Chapter Three

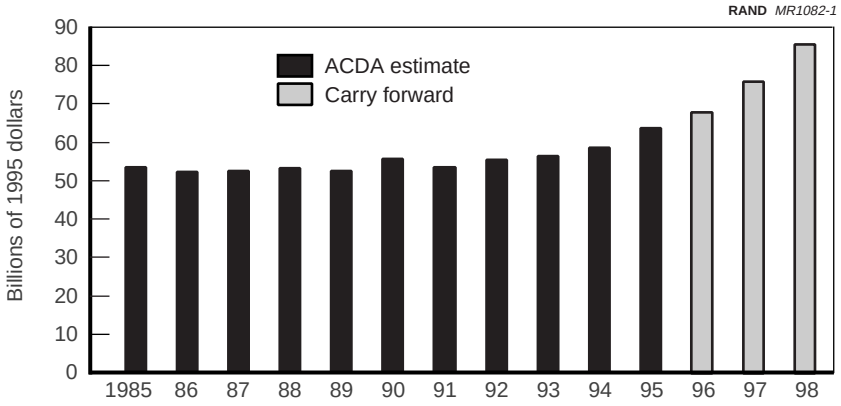
CHINA'S MILITARY MODERNIZATION

Consistent with its overriding concern for economic development and with its assessment that China does not face a major, direct threat to its territory or regime, the Chinese leadership has not put a great emphasis on its military capabilities, and its defense burden has remained moderate. Nevertheless, revamping the military was one of the "Four Modernizations" promulgated in 1973. It was, however, seen as "a long-term strategic program" as opposed to an urgent requirement, and no dramatic upsurge in the level of Chinese defense spending or effort occurred in the late 1970s and early 1980s (Allen, Krumel, and Pollack, 1995, p. 26). Instead, attention centered on

> redesigning the armed forces . . . so that they would be capable of absorbing and effectively using more advanced weapons and equipment as they became available in the future. (Allen, Krumel, and Pollack, 1995, p. 27.)

The defense research and development (R&D) system and industrial base were likewise to be transformed and more closely integrated into the civilian sector during the first decade of Chinese defense modernization.

By the early 1990s, China's explosive economic growth permitted Beijing to fund steady growth in military spending. As shown in Figure 3.1, the Arms Control and Disarmament Agency's (ACDA) estimate of China's defense expenditures reveals a period of more or less flat budgets followed by an increase in real terms of about 20 percent between 1991 and 1995. Our estimates of Chinese defense



NOTE: For 1985-1995, the ACDA estimates of Chinese defense expenditures, expressed in constant 1995 dollars, are from ACDA (1997), p. 65. For 1996–1998, the real year-over-year increase in Chinese defense expenditures was calculated on the basis of the increase in the official Chinese defense budget (expressed in current RMB), deflated by the implicit gross domestic product (GDP) deflator (which in turn was calculated by comparing the official figures for nominal and real GDP growth). The data for 1996 and 1997 were taken from China Statistical Publishing House (1998), pp. 55, 58, 276. The deflator for 1998 was the increase in consumer prices, as given in Economist Intelligence Unit (1999), p. 6. The official Chinese defense budget for 1998 was taken from IISS (1998), p. 178. The real increases were then applied to the ACDA estimate for 1995 to yield estimates for 1996 through 1998.

Figure 3.1—Estimated Chinese Defense Spending, 1985–1995

spending for 1996 through 1998 suggest a continued acceleration, with the 1998 budget representing a real increase of 54 percent from 1991.[1] While this does not represent a crash program to increase military capabilities at all costs—although Chinese GNP estimates vary widely, the defense burden, by any account, remains relatively light, i.e., below 3 percent—such budget expansion could, if sus-

[1]Estimating Beijing's defense spending is a contentious issue among analysts, and the results can vary tremendously depending upon the assumptions used, for example, regarding purchasing-power parity. Some experts put forward considerably smaller figures than the ACDA estimates shown above, while a few propose higher numbers. Various experts, for example, estimate Chinese defense spending at about $20–25 billion less than the ACDA numbers, while Richard Bitzinger argues that the PLA's spending may have reached $143 billion annually in the mid-1990s. (See Bitzinger, 1995, pp. 35–37.)

tained, result in a PLA that is far more up to date and capable than at any time in its history.

