school is at the top of the pyramid and is represented by only a very small portion of the PLA—thinkers in its premier academic institutions, a few officers in the General Staff Department and new General Equipment Department, some of the missile units in the Second Artillery, and a few other units equipped with modern cruise missiles. These elements are among the "pockets of excellence" described in the professional literature. The weapons that represent this school are also being incorporated into China's doctrine for Local War. The Chinese military and defense industries are investigating the entire scope of new technologies and theories applicable to RMA. Chinese defense industries are undertaking serious research efforts to identify areas upon which they should focus. No senior Chinese leader has lent his imprimatur to the RMA school. The lack of a focused, high-level vision of future war may slow the development of many of the concepts currently being explored by thinkers at lower ranks.

GENERAL TRENDS FOR A FUTURE PLA FORCE STRUCTURE

In recent years, the senior Chinese military leadership has outlined the general trends for the development of China's armed forces in the near- and mid-terms in professional writings and public speeches. Efforts have already begun in the following areas, and gradually the force structure will be modified to better implement these strategic directions:

1. Active duty PLA forces will become quantitatively smaller, with an emphasis on technological quality.
2. Reserves and the People's Armed Police will increase in size.
3. The PLA will retain many existing weapons and attempt to develop new tactics and techniques to defeat a high-technology enemy.

4. Only limited amounts of foreign weapons and equipment will be introduced into the forces; the indigenous Chinese defense industry will be the source of the majority of modern weapons.
5. Capabilities will emphasize rapid response and joint operations, focusing on precision attack, air operations, naval operations, information warfare, and space operations.
6. Command and control organizations will be reorganized to better manage the requirements of future warfare.

Like economic modernization, these elements of military modernization are considered long-term goals, which should be accomplished by the middle of the 21st century or 100 years after the founding of the People's Republic (2049). No specific milestones to achieve the different elements have been announced. However, by the year 2010 the general trends will have been in motion for over a decade and progress in these areas will be more apparent than they are at present. Chinese military capabilities will be improved but will still fall far behind many other contemporary modern forces. The remainder of the chapter will examine each of these six elements in more detail.

Smaller, but Better

In September 1997, President Jiang Zemin announced a 500,000-man reduction in the strength of the PLA, to be completed over the next three years. In reality, that reduction had begun a year earlier, as 14 ground force divisions in lower readiness categories were transferred to the PAP.⁹ By the time of Jiang's announcement, the number of PLA personnel transferred to the PAP probably ranged from 110,000 to 150,000. As the reduction continues, more, but not all, of the PLA forces to be reduced may be transferred to the PAP. The forces subject to this reduction come from the bottom of the PLA force structure pyramid, those best suited to fight a People's War. Many of the units that have been or will be eliminated are likely to be those manned at less than 100% strength, some even below 50%. Therefore, it is possible that *more authorized slots will be reduced than actual personnel*. Unless the PLA changes its policy on openness to outsiders, the specific units and numbers of personnel reduced may never be announced officially and thus remain the subject of debate and disbelief among many outside of China.

The majority of the forces to be eliminated in the ongoing reduction will be ground forces. According to the July 1998 Defense White Paper, ground forces will be reduced by 19%, naval forces by 11.6%, and air force personnel by 11%.¹⁰ These percentages amount to a reduction of about 418,000 ground forces, 31,000 naval

⁹Liu Hsiao-hua, "Armed Police Force: China's One Million Special Armed Troops," *Kuang chiao ching*, No. 307, April 16, 1998, pp. 42–47, in FBIS-CHI-98-126, May 14, 1998. See also Dennis J. Blasko and John F. Corbett, Jr., "No More Tiananmens: The People's Armed Police and Stability in China, 1997," paper presented at Staunton Hill Conference on the PLA, September 1997.

¹⁰Information Office of the State Council of the People's Republic of China, *China's National Defense*, July 1998.

personnel, and 52,000 air force personnel.¹¹ Of the 500,000 personnel to be reduced, the ground forces will account for nearly 84% of the total. In the year 2000, at the end of this reduction, the PLA will number approximately 2.5 million personnel, with ground forces (including the Second Artillery) comprising about 1.78 million, the navy 234,000, and the air force 418,000. During this period of troop cuts, the PLA will also experiment with organizational changes. Successful experiences during this period of experimentation will later be applied throughout the force.¹²

An important implication of the 500,000-man reduction underway is that the percentage of PLA ground forces within the total force structure will decrease as the percentages of naval and air forces increase. This condition parallels the increasing significance of the navy and air force in Chinese military strategy for the 21st century. In the past, the PLA was oriented to a continental defense strategy, which called for a large, dominant ground force. Now, as the PLA shifts its doctrine to local wars on the periphery of China, the navy and air force have risen in importance, receiving priority in PLA modernization efforts. They will naturally grow in proportion to the total force.

Presently, ground forces (including the Second Artillery) comprise 73% of the total force structure, with the navy and air force comprising only about 10% and 17%, respectively. If only for reasons of history, geography, and inertia, the PLA is likely to remain dominated by ground forces for several more decades, and many army units will still be best suited for the defense of mainland China using the People's War doctrine. However, as the PLA's focus shifts further from continental defense to a maritime orientation, naval and air capabilities will become more important and will better counterbalance the weight of the ground forces than they do today.

For a point of rough comparison, personnel numbers of the United States armed forces, which have global responsibilities that the PLA is not envisioned to assume, are much more heavily weighted toward naval forces (including marine forces) than they are to either the army or air force. Naval forces comprise 40% of U.S. forces, while the army and air force comprise 33% and 27%, respectively. For many reasons, the PLA is unlikely to select the U.S. force structure as a model for its modernization; however, over the years, the proportion of the PLA service arms will move further away from its nearly total dominance by the ground forces, as has been the case since the founding of the Red Army.

A force of 2.5 million will still be larger than needed for an adequate defense in the 21st century, especially as Chinese military doctrine stresses the use of high-technology weapons and equipment. The May 16, 1998 issue of the Hong Kong magazine *Wide Angle* predicts, "As the international environment relaxes and the national economy develops, further troop reduction may be required to ensure that

¹¹These specific numbers are derived by multiplying the White Paper's percentages by figures of 2.2 million, 265,000, and 470,000, found in International Institute for Strategic Studies, *The Military Balance*, 1996/97, London: Oxford University Press, 1996, pp. 179–181.

¹²Kuan Cha-chia, "Commander Jiang Speeds Up Army Reform, Structure of Three Armed Services to be Adjusted," *Kuang chiao ching*, No. 305, February 16, 1998, pp. 14–18, in FBIS-CHI-98-065, March 6, 1998.

the troops are well-equipped and highly-mobile.”¹³ Another recent prediction in the Hong Kong press envisions additional cuts of 100,000 personnel per year through much of the next decade, ending with a total force of about 2 million by 2010.¹⁴ Further reductions in personnel would be looked upon favorably by China’s neighbors (see Defense Minister Chi’s comments above) and benefit its own military modernization as its defense budget could be focused on fewer troops.

Therefore, it is likely that early in the 21st century Beijing will announce another significant reduction in the size of its standing forces. The bulk of future reductions beyond the current reduction can be expected to be felt again in the ground forces, and again in the units of a lower readiness category. The navy and air force may internally reorganize their forces and eliminate certain units (for example, many of the air force’s antiquated fighters will be retired and many of its anti-aircraft artillery units may be transferred to the reserves as more air defense missile units are activated), but for the purpose of this analysis it is assumed that the number of personnel in these service arms will remain constant or perhaps even increase. For the sake of argument, we will assume that the next reduction will also number 500,000 personnel.¹⁵

A little recognized fact is that civilians in the PLA are included among the total numbers of China’s active duty forces.¹⁶ Known as *wenzhi ganbu*, these PLA civilians wear uniforms and can be given ranks if necessary. Most PLA civilians serve in technical and logistics capacities, such as doctors, instructors, computer specialists, headquarters personnel, or technical service personnel, and would not be considered combat personnel. Some *wenzhi ganbu* also work in PLA commercial activities. The exact number of PLA civilians is not known, but possibly constitute 20–25% of the total force.¹⁷ After the 500,000-man reduction when the PLA numbers approximately 2.5 million, a conservative estimate of the number of PLA civilians in the force would be around 500,000.¹⁸

If this number seems high, the number of civilians who worked for the U.S. Department of Defense in 1997 was over 767,000, or an additional 53% added to the U.S. active duty strength of 1,443,000.¹⁹ Because the PLA is currently less technically

¹³Liu Hsiao-hua, “Jiang Zemin Convenes Enlarged Meeting of Central Military Commission, Policy of Fewer But Better Troops Aims at Strengthening Reserve Service Units,” *Kuang chiao ching*, No. 308, May 16, 1998, pp. 50–53, in FBIS-CHI-98-161, June 10, 1998.