The PLA TODAY: "SHORT ARMS AND SLOW FEET"

The Chinese military today is characterized by a set of strengths and weaknesses that set it apart from other defense establishments. Following is a short description of the current PLA, which one senior Chinese officer has described as a boxer with "short arms and slow feet." We then explore some of the ways the Chinese may be trying to extend their reach and increase their dexterity.

Chinese Military—Strategic Strengths

Sizable Forces. China has the largest armed forces in the world; despite a decade of downsizing, which is continuing, the PLA's active strength is roughly 2.8 million compared to, for example, about 1.4 million for the United States and 1.2 million for Russia.[2] China could surely ultimately overwhelm any local adversary by sheer weight of numbers if it could bring anything like the full mass of its forces to bear, but supporting such a large army requires vast resources that could otherwise be used for new weapons or expanded training.[3] Thus, although the PLA derives some strength from its huge size, it does not follow that reducing the size of the PLA will weaken it; if the resources that are freed up by manpower reductions were spent on the procurement of new weapon systems and improving training levels, the net result would likely be an increase in the PLA's overall military capability.

Strategic Nuclear Capability. In addition to its large collection of general-purpose forces, China has an intercontinental nuclear capability. This nuclear threat to the U.S. homeland would certainly loom large in the background of any Sino-U.S. confrontation. The Second Artillery Corps, Beijing's missile force, fields a small number—probably between 10 and 20—of *Dongfeng* (East Wind) models

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[2]All estimates from International Institute for Strategic Studies (IISS) (1998).

[3]Many of those demobilized from active service have been transferred to the People's Armed Police, a paramilitary force primarily concerned with maintaining domestic order. Because of that reshuffling, the military drawdown of the last decade has not freed as much modernization funding as it might otherwise have done.

4 and 5 (DF-4, DF-5) intercontinental ballistic missile (ICBMs).[4] The DF-4 cannot hit the United States, but the longer-range DF-5 can strike targets in most of the continental United States. A new mobile ICBM, the solid-fuel DF-31, is currently being flight-tested, and another advanced ICBM, the DF-41, is reportedly under development.[5]

Since the recent delivery of the Iridium satellites into orbit from Chinese launch vehicles, there has been speculation about the PRC's ability to develop ballistic missiles with multiple independently targetable reentry vehicles (MIRVs). Although much of the technology required to place multiple satellites into orbit from a single launch vehicle is applicable to MIRVs, other key technologies are required. First, the placement of reentry vehicles requires a significantly more precise delivery than the orbital transfer maneuver required to insert satellites into an orbit. Second, it is necessary to miniaturize the mass and volume of the nuclear warheads.[6] Third, because of the miniaturization, the MIRV warheads typically have smaller yields and hence must be more accurate. Size constraints may also require warheads to be narrower (relative to their length) and hence that they reenter the atmosphere more quickly, in turn requiring advanced materials to shield them against the resulting higher temperatures. Therefore, the successful launch of multiple satellites does not immediately indicate a MIRVing capability but does provide some of the technologies required. According to some observers, the DF-41 is likely to be the first Chinese ICBM to carry MIRVs (Lamson and Bowen, 1996, p. 23).

The other side of the coin regarding MIRV capability is Chinese nuclear weapon doctrine and strategy. It is unclear whether it would be significantly cheaper for the Chinese to MIRV their ICBMs instead of simply building more single–reentry vehicle missiles. Similarly, it

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[4]As with so many questions regarding China's military, there is wide variance in Western estimates of the number of deployed ICBMs. There are reports that six new missiles have been fielded in early 1998 with two more to follow later in the year. (See Gertz, 1998, p. 1.)

[5]The first test launch of the DF-31 was reportedly in May 1995.

[6]Reported Chinese espionage activities directed at gaining access to information about the U.S. W-88 warhead may have been intended to help with this problem.

is unclear whether there would be, in the absence of arms control restraints, any strategic advantage, either.

China has also built at least one *Xia*-class nuclear-powered ballistic-missile submarine (SSBN), but there is some controversy about whether or not she has ever undertaken an operational patrol. China is reportedly developing a follow-on SSBN class (Type 094) that will be deployed after the turn of the century, and the *Ju Lang* (Giant Wave) model 2 (JL-2) submarine-launched ballistic missile (SLBM) is being developed in parallel with its land-based counterpart, the DF-31.

Chemical and Biological Weapons. China ratified the Chemical Weapons Convention in 1997 and claims that it "does not produce or possess chemical weapons."[7] In fact, however, China has

> an advanced chemical warfare program, including research and development, production, and weaponized capabilities. . . . In the near future, China is likely to achieve the necessary expertise and delivery capability to integrate chemical weapons successfully into overall military operations.
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> China's current inventory of chemical agents includes the full range of traditional agents, and China is conducting research into more advanced agents. It has a wide variety of delivery systems for chemical agents . . . . (Office of the Secretary of Defense, 1997, p. 10.)[8]

China does acknowledge having an "anti–chemical warfare corps" engaged in developing protective technologies and procedures and maintains an anti–chemical warfare "school" and an anti–chemical warfare "institute" (Zhu and Huang, 1997). China is also believed to have transferred chemical weapon precursors and technology to Iran.[9]

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[7]China does admit to having "a significant chemical industry" and claims that it has on its territory "large quantities of chemical weapons abandoned by Japanese aggressor troops" at the end of World War II. (Information Office of the State Council of the People's Republic of China, 1955, p. 18.)

[8]See also Truesdell (1997).

[9]Office of the Secretary of Defense (1997), p. 12; Zabarenko (1993); Meyers (1997); Spector (1996).

China became a party to the 1972 Biological Weapons Convention in 1984, but apparently does not explicitly claim to have eschewed production or possession of biological weapons.[10] Instead, Beijing's official stance is that "China has consistently advocated a complete prohibition and thorough destruction of biological weapons. It opposes the production of biological weapons by any country and their proliferation in any form by any country." (Xinhua News Agency, 1995).[11] In any case, China is believed to have had an offensive biological warfare program prior to its accession to the Biological Weapons Convention in 1984, and this program has likely been maintained. As with China's chemical warfare program, possible delivery systems include ballistic missiles, cruise missiles, and aircraft.[12]

The existence of at least one "antibiological" warfare unit, associated with the Military Medical Research Unit of the Beijing Military Region, is known. The unit apparently conducts research on virulent bacteria, insect carriers of disease, and biological and chemical toxins. It is said to have been established for the purpose of "guarding against and defeating any enemy biological warfare," but presumably its research and technology could be turned to the purpose of creating biological weapons, too, if in fact the unit is not already so engaged. Since this unit is identified as belonging to the Beijing Military Region and its research appears to be focused on China's northern environs, it seems plausible that the other military regions have biological warfare units as well (Yu, Gao, and Gao, 1994, pp. 5–6).

Surface-to-Surface Missiles. The Chinese have also invested heavily to develop a family of short-, medium-, and intermediate-range ballistic missiles (SRBMs, MRBMs, and IRBMs, respectively); these are listed, along with China's ICBMs and SLBMs, in Table 3.1. Many of these missiles can carry nuclear or conventional payloads, and the Chinese are reported to be working on more-advanced warheads for their missiles, including conventional submunitions.

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[10]ACDA (1996), p. 68.

[11]This difference may reflect the much weaker enforcement mechanisms for the Biological Weapons Convention as compared to the Chemical Weapons Convention or Non-Proliferation Treaty.

[12]ACDA (1996), p. 68; Office of the Secretary of Defense (1997), p. 10; and Truesdell (1997).

Table 3.1

Known Chinese Ballistic Missiles Deployed or Under Development

Name	Type	Development Began	Entered Service	Propulsion	Range (km)	Payload (kg)	CEP (m)	Number Deployed
DF-3	IRBM	~1960	1971	Liquid	2,800	2,150	1,000	~100
DF-4	IRBM	1965	1980	Liquid	5,500	2,200	1,500	20–50
DF-5	ICBM	1965	1981	Liquid	12,000	3,200	500	20
DF-11	SRBM	1984	1992	Solid	280	800	600	200+
DF-15	SRBM	1984	1991	Solid	600	500	300	400+
DF-21	MRBM	~1965	1987	Solid	1,800	600	N/A	30–50
M-7	SRBM	1985	1992	Solid	150	190	N/A	N/A
M-18	IRBM	1984		N/A	1,000+	N/A	N/A	N/A
DF-25	IRBM	N/A		Solid	1,700	2,000	N/A	N/A
DF-31	ICBM	1985		Solid	8,000	700	N/A	N/A
DF-41	ICBM	1986		Solid	12,000	N/A	N/A	N/A
JL-1	SLBM	1967	1983	Solid	1,900	600	N/A	N/A
JL-2	SLBM	N/A		Solid	12,000	700	N/A	N/A