¹⁴Willy Wo-Lap Lam, “New-Look PLA Plans More Cuts,” *South China Morning Post*, June 30, 1998.

¹⁵This number was derived independently, but is consistent with those found in Willy Wo-Lap Lam, “New-Look PLA Plans More Cuts.”

¹⁶Shaoguang Wang, “Estimating China’s Defense Expenditure: Some Evidence From Chinese Sources,” in *China Quarterly*, September 1996, p. 891. The author’s conversations with PLA officers in 1995 and 1996 support this assertion. The 1998 Defense White Paper also contains the statement that “different from many other countries, China includes . . . civil cadre . . . in the overall strength of the PLA.”

¹⁷Author’s conversation with PLA civilian in September 1996.

¹⁸In early 1997, *Wide Angle* magazine estimated that about 500,000 people serve in “military enterprises and such departments as military research, medical care, literature and art, sports, and education.” Yuen Lin, “China’s Military Strength and Peripheral Military Situation,” *Kuang chiao ching*, No. 293, February 16, 1997, pp. 62–67, in FBIS-CHI-97-059, February 16, 1997.

¹⁹*Defense 97 Almanac*, Issue 5, Washington: Department of Defense, 1997, p. 17.

complex than U.S. forces, it is not unreasonable that they would have a smaller percentage of civilians than does the United States. Most countries do not include civilians in the number of their active duty forces.

China would be able to *reduce significantly the size of its military without any impact on its capabilities*, if it were to declare openly the true numbers of its *wenzhi ganbu* and disaggregate them from the PLA active duty force statistics. Such a decision would conform to generally accepted international standards and would make comparisons between the size of the PLA and other militaries more accurate and illuminating. However, such an announcement would probably be interpreted by some critics as a disingenuous attempt to deceive the world about Chinese military strength. Nevertheless, for the purpose of this analysis, 20% of the PLA year 2000 end-strength will be subtracted from each component of the force to represent the approximate number of *wenzhi ganbu*, to more accurately portray the size of PLA forces.

The PLA could be further streamlined by removing from the active force the officers and enlisted troops devoted to commercial activities. The Hong Kong newspaper *Ming Pao* reported in May 1998 that President Jiang “clearly demanded that all army-run enterprises be separated from the army in three years” at an unpublicized meeting of senior military officers.²⁰ A recently announced policy has prohibited noncombat, as well as combat, units at Group Army level and below from engaging in commercial activities.²¹ In mid-July 1998, President Jiang announced that the army and the PAP must not engage in commercial enterprises.²² This edict was pronounced during an anti-smuggling meeting and probably applies mainly to commercial enterprises, such as major hotels, restaurants, real estate ventures, trade and investment operations, and other ventures in which crime and corruption are rampant. Traditional agricultural and light-industrial sideline production at the unit level and the PLA’s system of numbered factories, which produce nonlethal material and logistics supplies, will probably be affected only minimally, if at all. Most of the commercial management personnel about which Jiang spoke are found at higher headquarters, where they would not be considered deployable combat personnel. These personnel may be redesignated as *wenzhi ganbu* or non-military-related civilians and dropped from the active duty rolls once their enterprises are separated from the PLA.

Some higher echelon engineer and transportation units have for years been dedicated to military and civilian construction and commercial projects. Since these units probably do minimal training for their wartime missions, they too could be transformed into organizations manned by *wenzhi ganbu* to support the PLA. Any attempt to quantify the number of PLA officers and enlisted currently performing

²⁰“Jiang Zemin Criticizes Slow Progress in Army Reform; Reducing the Army by 500,000 Not Proceeding on Schedule,” *Ming Pao*, May 19, 1998, p. A12, in FBIS-CHI-98-140, May 20, 1998.

²¹*Guangming ribao*, April 11, 1998; and “China: Noncombat Units Should Not Engage in Business Production,” *Xinhua*, April 10, 1998, in FBIS-CHI-98-100, April 13, 1998. This prohibition does not include sideline production found in unit farms.

²²Seth Faison, “China’s Chief Tells Army to Give Up Its Commerce,” *The New York Times*, July 23, 1998.

commercial activities would be a guess. Therefore, this option will simply be mentioned for consideration, and no personnel subtracted from the active duty strength in the following projection.²³

If, over the next decade, the PLA does not include its civilians in active duty personnel numbers and reduces another 500,000 from the ground forces, by about the year 2010 it will have a total manpower strength of approximately 1.465 million personnel.²⁴ The ground forces will comprise about 64% of that number, a drop of 9% from its current proportion of the forces. Assuming that the navy and air force are not subjected to major personnel reductions, but rather redistribute personnel among units, the proportions of these two service arms will grow to 14% and 23%, respectively. (See Table 1.)

Table 1
Comparison of U.S. and Chinese Active Duty Forces

Component	U.S. 1998	PLA 1998	PLA 2010(5)
Army (1)	483,000/33%	2,090,000/73%(4)	932,000/64%
Navy (2)	578,000/40%	280,000/10%	199,000/14%
Air Force (3)	383,000/27%	470,000/17%	334,000/23%
Total	1,443,000/100%	2,840,000/100%	1,465,000/101%

Sources: *Defense 97 Almanac* for U.S. forces and *The Military Balance, 1997/98* for the PLA.

Notes: 1. PLA Army figures include 90,000–125,000 Second Artillery personnel.

2. Navy figures include marine forces in both countries.

3. PLA Air Force includes all airborne and some anti-aircraft artillery personnel.

4. The number of PLA ground forces (Army) in 1998 evidently reflects the impact of the initial phase of the 500,000-man reduction announced in 1997. This number is 110,000 smaller than the 2.2 million listed in previous years.

5. Percentages do not add to 100 because of rounding.

The proportion of naval forces could be further expanded if Beijing decides to increase the size of the existing 5,000-man marine force by changing the uniforms and mission of several ground force infantry units stationed near the coast. If five infantry divisions, approximately 60,000 men, were converted to marines, the percentage of naval forces would grow to about 18% of the total force, while the ground forces would drop to 60%.²⁵ Such a decision would be politically sensitive internationally and probably be considered threatening by Taiwan, Japan, and countries having territorial disputes with China in the South China Sea. However, it would provide the PLA greater flexibility in its protection of its maritime claims.

Significantly, a reduction of one million from the 2.2 million-strong ground forces (as of 1996, prior to the current round of reductions) conducted over the next 12 years

²³If *Wide Angle* is correct (see footnote 13), many of the personnel in these units may already be included in the 500,000 personnel the author has assumed to be considered civilians working for the PLA.

²⁴This number would be consistent with Willy Wo-Lap Lam's earlier estimate.

²⁵According to *Jane's Defence Weekly*, "Rapid Deployment Key to PLA Modernization," April 15, 1998, the 31st Group Army in Nanjing Military Region has three infantry divisions capable of amphibious operations.

would have no adverse impact on the PLA's ability to project force beyond their borders. Currently, the PLA can move only a few tens of thousands of troops beyond its borders using air and sealift. With fewer forces, the military budget will be able to stretch farther than it can now. In an important long-term investment for the PLA, more funds could be made available for aircraft and ships suitable for transporting and supplying airborne troops, ground forces, or marines. Remaining troops will be able to undergo more training and receive more modern equipment than they currently do.

The size of PLA combat units will become smaller as newer, more capable weapons and communications and mobility equipment enter the force. There are too many factors, too many types of units, and too many unknowns as to exactly when and what new weapons will be incorporated into the inventory to speculate about the specific size of any tactical unit. However, it is well understood that the basic form of many units will change. As Li Xueyong of the Army Command Academy said at a 1998 "Theoretical Symposium on Characteristics and Laws of Hi-Tech War":

combat forces are bound to become smaller in size but stronger in combat effectiveness. As a result, smaller units are likely to become "comprehensively composed" and capable of fighting bigger battles.²⁶

Though Professor Li was referring to ground force units, the principle he outlines is applicable to other services as well. His reference to "comprehensively composed" units would translate into combined arms units, which organically integrate various service arms so the capabilities of each individual arm complement and enhance the others.