The accuracy of Chinese missiles can be expected to improve, in part because the integration of global positioning system (GPS) receivers into their inertial guidance systems. GPS assistance alone could reduce the circular error probable for current-generation Chinese missiles by 20 to 25 percent and by up to perhaps 70 percent for future systems (see Frost and Lachow, 1996).[13] The Chinese have also announced plans to deploy their own *Twin Star* satellite navigation system, although its utility for assisting in missile guidance has not, to our knowledge, been assessed.[14]

Geographic Extent. China's large size gives it the defensive advantage of strategic depth. In the past, China has relied on the country's vastness to swallow up an invading army and make it subject to guerrilla-style attack until Chinese forces gained enough strength to expel it. (This view was codified in the doctrine of "people's war.") Under contemporary conditions, China's geographic extent would make it impossible for anyone to subject it to the kind of strategic air campaign to which Iraq was subjected in the 1991 Gulf war—it is difficult to imagine an attacking air force sufficiently powerful to launch crippling simultaneous attacks against the full range of vital military targets throughout the vast Chinese mainland.

Casualty Tolerance. Finally, China has in recent history demonstrated a willingness to absorb substantial casualties in military operations. Precise figures are unknown, but typical estimates for Chinese losses in the 1950–1953 Korean war range from 300,000 to 1 million men. In the 1979 Sino-Vietnamese conflict, Hanoi claims to have killed or wounded 42,000 Chinese in less than a month of fighting, while the Chinese admit to 20,000 casualties (Allen, 1995, p. 92).[15]

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[13]Chinese engineers have claimed that GPS integration could "raise impact accuracy about one order of magnitude." (Gerardi and Fisher, 1997, p. 129.)

[14]"Chinese 'GPS' Project Set" (1994), p. 25.

[15]Chinese casualties may be compared to the roughly 200,000 U.S. killed and wounded in action in 10 years of combat in Southeast Asia. China's tolerance for large human losses may erode as and if its political system becomes more responsive to the popular will; one could also speculate about the long-term effects of the one-child policy on casualty tolerance.

Chinese Military—Strategic Weaknesses

Obsolete Equipment. Along with these strengths, the PLA suffers from many glaring weaknesses. The Chinese military is mainly equipped with aging, obsolete, and inadequate weapons. The People's Liberation Army Air Force's (PLAAF's) most numerous fighter, for example, is the Shenyang J-6, which is a Chinese-produced copy of the 40-year-old MiG-19 FARMER.[16] The J-6 first flew in 1961, entered service with the PLAAF in 1962, and still constitutes over half of the Chinese air force inventory.[17] Although many older aircraft are being retired, they still account for the lion's share of the PLAAF force structure.

The other services suffer from obsolescence as well, with both the army and navy fielding systems that, for the most part, are based upon decades-old Soviet technology. The army's primary tank is the Type-59, which is a Chinese-produced copy of the Soviet T-54, which entered service in 1953.[18]

The navy likewise boasts an aging fleet of only modest capabilities. Its warships are, with a few exceptions, variants of 1950s-era Soviet designs.[19] They lack long-range air defenses and have serious shortfalls in antisubmarine warfare capability. While the People's Liberation Army Navy (PLAN) has in excess of 40 replenishment vessels, they are—by U.S. standards—small and few, which limits the PLAN's ability to operate at sea for extended periods. (See Yung, 1996, p. 18.)

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[16]According to IISS (1998), some 1,800 of the PLAAF's 3,000 fighters and bombers are J-6 variants. The MiG-19 entered Soviet service in 1955. (Taylor, 1988, p. 181.)

[17]To put this in perspective, the predominant fighter aircraft in the USAF inventory in 1962—when the J-6 began PLAAF service—was the North American F-100 *Super Sabre*, which last saw squadron service in the active Air Force 25 years ago. The mainstays of the current USAF—the F-15 and F-16—first flew in 1972 and 1974, respectively, when the basic J-6 design was already 20 years old.

[18]According to the IISS (1998), roughly 6,000 of 8,800 main battle tanks in PLA service were Type-59s in 1998.

[19]For example, the most numerous major surface combatant in the PLAN is the *Jianghu*-class frigate, which is basically "an enlarged variant of the Soviet 'Riga' type." The *Riga* entered fleet service with the Soviet navy in 1955. (Jordan, 1994, p. 276.) For data on the *Riga*, see Polmar (1986), pp. 229–230.

Poor Logistics Support. One example of a more-systemic PLA weakness is that its logistics and supply systems are uncoordinated and wholly inadequate to support any sustained power-projection operations. China has historically lacked the kind of modern transportation infrastructure needed to support large forces engaged in high-tempo offensive warfare. Maoist military planning envisioned a defensive military campaign fought largely on Chinese territory by "an army of rifles and millet"; the war would overstress the *adversary's* logistical system and mitigate the shortfalls in China's own. The doctrine of people's war, then, provided the PLA with little incentive to develop a modern logistics and supply system. Instead, each military region was left to develop and sustain its own supply infrastructure, with all the resulting inefficiency and unresponsiveness.

In 1979, the Chinese were able to move a significant quantity of troops and equipment by rail for the campaign against Vietnam. This, however, was a special case involving an overland offensive in an area having a reasonably robust rail network. Today, when Chinese security concerns seem increasingly focused on areas not contiguous to the mainland—particularly Taiwan—the PLA's limited ability to support power-projection operations could be a serious constraint on the regime's ability to employ military force to achieve its policy objectives.

Command, Control, and Communications Shortcomings. The Chinese military has suffered from enduring problems with command, control, and communications. China, like most developing countries, has lacked a modern, high-speed, high-bandwidth, redundant national communication system. However, China's rapidly growing economy is sparking significant progress in creating a more-advanced national communication backbone, and the PLA will likely benefit from these developments. Advanced communication technologies being pursued in China include fiber optics, terrestrial point-to-point microwaves, cellular telephones, communication satellites, and satellite telephones, among others.

Poor Quality of Personnel and Training. The PLA is, on the whole, poorly trained and does not offer the capability that its size alone might seem to indicate. Within the PLAAF, in particular, training is both limited and of marginal quality. A typical USAF fighter pilot will accumulate about 200 hours of flying time in a given year; his

Chinese counterpart may log 80 or so. Such limited flying time is barely enough to ensure that pilots can operate their aircraft safely; advanced operational techniques and tactics are simply impossible to learn in so little time. Although the PLAAF has organized "blue force" *Aggressor*-like units, the standard training syllabus still consists of stereotyped engagements against single, nonmaneuvering targets. The kind of free-form one-on-one or two-on-two "hassling" that is commonplace in Western air forces is virtually unknown in China, as is true joint or combined-arms training. As a result, the PLAAF has no capability to perform some missions, such as close air support, that are commonly assigned to the air arms of other nations.

Summing Up: The Chinese Military Challenge Today

China today is indisputably not a "peer competitor" to the United States; however, it is also not just another regional power. At least four important characteristics differentiate China from the "standard" regional power that appears in the "major theater war" (MTW) planning cases, such as Iraq and North Korea.

First and most important, China has nuclear weapons that can reach U.S. territory. The existence of such capabilities would weigh heavily in any possible future Sino-U.S. confrontation. For example, it is difficult to imagine that the United States would wage a largely unconstrained strategic air campaign as in Operation Desert Storm against an opponent that could wreak devastation on the American homeland, both because the United States would be concerned about crossing a threshold that might trigger Chinese nuclear retaliation and because the United States might not want to break all communication links between the Chinese leadership and its nuclear forces.

A second related point is that the PLA fields a greater variety of tactical surface-to-surface missiles than does any putative MTW adversary.[20] These systems—with different ranges, warheads, and reentry characteristics—would prove especially problematic for current and near-future U.S. ballistic missile defenses (BMD). In addition to the devastation that such a missile attack could wreak on U.S. facilities, aircraft, etc., even the *threat* of missile attack against sea and airports

[20]In recent unpublished work, Stillion and Orletsky discuss the threat these missiles pose in detail.

might deter U.S. use of the ports and could increase absenteeism among the civilian employees of such facilities, leading to delays in U.S. strategic and intratheater force movements.

Third, the absolute size of the PLA would present challenges should the United States and China come into conflict. Under most likely circumstances, U.S. forces would at least initially find themselves greatly outnumbered, albeit by poorly trained personnel employing obsolescent systems.