As Chinese military modernization proceeds beyond the first decade of the 21st century, the proportions of naval and air forces can be expected to continue to grow as more resources are shifted away from the ground forces. This trend will reflect a major transformation in the culture of the PLA. No longer will China's security be oriented toward army-dominated continental defense, but rather the PLA will turn its focus outward to its maritime periphery using naval, air, and missile forces.

More Reserves and PAP

Defense of the Chinese mainland from land invasion cannot and will not be ignored by PLA planners. Neither will the PLA's role in domestic stability be forgotten. However, large active duty ground forces may not be the most cost-effective way to perform those missions in the 21st century. For the defense of the mainland from land invasion, a larger reserve force may prove more suitable than a large standing active duty force. For domestic security, PAP forces have been tasked officially by the National Defense Law to safeguard security and maintain the public order.²⁷

²⁶Huang Youfu, Zhang Song, and Zhao Guifu, "Take Note of Trial of Strength on Network, Greet Battlefield Changes—Summary of Theoretical Symposium on Characteristics and Laws of Hi-Tech War," *Jiefangjun bao*, May 5, 1998, in FBIS-CHI-98-154, June 3, 1998.

²⁷"National Defense Law."

A land invasion of China is unlikely to be a lightening strike or bolt from the blue. Rather, PLA planners can assume a reasonable warning period during which they could mobilize reserve forces to augment the standing army. Even with active duty ground forces numbering less than a million, many units will be located near traditional “avenues of attack” into China and will be able to act in concert with the local reserve and militia forces to trade space for time, utilizing People’s War tactics. New smaller, more mobile ground forces will be able to be shifted from one part of the country to another to reinforce units in an area under attack. (Reserve and militia units will have an important role in supporting active duty forces from other regions once they arrive from their home bases.) Moreover, a more modern air force and mobile missile forces will be able to support the defense of a land attack against the mainland.

According to *Wide Angle*, an April 1998 meeting of the Central Military Commission emphasized the need to expand the reserve forces. After the meeting, the Military Districts were ordered to step up the implementation of plans to build reserve units.²⁸ At present, Chinese reserve forces are estimated to number 1.2 million.²⁹ Much of the equipment and many of the personnel affected by reductions in the ground forces (who do not go to the PAP) in the next decade can be expected to find their way into the reserves. In addition to army reserves, more naval and air force reserve units will be formed as older PLA equipment is retired and their units disbanded. A new form of reserves, similar to the U.S. Individual Ready Reserve, in which officers are centrally managed but not assigned to specific units may also have been instituted in the PLA.³⁰ These soldiers often are specialists used to augment headquarters elements at higher echelons.

Maintaining reserve forces is less expensive than active duty forces—according to *Wide Angle*, one-tenth the cost of an active army division.³¹ Eventually, the reserves could outnumber the total of PLA active duty forces, perhaps up to a total of 2 million if the PLA undergoes another 500,000-man reduction. A larger number of reserves than active duty forces would not be unique to the PLA. In 1997, total numbers of U.S. reserve forces (including National Guard units) were more than 1,449,000, slightly larger than the 1,443,000 on active duty.³²

A larger reserve force also would be able to assist many of the disaster relief and community service missions that the PLA, PAP, and militia are often called to perform. These missions will continue to be an essential role for the armed forces of China no matter what their size and composition. Such missions test the organization and command and control structure of the forces, as well as contribute to the national military objective of “building the nation.”

²⁸Liu Hsiao-hua, “Jiang Zemin Convenes Enlarged Meeting of Central Military Commission.”

²⁹*The Military Balance*, 1997/98, p. 176.

³⁰Thanks to Dr. David M. Finkelstein for providing information on this new type of PLA reserve officer.

³¹Liu Hsiao-hua, “Jiang Zemin Convenes Enlarged Meeting of Central Military Commission.”

³²*Defense 97 Almanac*, Issue 5, p. 23.

As the reserve force grows in size, the requirement for maintaining a large militia force will probably be reevaluated. Much of the existing militia strength would be of questionable military value in a modern conflict, and as more reserve units are established, some militia forces may be eliminated. However, because of the difference in wartime missions between the reserves and militia, the reserves are not envisioned to totally replace the militia. To formally disband much of the militia would appear to be a rational act (to many Western observers), but to do away with the entire militia would be difficult to justify as long as the PLA continues to hold Mao's military thought as the basis for all military strategy. Therefore, in the first decade of the 21st century, the Chinese militia will probably gradually be reduced to a smaller force than exists today, but not eliminated completely.

As the reserves expand, so too will the PAP. Currently the PAP strength is approximately 800,000,³³ and is probably on its way to about one million as the PLA continues its reduction through the year 2000. Once they get rid of their heavy weapons, the PLA's lower readiness disbanded light infantry and artillery units will be well organized and equipped to handle the internal security mission. The units will need specialized training and some specialized equipment in their newly assigned role, but the transition should not be too difficult. Many will likely become rapidly deployable, mobile reaction units.

Strengthening the PAP will make intervention by the active duty PLA less necessary, and therefore less likely, in a future domestic crisis (though always an alternative). Both the PAP and PLA will be able to focus on and train to perform their respective primary missions, rather than spending undue amounts of time on secondary missions. As the PLA becomes more technically advanced and complex, it will become less suitable for domestic security missions and will require specific, intensive training to maintain its proficiency in its mission to defend China from external foes.

Use Existing Weapons to Defeat a High-Technology Enemy

At a size of 3 million, the entire PLA could not be equipped adequately with modern equipment. Even at half that size, equipping the force with weapons of the late 20th century would be a daunting and expensive task. Beijing's decision in the 1980s to selectively equip only a portion of the force with the most modern equipment continues to make sense. The gradual introduction of modern equipment into the force allows for experimenting with how the PLA may best put the new equipment to work, as well as allowing time for doctrine to be developed and disseminated. At the same time, the education and sophistication level of the soldiers, sailors, and airmen has risen and the general mind-set of the PLA has been modified to accept the need for high-technology equipment. This is not a trivial transformation for a military that proudly continues to trace its roots back to a technologically inferior guerrilla force.

³³*The Military Balance*, 1997/98, p. 179; and Liu Hsiao-hua, "Armed Police Force: China's 1 Million Special Armed Troops."

It also prepares the way for the mental shift necessary for naval and air force operations, not land warfare, to be the centerpiece of most future PLA operations.

As new equipment is introduced into the force, the PLA will still retain large numbers of older, lower technology weapons. Excerpts from the 1995 RAND study *China's Air Force Enters the 21st Century* illustrate this fact.

Though new information may revise some of the numbers slightly (see the following paragraph and Table 3), the trend is obvious. The majority of PLA Air Force fighters will be second-generation F-6 and F-7s well into the first decade of the 21st century. Though they may be upgraded with more advanced avionics, engines, and weapons systems, the survivability of these aircraft against the fourth-generation fighters of many potential foes is highly questionable. It will take many years before the proportion of truly modern aircraft outnumbers the older fighters in the inventory.

Table 2
Chinese Fighter Force Projection (excerpt)

Aircraft	Number in 1994	Number in 2005
F-6	2,824	544
F-7	586	919
F-8	205	466
Su-27	26	70

Source: Kenneth W. Allen, Glenn Krumel, and Jonathan D. Pollack, *China's Air Force Enters the 21st Century*, Santa Monica: RAND, MR-580-AF, 1995, p. 163.

Willy Wo-Lap Lam has reported that the fighter force will be reduced to about 1,000 aircraft in the next decade.³⁴ This number is supported by a recent projection by Ken Allen, who estimates that by the year 2010 the numbers of *relatively modern fighters* in the force will be less than 1,000. Table 3 estimates the composition of the “modern” Chinese fighter aircraft force in 2010.

Allen acknowledges that these total numbers may be on the high side. Significantly, more than half of this total figure will be the F-7-III, a modification of the MiG-21, an aircraft first designed in the 1950s. Army, Navy, and Second Artillery units all face similar challenges with the majority of equipment in their inventories.

All estimates of this type are based on imperfect information and are likely to be proven inaccurate in many details over time. However, the general trend indicated above cannot be denied—unless a drastic political decision is made by Beijing to change the priority for funding PLA modernization, the Chinese armed forces will continue to be equipped with older, but modified, equipment well into the 21st century.

Falling back on their Red Army heritage, the senior Chinese military leadership has emphasized that they will have to learn to make do with what they have got by

³⁴Willy Wo-Lap Lam, “More Cuts Planned for Lean, Mean PLA,” *South China Morning Post*, June 25, 1998.

creating new tactics and techniques that will optimally employ their existing weapons to defeat an enemy with high technology weapons. Chen Bingde joins the chorus as he repeats this mantra:

We must focus on defeating a strong and superior force with a weak and backward force . . . our Army still generally must rely on inferior weapons and equipment to defeat enemies with superior weapons and equipment . . . Comrade Jiang Zemin pointed out that we must study strategies and tactics to defeat the enemy with our Army's existing weapons and equipment, especially the strategic concept of fighting a people's war under conditions of high technology.³⁵

Table 3
Chinese Fighter Aircraft in the
Year 2010

Type	Number
F-7-III	480
F-8-II	240
Su-27	128
F-10	30
Total	928

Source: Kenneth W. Allen, "PLAAF Modernization: An Assessment," in James R. Lilley and Chuck Downs (eds.), *Crisis in the Taiwan Strait*, Washington DC: National Defense University Press in cooperation with the American Enterprise Institute, 1997, p. 244.

Units all over the army are investigating ways to implement this directive. A Group Army in the Shenyang Military region attacked the problem with vigor:

They mobilized the masses in launching the activity in which everybody assiduously studied and thought out "a few methods by which the inferior can defeat the superior." Over the past 15 months, everywhere in the barracks there have been fiery scenes of "I offer a stratagem or a method for 'winning a hi-tech war'." From the armies and divisions down to the companies, more than 320 teams, formed to tackle key problems, have been active on the training grounds, staging contest platforms at every level. All people, be they generals or soldiers, have got into action and racked their brains to think up methods for "winning a hi-tech war" and defeating the enemy.³⁶

Their efforts were successful in that they:

have attained more 320 achievements, such as the "mechanized army group's wartime ammunition supply system" capable of raising work efficiency by 108-fold, the "rocket mortar ground-wind allowance automatic measurement and calculation equipment" capable of raising shooting accuracy by 10-fold, and the "tank rapid-warmup system" which raises the capability of mechanized units to set out quickly under bitter cold conditions. They have "grafted" their hi-tech achievements to the

³⁵Chen Bingde, "Intensify Study of Military Theory To Ensure Quality Army Building."

³⁶Zhang Haiping and Liu Shiren, "Army Group Under Shenyang Military Region Starts Mass Training in Science and Technology," *Jiefangjun bao*, May 21, 1998, p. 1, in FBIS-CHI-98-155, June 4, 1998.

existing equipment, inventing more than 120 methods for countering hi-tech weapons of the powerful enemies, such as thermal imaging surveillance and electronic jamming. In the whole army, they are the first to realize a leap from surface to armored cars in terms of “field command automation system.” Given their success in attaining 800-plus achievements and solving 280-plus difficult problems of “winning a hi-tech war,” the mighty mechanized troops can move more quickly and become even stronger in the hi-tech battlefields.³⁷

A significant aspect of this report is that it indicates one element of “using existing weapons to defeat a high tech enemy” simply involves improving the performance of equipment that has been in the inventory for decades. For example, the “rocket mortar ground-wind allowance automatic measurement and calculation equipment” and the “tank rapid-warmup system” probably do not involve great technological innovations. This implies that for many years the PLA’s training on this equipment was performed at less than maximum capability under less than realistic modern battlefield conditions. Had these units actually been training consistently under realistic conditions, they would have confronted and been forced to solve many of these problems much earlier. That such an effort to develop methods to operate their weapons and equipment systems at maximum effectiveness was undertaken only in 1997 says much about the previous state of training in the PLA. On the other hand, the seriousness with which they have applied themselves to overcoming this problem indicates a step up on the ladder of military professionalism.

The same spirit is also being applied in theory to information warfare of the 21st century. It is evident that the PLA has studied assiduously the 1991 Persian Gulf campaign. Nearly all the writings about future battle plans begin with attack on enemy command and control and air defense units:

we should learn to fight an information battle by relying upon existing equipment. After an information battle starts, we should immediately launch an all-round attack on the enemy’s C3I system by relying upon artillery, airmen, and campaign strategic missile units, and dispatch special units to an enemy’s rear . . .³⁸

The untested question is whether such intentions can be successfully executed. So far, most of the techniques and tactics the PLA has developed are the result of academic studies of conflicts involving foreign militaries. There is little indication that the PLA has tested any new techniques they have developed *against actual high technology weapons*. They simply do not have access to the kind of weapons and systems they are seeking to defeat for them to test the effectiveness of their innovations. While they can quantitatively evaluate whether they have improved the effectiveness of their weapons, the PLA cannot be confident that the theoretical methods they have developed to defeat high technology weapons will be successful on a modern battlefield.

Perhaps, the large numbers of existing weapons will best fit into camouflage, concealment, and deception (CC&D) schemes. The vast majority of existing

³⁷Ibid.

³⁸Zhang Deyong, Zhang Minghua, and Xu Kejian, “Information Attack,” *Jiefangjun bao*, March 24, 1998, p. 6, in FBIS-CHI-98-104, April 14, 1998.

weapons in the PLA inventory, even when their capabilities are maximized by equipment modification or employment techniques, simply do not have the range to be used in an offensive manner against many modern high technology weapons systems with long-range target acquisition, stand-off, and precision strike capabilities. As PLA leaders have the opportunity to observe personally modern military capabilities as part of their foreign diplomacy efforts, a telling indicator of their understanding of modern warfare will be if they continue to believe that existing weapons are capable of defeating a high technology foe.

Foreign Imports vs. Local Production

In the 1997 book entitled *The Third-Generation Leadership Group of the Party and the Building of the Quality of Armed Forces*, published by the Chinese Commission of Military Sciences and the Academy of Military Sciences, Chengdu Military Region Commander Liao Xilong states that:

Jiang Zemin has emphasized time and time again that self-reliance should be the key word in strengthening our Army's modernization. Judging by this, in developing its arsenal for cross-century purposes, the PLA will continue to adhere to the principle of mainly relying on self-reliance and drawing on foreign experience to a limited extent. As far as some leading-edge weapons are concerned, in particular, domestic production will be the top priority.³⁹

The balance between self-reliance and foreign import has long been a matter of debate, but appears to have been resolved with the emphasis on self-reliance. Speaking at the macro-planning level, Cao Gangchuan, currently director of the General Equipment Department, is quoted in the book mentioned above when he was Minister of the Commission of Science, Technology, and Industry for National Defense (COSTIND):

Recently, Jiang Zemin pointed out that at present and for some time to come, it would be impossible to improve all the weapons and equipment of the PLA. It is imperative to identify priorities and find out what needs to be done and what can be left aside for the time being. In particular, we must make up our minds to concentrate financial resources, materials, and research resources on the research and development of critical technologies and critical weapons, in order to achieve breakthroughs and innovations . . . On the one hand, we should focus on achieving a breakthrough in key technologies . . . we should set our eyes on the leading edge of science and technology world-wide . . . On the other hand, we should focus on the development of new-generation weapons and equipment. In the scheduling of defense research programs, substantive measures should be taken to strike an overall balance between demand and possibility; as far as financial resources allow, make up our mind to cut non-key projects . . .⁴⁰

These words indicate that hard choices in priorities must be made. The acquisition of limited numbers of a few types of foreign equipment has been approved.

³⁹Kuan Cha-chia, "Military Regional Commanders Express Support for Jiang Zemin, Military Works Out Development Plans for the 21st Century," *Kuang chiao ching*, No. 300, September 16, 1997, pp. 12-17, in FBIS-CHI-97-288, October 15, 1997.