Finally, China's geographic extent may make it very difficult for U.S. forces to conduct parallel attacks on the full range of targets that the USAF, in particular, anticipates striking in the course of an MTW. A comprehensive air campaign against China, by contrast, could prove to be a very long-drawn-out affair, which could greatly reduce its impact.

Thus, even today's PLA—ponderous, poorly trained, and ill-equipped as it is—presents unique and more-demanding planning and operational challenges to U.S. strategists contemplating a possible confrontation with China.[21] Beijing's ambitious modernization program could, if sustained through the first 15–20 years or so of the next century, greatly intensify those challenges.

CHINESE MILITARY MODERNIZATION

Two Avenues to Improved Capabilities

China appears to have embarked on a sustained two-tracked approach to modernizing the PLA.[22] Beijing is striving to achieve a significant degree of self-sufficiency in weapon production, but Chinese industry lacks the technological expertise to design, develop, and produce everything that the PLA needs. As a result, China has been forced to look to foreign countries—principally Russia but also Israel, France, and other Western states—to obtain military hardware. In these dealings with foreigners, the Chinese have two differ-

[21]This, of course, should not be read as a *prediction* that such a conflict will occur.

[22]This path—mixing indigenous production with arms purchases abroad—may not result from a deliberate strategic choice. Instead, it may simply be the outcome of disputes between the military, which wants weapons that work, and the defense industries, which argue that China should not be dependent on imports.

ent but related goals. First, they are endeavoring to fill pressing near-term military needs. Second, and perhaps more importantly, however, they are attempting to acquire advanced military and military-related technology and know-how. The foreign purchases also represent hedges against failure of indigenous development programs.

Understanding this dual approach makes sense of what might otherwise look like a wasteful acquisition policy. As Table 3.2 shows, the Chinese are simultaneously developing home-grown weapons *and* procuring foreign weapons that seem to fill the same role—for example, KILO and *Song* diesel submarines. The KILOs will both enhance the navy's current operational capabilities and serve as a source of improved submarine technology. It is not likely that the Chinese will try to reverse-engineer the KILO entirely, but will instead borrow key technologies, such as sensors, weapons, and propulsion, for incremental incorporation into indigenous designs.

It is also important to note that the two threads are interwoven. For example, after buying about 50 Su-27 FLANKER fighters from Russia, the Chinese have embarked on building additional aircraft from Sukhoi-supplied kits. Eventually, they plan to transition to building the aircraft more or less from scratch, with only the engines and a few other components being imported. In this way, the PLAAF may eventually field a force of up to 300 FLANKERS.[23]

Table 3.2

"Redundant" Chinese Development and Acquisition Programs

System	Building	Buying
Advanced fighter	J-10	Su-27
Diesel attack submarine	*Song*	KILO
Destroyer	*Luhu, Luhai*	*Sovremenny*
Advanced surface-to-air missile (SAM)	HQ-9	SA-10

[23]The Chinese-built variant will probably be referred to as the J-11 and will reportedly be 70 percent of Chinese manufacture. See "Beijing Builds Su-27 Fighters from Russian Kits" (1998).

Chinese Military Modernization: Buying Abroad[24]

Varied Appetite, Modest Means. China has been an active if restrained buyer of modern weapons on the world market. The PLA's shopping list has been varied—Table 3.3 lists some of Beijing's reported recent purchases—but the pace, relative to China's financial resources, has been modest. Although the Chinese government reportedly has about $140 billion in foreign reserves, it has imported a total of only about $3 billion (1990 dollars) in weapons over the five-year period from 1990 to 1994.[25] The financial impact of these purchases has been further reduced by China's insistence on using barter to pay for significant portions of many arms deals, particularly those with Russia's hard-pressed defense industry.[26]

In addition to these purchases, China is pursuing, or has been offered, a number of other advanced weapons and systems, some of which will almost certainly find their way into Beijing's arsenal. For example, Israel and Russia are building a prototype airborne early warning aircraft—similar to the U.S. Airborne Warning and Control System—combining the Beriev A-50 airframe and the Israeli *Phalcon* radar system; China is an obvious likely customer for this system. (See Novichkov and Taverna, 1997, p. 27.) China is also reportedly acquiring some quantity of the X-31 export version of the very-long-range, Mach 2+ Russian Kh-31 air-to-air/air-to-surface missile.[27] Russian Il-78 CANDID tanker aircraft have also reportedly been discussed. The Chinese navy has also long been interested in acquiring an aircraft carrier; *Jane's Fighting Ships 1997-98* alleges that Beijing has contracted with a Russian firm to design a carrier to PLAN specifications and that fabrication of long-lead components has already begun in a Chinese shipyard. (Sharpe, 1997, p. 116.)