⁴⁰*Ibid.*

However, the PLA leadership would prefer that most of the new equipment entering the force be of Chinese origin. And, for the most part, that means the majority of the PLA's equipment will still lag behind world standards. Therefore, the PLA leadership has resigned itself to a mix of old and new equipment for the foreseeable future. As Chen Bingde says, the PLA must "energetically explore new methods of operations to make use of the combination of high-, medium-, and low-grade weapons in combat."⁴¹

The ability of the Chinese defense industries to produce advanced weapons and deliver them in large numbers to the forces is debatable. Shenyang Aircraft Corporation is reported to have begun production on the first Su-27 to be assembled from knockdown kits supplied by Russia.⁴² The annual production target is 10–15 aircraft, which will not be achieved for several years. Annual production of the F-8 series fighter is estimated to be about 24 per year and F-7 about 50.⁴³ The F-10 reportedly has recently made its initial test flight; flight-testing could go on for up to two years before it goes into production.⁴⁴ If the F-10 goes into production early in the 21st century, it will probably replace F-7 production at Chengdu. The Allen, Krumel, and Pollack RAND study referenced earlier suggests that China cannot afford more than one full-scale primary fighter development program at any one time.⁴⁵ Thus, it is likely that F-8 or Su-27 production will suffer. Once the F-10 reaches full-scale production, it *could* reach 75 aircraft per year and become the mainstay of the early 21st century PLA Air Force.⁴⁶ However, based on the aviation industry's past experience, a production figure of 75 aircraft a year is a highly optimistic goal, and unlikely to be attained within the first decade of F-10 serial production. In any case, as demonstrated in Table 3 above, it will take many years before the F-10 outnumbers the older F-7s in the PLA Air Force's inventory.

Unless military procurement budgets are drastically increased, total fighter production will be about 100 aircraft per year after the turn of the century. Allen et al. predict a 45% drop in the numbers of the fighter force if existing production rates are continued.⁴⁷ For a point of reference, the Soviet Union at the end of the 1980s produced 575–625 fighters and fighter-bombers, mostly of the fourth-generation represented by the Su-27 and MiG-29.⁴⁸ Thus, a policy of self-reliance in military equipment production will result in a significantly smaller, if technologically improved, force. Production at such a pace can hardly be characterized as "rapid military modernization."

⁴¹Chen Bingde, "Intensify Study of Military Theory."

⁴²"Beijing Builds Su-27 Fighters from Russian Kits," *Jane's Defence Weekly*, June 10, 1998, p. 12.

⁴³John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defense Industries," *The China Quarterly Special Issue: China's Military in Transition*, No. 146, June 1996, p. 413.

⁴⁴"First Flight for F-10 Paves Way for Production," *Jane's Defence Weekly*, May 27, 1998, p. 17.

⁴⁵Allen, Krumel, and Pollack, p. 165.

⁴⁶Frankenstein and Gill, p. 415.

⁴⁷Allen, Krumel, and Pollack, p. 164.

⁴⁸*Military Forces in Transition 1991*, Washington: Government Printing Office, 1991, p. 23.

A similar situation exists in all the defense industries. Modern equipment is likely to continue to be introduced only gradually to selective units in all services over the next decade or more. Contrary to the desires of the PLA leadership, most truly modern military equipment introduced into the force, with a few exceptions, will be of foreign origin well into the next decade.

The singular important exception to this condition may be strategic, fixed communications. The PLA has benefited, like the rest of China, by the opportunity to skip a generation of hard-wire telephony by moving quickly into optical fiber, mobile, and satellite communications systems. (This sector may be the best, and only(?), example of a real leapfrog in technology.) These advancements will enhance national strategic command and control, but will only improve battlefield communications on the margin. Most of these new systems have yet to be transformed into reliable, survivable, mobile, tactical communications equipment available to the lowest unit level. As the U.S. Army has discovered in its attempts to digitize its tactical operations centers (TOC), the common computer equipment that works well in an office environment requires “huge quantities of power cables and computer connector cables” to operate in the field.⁴⁹ These cables and their electric generators make the U.S. TOCs difficult to move, and unless they are mobile, they are unlikely to survive on a modern battlefield.

Some communications equipment, like beepers, mobile telephones, and hand-held commercial radios, are currently in use in the city and in administrative environments. However, not all of them are applicable for use in the field where conditions are much more harsh and a supporting infrastructure does not exist (such as relays for beepers and cell phones). Some communications systems, such as the Iridium satellite communications system, overcome these obstacles (and will be used by U.S. forces). But these foreign systems are very expensive now, and therefore will probably be only in experimental use in the PLA for the near- to mid-future.

Surprisingly, the PLA leadership appears to be ready to accept this state of affairs. A slow introduction of modern equipment allows for personnel to be trained to operate and maintain it, whenever it arrives. According to *Wide Angle*, Jiang Zemin has set the requirement, particularly for the navy, air force, and Second Artillery, that “we should let qualified personnel wait for the arrival of equipment rather than let equipment wait for qualified personnel to operate it.”⁵⁰

One final point related to self-reliance is the PLA’s fascination with “secret weapons.” The Chinese military literature is replete with references to developing “‘secret weapons’ that can effectively have the enemy by the throat,” as Chief of the General Staff Fu Quanyou wrote in March 1998.⁵¹ These weapons may include methods of attacking information and electronic systems, advanced physics weapons, or low-

⁴⁹Colin Clark, “Key Force XXI Systems Fail Grade,” *Defense Week*, June 15, 1998, p. 1.

⁵⁰Kuan Cha-chia, “Military Authorities Define Reform Plan; Military Academies To Be Reduced by 30 Percent,” *Kuang chiao ching*, No. 306, March 16, 1998, pp. 8–9, in FBIS-CHI-98-084, March 25, 1998.

⁵¹Fu Quanyou, “Make Active Explorations, Deepen Reform, Advance Military Work in An All-Round Way,” *Qiushi*, No. 6, March 16, 1998, pp. 2–6, in FBIS-CHI-98-093, April 3, 1998.

yield tactical nuclear weapons. One problem the PLA may face with this type of weapon is keeping them secret while testing their effectiveness and perfecting methods of employment. Without testing and doctrine for employment, the final military utility of “secret weapons” is problematic.

MODERN CAPABILITIES

Of course, many in the Chinese military are not completely happy with such a strategy of equipment modernization. Instead of setting priorities, some call to do it all at the same time, especially when it comes to weapons and equipment needed for information warfare. Passages such as this in the *Liberation Army Daily* newspaper are not uncommon:

If we take the matter lightly and let the opportunity slip past, we will once again be discarded by history when developed countries have completed their work of building an information army by the middle of the 21st century. The opportunity created by the new military revolution is a chance of a lifetime. Our army enjoys many favorable conditions for informationization.⁵²

The author then goes on to say that “it is quite obvious” that in the reform of the structure of military organizations, equal attention should be paid to firepower, mobility, and the rapid flow of information.⁵³ A big order, but one that seems to cover the priorities in military capabilities the PLA has set for itself. The Chinese military has identified selected systems with the following capabilities as a focus of its equipment modernization program:

- Long-range precision attack
- Air operations
- Naval operations
- Information warfare
- Space operations.

Long-Range Precision Attack

The weapon that first comes to mind with the capability for long-range precision attack is the cruise missile. China has several types of air- and sea-launched cruise missiles, but none is capable of attacking land targets. A land-attack cruise missile must be a high priority for development or acquisition. These weapons will give the navy and air force capabilities needed for several local war scenarios. Over the next decade, new cruise missile-equipped units can be expected to be added to the PLA force structure as existing ones are upgraded with more accurate and powerful versions of weapons in the inventory.

⁵²Wang Baocun, “Talk on Deepening Reform.”

⁵³*Ibid.*

In the ground forces, precision guided munitions (PGM) can be expected to be distributed to existing artillery and tank units. PGMs will enhance the capabilities of the artillery by their ability to hit discrete targets. Most forms of artillery-delivered PGMs require that the target be designated by a device, such as a laser aimed by personnel on the ground or in the air. Thus, secure, reliable, and rapid tactical communications links between forward observers and firing units are essential. Precision-guided anti-tank rounds can be fired by ground troops, artillery, tanks, or helicopters. Again, communication is as important as the weapons themselves. PGMs will probably first be imported in small quantities, with the eventual goal of mass-production by the indigenous Chinese ordnance industry. Their introduction into the force will require minor structural changes to ensure that the targeting and communications requirements can be achieved.

PLA ground forces are likely to put priority on building helicopter units. Currently only extremely limited numbers of helicopters are found in the force. However, the PLA's command and control, reconnaissance, mobility, and attack capabilities could all be greatly enhanced by additional helicopter formations at lower echelons of the ground forces. A major investment here could prove to be one of the army's most important decisions in shaping the force for the 21st century.

The PLA historically has looked at its strategic missile force as an extension of its conventional artillery, hence the name Second Artillery. Battlefield and strategic missiles are incorporated routinely into battle plans. Given the Congressional investigations that began in the spring 1998 concerning alleged U.S. technology transfers which may have led to improvements in the Chinese missile force, it is unnecessary to mention that the PLA seeks to improve the accuracy of these weapons, both tactical and strategic.

Until the PLA can build a more modern and effective conventional force, the role of cruise and ballistic missiles will become increasingly more important. These two weapons are the PLA's most visible *modern, high technology* weapons and their psychological value will continue to be emphasized for deterrent purposes. It is likely that they, and possibly China's nuclear forces, will increase in numbers gradually in the first decade of the 21st century.

Alastair Iain Johnston writes that some Chinese military strategists may have determined that China ought to upgrade its nuclear force from its current minimal deterrent capability to one capable of "limited deterrence."⁵⁴ To the Chinese, their existing minimal deterrence force requires only the ability to carry out a simple, undifferentiated countervalue second strike. Very few warheads are needed to accomplish this task, and the small number of weapons leaves the force vulnerable to an opponent's first strike.⁵⁵ These analysts advocate that China should instead build a limited deterrence force, capable of limited counterforce warfighting. One Chinese study determined that such a force would be required to:

⁵⁴ Alastair Iain Johnston, "China's New 'Old Thinking'," *International Security*, Vol. 20, No. 3, Winter 1995/96, p. 5.

⁵⁵ *Ibid.* p. 18.

- Strike enemy strategic missile bases and weapons stockpiles, major naval and air bases, heavy troop concentrations, and strategic reserve forces, thus destroying the enemy's strategic attack capabilities;
- Strike at the enemy's theater through strategic political and military command centers and communications hubs, thereby weakening its administrative and command capabilities;
- Strike at the enemy's strategic warning and defense systems;
- Strike the enemy's rail hubs, bridges, and other important targets in its transportation networks;
- Strike basic industrial and military industrial targets;
- Strike selectively at several political and economic centers so as to create social chaos; and
- Launch warning strikes in order to undermine the enemy's will to launch nuclear strikes, and thereby contain nuclear escalation.⁵⁶

A limited deterrence force would be able to respond to any level of attack—from tactical to strategic—with an option appropriate to the scope of the initial attack. One set of Chinese strategists argues that such a force would require:

- A greater number of smaller, more accurate, survivable and penetrable ICBMs;
- SLBMs as countervalue retaliatory forces;
- Tactical and theater nuclear weapons to hit battlefield and theater military targets and to suppress escalation;
- Ballistic missile defenses to improve the survivability of the limited deterrent;
- Space-based early warning and command and control systems; and
- Anti-satellite weapons to hit enemy military satellites.⁵⁷

Johnston concludes that China does not now have the operational capabilities to implement this vision. Rather, this proposal appears to establish a wish list of capabilities from which Beijing must choose within the economic, technological, and arms control constraints the nuclear modernization program faces.⁵⁸ If Beijing made the decision to do so, Johnston assesses *China has the technical capacity to increase the size of its nuclear forces by about two to three times* and to improve its operational flexibility to be better able to execute a doctrine of limited deterrence.⁵⁹

⁵⁶Ibid. p. 20.

⁵⁷Ibid.

⁵⁸Ibid. p. 6.

⁵⁹Alastair Iain Johnston, "Prospects for Chinese Nuclear Force Modernization: Limited Deterrence Versus Multilateral Arms Control," *The China Quarterly*, No. 146, June 1996, p. 548.

However, there is no authoritative evidence to confirm that the senior Chinese leadership has made the political decision to adopt a limited deterrence doctrine or that such a doctrine is being translated into military plans.⁶⁰ The Chinese writings cited above may only be that part of the debate accessible to outsiders. Foreigners simply do not know which theorists have the greatest influence on Chinese decisionmakers and what nuclear doctrine or force structure has been adopted by Chinese warfighters for the 21st century. The move to a limited deterrence force would emphasize the need for a wide array of precision attack weapons and the command, control, communications, computer, and intelligence (C4I) systems necessary to acquire and target long-range weapons.

Air Operations

The primary trend in the development of the PLA Air Force force structure was summed up by its commander Liu Shun Yao as a “switchover of the air force from air defense to combined offensive and defense.”⁶¹ The principal role of the vast majority of the aircraft in the forces has historically been local defense of the Chinese mainland. That is the mission most pilots have trained for, and command and control systems have been designed to support. However, as can be seen from the purchase of Su-27s and the efforts to develop in-flight refueling and airborne command and control capabilities, the emphasis in the past decade has switched to acquiring an offensive-oriented force projection capability. Newer air-to-air missiles and air-launched cruise missiles will be an essential element of this aspect of modernization. The ground-based, logistics support for newer, more offensive-oriented units will grow as weapons systems become more sophisticated. More civilian technicians will probably be needed to keep the modern systems operational. The trend toward larger logistics units also will be found in the other services as the number of high technology systems increase throughout the PLA.

The number of long-range transport units in the force is also scheduled to increase as units dedicated solely to air defense decrease. A larger, long-range air transportation capability is essential as the PLA seeks to improve its strategic mobility. Long-range transport will be necessary to support not only the air force’s operations in various parts of the country, but also ground and naval operations. Because of their cost, these larger aircraft will probably be added to the force incrementally. However, as China’s strategic airlift expands, Beijing must be prepared to explain this, and other modifications in the force structure, to its regional neighbors or risk the inference that these developments threaten China’s neighbors and are destabilizing to the region.

⁶⁰Personal correspondence with Dr. Johnston, May 1998.

⁶¹Kuan Cha-chia, “Military Regional Commanders Express Support for Jiang Zemin.”

Naval Operations

The \$64,000 question is when will the PLA Navy deploy an aircraft carrier? According to the June 3, 1998 issue of *Jane's Defence Weekly*, the answer is "China is prepared to wait until 2020 to have a fully functioning aircraft carrier at sea."⁶² China believes it needs a carrier to complete its naval modernization plans. Currently, it appears that the decision has been made to build one in China rather than buy one from abroad. *Jane's* reports that the Central Military Commission is prepared to wait until the year 2000 to begin a two-year feasibility study on the project, which is then estimated to take 18 years to complete construction, fitting out, sea trials, and training. Funding of \$500 million for the program has not yet been secured.⁶³

If this is the case, then the PLA Navy has more time to incorporate the capabilities that will allow an aircraft carrier at sea to survive beyond the first seconds of a high-intensity exchange. The PLA Navy's shortfalls in air defense and anti-submarine capabilities are well documented, not to mention its shortcomings in logistical support at sea. A decision to delay the introduction of a carrier will allow the PLA Navy time to build the capabilities, train the personnel, and form a battle group to protect a carrier. As a result, additional modern destroyers, frigates, logistics support ships, and submarines are likely to be added to the force before the one high-value, high-profile carrier becomes a reality.

Another PLA Navy deficiency, modern amphibious ships and craft, also can be expected to be a focus of acquisition efforts. These vessels will be particularly important if the decision is made to expand the size of the marine force.

Information Warfare

The precise manner in which information warfare (IW) will affect the PLA force structure is difficult to predict. As *China Electronic News* points out, information warfare is "a style of warfare; it is not a category of war . . . IW has to do with the substance of warfare . . ."⁶⁴ The article divides IW weapons into three types:

1. Weapons that destroy information infrastructure, such as telecommunications systems, electrical power systems, transportation systems, etc.
2. Weapons that use procedures to induce powerful psychological reactions in personnel and control their actions.
3. Weapons that use wireless suppression methods to defeat the enemy's electrical, sonar, or infrared equipment.⁶⁵

⁶²Paul Beaver, "China Will Delay Aircraft Carrier," *Jane's Defence Weekly*, June 3, 1998, p. 26.

⁶³*Ibid.*

⁶⁴Liang Zhenxing, "China: New Military Revolution, Information Warfare," *Zhongguo dianzi bao*, October 24, 1997, p. 8, in FBIS-CHI-98-012, January 12, 1998.

⁶⁵*Ibid.*

The Chinese military literature is full of discussions about IW and this article was chosen as only an example. However, it implies that IW capabilities will be added onto, and incorporated into, existing and future forces. It is unlikely that large organizations will be designated specifically as IW units; however, most, if not all, units will have IW missions.

The Chinese often look to “secret weapons” under development by their defense industries to be applicable to IW. According to Chinese theory, these future weapons expand the three dimensional concept of military operations of air, land, and sea to include the additional operational dimensions of electromagnetism and space. A significant portion of research and development efforts has been focused on what are known as “advanced physics weapons,” some of which may have nuclear components. An article in *Contemporary Military Affairs* noted that:

the weapons systems produced by the third military revolution mainly use sound, electromagnetism, radiation, and other destructive means. Operational actions in which armed forces use radiation-damaging energy to strike at the enemy’s electronic equipment, weapons systems, military equipment and personnel, and other military targets are called “radiation combat.” The main radiation weapons are laser weapons, microwave weapons, particle beam weapons, and subsonic wave weapons; they possess enormous military potential.⁶⁶

Significantly, but left unstated in the Chinese article, some weapons used to conduct “radiation combat” may have a nuclear device as an integral component of the weapon. The enhanced radiation warhead (i.e., “neutron bomb”) is the most obvious example. Other weapons, such as electromagnetic pulse (EMP) weapons, may use small nuclear reactions to initiate a powerful secondary effect, such as the local disabling of electromagnetic systems like computers. If such a weapon were to be used, the threshold for the employment of other, more traditional nuclear weapons would become less distinct than it is today. The lowering of the nuclear threshold may be an important unintended consequence of the pursuit of advanced weapons to conduct information warfare in the future.

Space Operations

The Chinese have accepted that space will be an integral dimension of warfare in the 21st century. Generally, operations in space fall into two categories: 1) weapons, including missiles traveling through space or space-based systems that can be used against missiles, satellites, or targets on the surface of the earth, or 2) support to operations, such as communications, global positioning, intelligence collection, and weather systems. Though the criticality of space systems is not disputed, the cost, technical feasibility, and suitability of the whole array of space systems are a matter of debate.

⁶⁶Chen Huan, “The Third Military Revolution,” in Michael Pillsbury (ed.), *Chinese Views of Future Warfare*, p. 396.

Officially, Chinese policy advocates a complete ban on weapons of any kind in outer space.⁶⁷ Based on this policy, the relatively low national priority given to military modernization, and the limited resources likely to be available to the PLA and defense industries, it appears that the most likely course to be pursued will be one concentrating on space-based support operations. Two officers from COSTIND's Command Technical Academy writing in *China Military Science* concluded:

Economically, the development of a space force consisting mostly of information support might is now most economical . . . in the current stage, the technology is advanced and mature enough for building a space force consisting mostly of information support might . . . But building a large-scale space attack force would be very risky technically, as well as exceeding the economic limits of national might.⁶⁸

Space-based systems, as well as the other capabilities discussed above, will all contribute to the PLA's ability to deploy rapidly and conduct joint and combined arms operations. The Chinese military literature and developing doctrine have fully embraced these concepts. To implement them, however, changes will have to be made in existing basing arrangements and command and control structures.

ADJUSTMENTS IN THE COMMAND AND CONTROL STRUCTURE

As long as the PLA is "subject to the leadership of the Communist Party of China,"⁶⁹ one of its military objectives will be to protect the Party. To do so, there will be a need to continue the political commissar system that parallels the operational chain-of-command. At the top of the hierarchical order will be the Central Military Commission (CMC). There is no indication that any major changes to the existing political structure are being contemplated, though some of its manpower may be reduced slightly.

On the other hand, there has been discussion about strengthening the office of the Ministry of National Defense (MND) so that the Defense Minister has institutional power, in addition to his personal power and influence derived mostly from his position on the CMC. One controversial way for this to occur would be to appoint a civilian to be Defense Minister.⁷⁰ Such a decision could be interpreted positively by the international community as a further separation of the PLA from involvement in national politics. It would also resemble the civilian command of the military found throughout much of the world. A civilian Defense Minister would probably focus mostly on the larger issues of national military-political strategy. To do so would require a staff, some of which may be civilian deputies or assistants. The establishment of such a system could assist the Chinese military's foreign diplomacy by creating Chinese counterparts for civilians often found in other nations' defense

⁶⁷*China's National Defense*, July 1998.

⁶⁸Ping Fan and Li Qi, "A Theoretical Discussion of Several Matters Involved in the Development of Space Forces," *Zhongguo junshi kexue*, May 20, 1997, pp. 127-131, in FBIS-CHI-97-302, October 29, 1997.

⁶⁹Article 19, National Defense Law.

⁷⁰See Willy Wo-Lap Lam, "Proposal to Give Civilian Top PLA Job," *South China Morning Post*, June 1, 1998, Internet Edition.

establishments. The initial difficulty of this proposal would be finding candidates with appropriate experience with defense issues. For the purpose of this analysis, the civilianization of the Defense Ministry will be assumed as well as inserting the MND in the chain-of-command between the CMC and the General Departments.⁷¹

However, the most important changes in the PLA's structure that affect its operational capabilities will be found at the levels of command one and two levels below the General Departments and within the forces themselves. As Chen Bingde has written:

Our Army's command system is still far from meeting the requirements to organize and direct local warfare under the conditions of high technology . . . Our methods in conducting military operations are relatively backward, and our command system remains inefficient. Our reconnaissance, early warning, command and control, and electronics countermeasures capabilities are still relatively weak.⁷²

One method of improving the command system that apparently has been proposed is the reduction of Military Regions from seven to five.⁷³ There appears to be debate about what the five new headquarters will be called—possibly “theaters,” “war zones,” or no change in name. Five “theaters” (used for lack of a better term) could be drawn to logically divide the major strategic directions China must defend:

- The Northeast, oriented toward Russia, Korea, and Japan;
- The Northwest, oriented toward Central Asia and Russia;
- The East, oriented toward Taiwan and Japan;
- The South, oriented toward the South China Sea, Indochina and India; and
- The Central Reserve and Capital Region, primarily used as a holding area from which additional troops can be dispatched to China's four corners, as well as protection of Beijing.

These headquarters are likely to be smaller in size than existing Military Region headquarters, with some current local functions assumed by Beijing. Nan Li writes that these new joint commands will give prominence to the command departments and the battlefield functions of intelligence, decision control, communications and electronic warfare, and fire control and coordination.⁷⁴ As the PLA gets smaller, it may actually be easier to exercise central control and standardization than it has been with larger forces. A true indicator of the PLA's commitment to joint operations would be for the commander of the Eastern or Southern Theaters to be a naval officer or the Central Reserve/Capital Region commander to be an air force officer.

⁷¹However, there was not one reference to the Ministry of National Defense or the Minister of Defense in the 1998 Defense White Paper. Therefore, this assumption may prove to be premature.

⁷²Chen Bingde, “Intensify Study of Military Theory.”

⁷³Hsiao Peng, “Seven Major Military Regions To Be Changed Into Five Major Theaters—A Great Change in PLA Commanding System Is Under Deliberation,” *Sing tao jih pao*, April 15, 1998, p. A4, in FBIS-CHI-98-105, April 15, 1998; and Willy Wo-Lap Lam, “PLA Faces Streamlining of Regions,” *South China Morning Post*, April 16, 1998.

⁷⁴See Nan Li's chapter in this volume.

One way to give the ground force more clout as it suffers the bulk of manpower reductions would be to form an “Army Headquarters” subordinate to the General Staff Department, equal in status to the headquarters of the navy and air force. Army headquarters would be responsible for training, manning, doctrine, and equipment policy for the entire ground force. The General Departments would then be responsible for coordinating the policies and efforts of all the services. If such decisions were taken, then the PLA would appear to be adopting a U.S.-style Joint Staff system. However, the Chief of the General Staff would probably be first among equals at the General Department level, and no position of “Chairman” created. Those chairman duties would be reserved for the CMC.

As mentioned earlier, the PLA during the 500,000-man reduction will experiment with organizational structures. Some headquarters elements will be eliminated. Reportedly, up to 30% of PLA academies may be disbanded.⁷⁵ Within the ground forces, two things will probably occur to accommodate the reduction: 1) Many group armies will lose a division, usually an infantry division, as units are demobilized or transferred en masse to the PAP; and 2) several group armies, perhaps five or six in all, will be eliminated.⁷⁶ The group army headquarters to be disbanded will most likely come from the Shenyang, Beijing, and Jinan Military Regions, where there is a higher density of ground forces than in other parts of the country. In the process of the 500,000-man reduction, some units that survive the elimination of their higher headquarters will be reassigned to other remaining headquarters.

In the past, though group armies have appeared to be under the command of the Military Regions in which they are stationed, local commanders in reality have had only extremely limited authority to move troops. Any unit movement larger than a battalion or any movement outside a regional boundary has to be ordered by the CMC working through the General Staff Department.⁷⁷ Even as ground force units become fewer and more mobile, this rigid control system is unlikely to change.

An important indicator to watch will be whether larger ground force units consolidate their subordinate organic elements closer together to facilitate rapid deployment and combined arms training as units reorganize themselves. Presently, many group armies and divisions are spread over wide areas, with individual regiments often in isolated locations, which slows the time it takes for these units to marshal for deployment and makes routine combined arms training that much harder because of the distance units must travel to operate together. Therefore, it would seem logical that some of the smaller, reorganized combat units will consolidate at railheads or near airfields to improve their rapid response capabilities.

As the number of existing Military Regions is reduced, it will be necessary for naval and air force headquarters to follow suit. Thus, the air force could ultimately end up with five regional air forces corresponding to the “theaters” and the navy possibly could eliminate one fleet headquarters, probably the Northern Fleet, as it basically

⁷⁵Kuan Cha-chia, “Military Authorities Define Reform Plan.”

⁷⁶“Rapid Deployment Key to PLA Modernization,” *Jane's Defence Weekly*, April 15, 1998, p. 32.

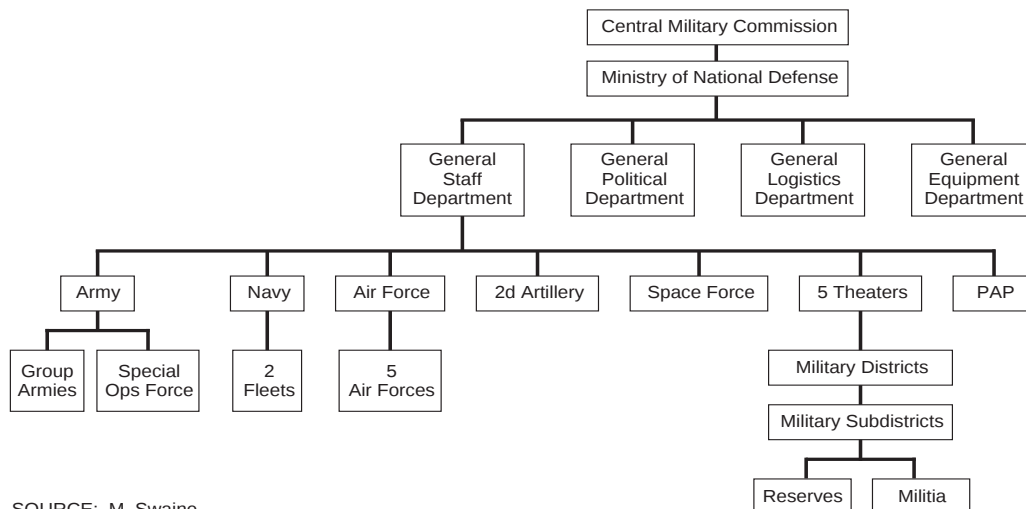
⁷⁷Swaine, *The Military & Political Succession in China*, pp. 122–124.

shifts to an eastward and southern orientation. Elimination of these headquarters will free up personnel slots for reallocation to technical support roles needed to sustain the new equipment entering the forces.

For new capabilities to be properly allotted throughout the forces, contrary to the general trend to reduce headquarters, two new smaller national-level headquarters may be formed: Space Forces and Special Operations Forces. As the PLA's capabilities in these two very specialized functions expand, their operations may become too complex for simple inclusion in existing headquarters. Moreover, these two functions will be involved in any future military scenario, so it seems reasonable for them to be controlled by central headquarters.

The Space Force Command would probably have the status of the other services and rank behind the Second Artillery in order of precedence. It would serve as a centralized location for the integration of communications and intelligence systems that will be essential for the conduct of any military operation. All theater commands will have access to the capabilities of this organization in routine planning and in times of emergency. It will be able to augment the theater headquarters as required.

The Special Operations Forces will be relatively small, composed primarily of ground troops, and could reasonably be subordinated to the new Army Headquarters as long as this headquarters retained the ability to go to the air force and navy for direct support as necessary. These troops can be expected to be the best of the ground forces, tasked with *strategic* long-range reconnaissance and surveillance missions, as well as precision strike at important enemy targets. These units will be separate from, but related to, tactical reconnaissance units found at lower organizational levels. Because of their strategic orientation, political sensitivity, and specialized training requirements, special operations units would best be consolidated at a



SOURCE: M. Swaine

Figure 2—Postulated PLA Command Structure

national level headquarters. The concept of dedicated special operations forces in the PLA is still in its infancy and its development will take time and significant resources.

SUMMARY AND CONCLUSIONS

The Chinese force structure developments speculated in this essay have been based on a straight-line projection of international and domestic security conditions. Major changes in the international or China's internal security situations could result in unforeseen modifications to the PLA to cope better with the new reality at hand.

In summary, these are the major trends foreseen:

- The PLA will be reduced in size to perhaps 1.5 million strong.
 - The percentages of naval and air forces will increase as ground forces decrease.
 - PLA civilians and business operations may be stripped from the active duty rolls.
- The numbers of reserves and People's Armed Police will increase.
- For the foreseeable future, units will have a mix of high-, medium-, and low-technology weapons and equipment and will strive to find ways to maximize the use of their existing equipment to defeat a high-technology enemy.
- The numbers and types of logistics and technical units will increase throughout the force to maintain and support the PLA's modern equipment.
- The Chinese defense industries will be able to produce limited amounts of modern weapons for the PLA, but most truly advanced weapons will be of foreign origin and relatively few in number.
- Rapid deployment of conventional forces will be enhanced through acquisition of transport ships and aircraft as well as by unit consolidation near points of embarkation.
- Naval and air forces will acquire more offensive capabilities and the ability to operate farther from the Chinese land mass, but an operational aircraft carrier capability will not enter the force until at least the end of the second decade of the 21st century.
- Cruise missile, ballistic missile, and nuclear forces will be improved gradually and incrementally and will remain the key to China's deterrent force.
- Changes in the command and control structure will contribute to better integration of forces and capabilities.
 - Several regional headquarters will be eliminated, resulting in five "theater-like" headquarters.
 - A few smaller headquarters will be formed for the Army, Special Operations Forces, and Space Forces.

- Tactical units will be restructured during a period of experimentation.

During the period of reorganization, it is likely that some units will suffer a decrease in effectiveness until all the kinks of the new structure are worked out. Eventually, as modern systems are linked together, the PLA will realize an improvement in overall capabilities. However, they will not be transformed into a force capable of long-range, sustained force projection for several decades to come. Integrating the pockets of modernity into integrated systems will probably be the PLA's biggest challenge. Force structure changes will not solve these problems by themselves. Training, doctrine, and attitudes are the key to systems integration.

Beijing must also contend with problem of how to explain its military modernization to its neighbors and the rest of the world. There are already many misperceptions about the pace and scope of China's military modernization that Beijing has not adequately addressed. For China to achieve its goals by the mid-21st century, it must find a way to inform the world in a credible manner about its national intentions. Any visible improvement in Chinese military capabilities will raise questions, particularly among China's Asian neighbors. The "Defense White Paper" is only part of the answer. Greater Chinese willingness to allow foreigners to observe and understand their forces is essential. When asked, the Chinese must be willing to answer questions, not simply respond with a dismissal of uncomfortable inquiries. Certainly, many details need remain secret, but a greater openness that can be verified through observation would contribute significantly to the perceptions of China's neighbors and other concerned observers.

No nation knows what its military will look like in 2010. This paper is based on no "inside" information and is, at best, only partially informed speculation. Changes in the international or domestic security situations could have major impacts on the future force structure. For example, China may feel compelled to more rapidly expand and modernize its strategic missile force if India builds a nuclear arsenal or if a Theater Missile Defense system is deployed in Japan or near Taiwan. Likewise, extended domestic unrest caused by economic and social change underway in China could force the PLA to reemphasize its secondary mission of ensuring domestic stability. Given these uncertainties, it is essential to monitor the trends identified above to determine how the PLA interprets its environment and translates its perceptions into a concrete force structure capable of achieving its national military objectives in the 21st century.