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[24]It is important to exercise some caution in describing China's acquisitions of foreign weapons, since many "sales" reported in various media—particularly in the Taiwanese press—are speculative, to say the least. We have tried to confine our discussion to purchases, or expressions of Chinese interest, that can be verified through reasonably reliable sources.

[25]China's acquisition of weapons from abroad. (Gill and Kim, 1995, p. 100.)

[26]Reports indicate that the barter included "an enormous amount of canned fruit" and "one million cigarette lighters" were included as partial payment to Russia for weapon purchases. (See Gill and Kim, 1995, p. 58 and FBIS, 1996.)

[27]See "China and India are expected to become . . ." (1997), p. 17.

Table 3.3

Reported Chinese Arms Purchases

Type	System	Source	Qty	Notes
Fighter	Su-27 FLANKER	Russia	50+	Chinese will build more from kits, ultimately produce
Destroyer	*Sovremenny*	Russia	2	Vessels originally ordered by Russian navy
Submarine	KILO 877EKM	Russia	2	Export version
Submarine	KILO 636	Russia	2	First sale of Russian navy version
SAM	SA-10 GRUMBLE	Russia	?	Mobile and fixed variants
SAM	SA-15 GAUNTLET	Russia	15	Advanced terminal-defense SAM
Radar	Searchwater	UK	6–8	Advanced air- and sea-surveillance radar
Radar	Improved *Zhuk*	Russia	150–200	Advanced radar for F-8, F-10
Helicopter	Ka-28 HELIX	Russia	12	Ship-based antisubmarine warfare helicopter
Helicopter	*Dauphin*	France	?	Multipurpose helicopter
Helicopter	Mi-17	Russia	28+	
Air-to-air missile	*Aspide*	Italy	?	Radar-guided; similar to U.S. Sparrow
Antiship missile	SS-N-22/3M80 SUNBURN/ *Moskit*	Russia	?	Supersonic sea-skimmer to equip Sovremenny
Airlift	Il-76 CANDID	Russia	?	Heavy-lift transport

Finally, China has reportedly attempted to purchase numerous systems and technologies without success, at least so far, including

- The Russian R-77 (AA-12) ADDER, comparable to the U.S. Advanced Medium-Range Air-to-Air Missile (AMRAAM), as a beyond-visual-range "fire-and-forget" radar-guided air-to-air missile
- Radar surveillance satellite technology from Canada and elsewhere

- Su-30MK advanced multirole variant of the FLANKER[28]
- Tu-22M BACKFIRE bombers
- SS-18 ICBMs and/or related technology from Ukraine.

Operational Worries. In many cases, China has achieved only limited operational success with systems purchased from abroad. For example, there have been reports of maintenance and training difficulties with the PLAN's KILOs (Chen, 1997). Many of these difficulties can be attributed to the lack of Chinese operational expertise and China's disinterest in purchasing the crew-training packages that are typically part of international weapon deals. The Chinese have often bought training for only a small number of personnel with the apparent expectation that this cadre would suffice to train the necessary additional troops. Likewise, the PLA has tended to pay for only minimal training for maintenance and support personnel, with predictable results.[29] This approach has resulted in a dismal operational readiness rate for many newly acquired systems.

Before drawing profound conclusions about Chinese incompetence, however, two points should be made. First, almost all military organizations experience "growing pains" when asked to absorb new weapons and technologies; the PLA is by no mean alone in suffering from difficulties in so doing. When the USAF transitioned from the F-4 to the F-15 as its primary air-superiority fighter, for example, it took several years for training syllabi and tactics to catch up with the radically different capabilities of the new platform. And new systems in the U.S. military typically suffer from depressed readiness rates for several years after their introduction until maintenance procedures have been fully developed and spares pipelines have been filled—that is, as the weapons "mature." This, occurs despite the plentiful support from the many contractors typically involved in a major Pentagon procurement program.

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[28]With orders from India and Indonesia for the Su-30MK on the books, Russia may find it increasingly difficult to refuse if China persists in pursuing the aircraft. On March 2, 1999, the Hong Kong *Standard* reported that China was "negotiating with Russia to buy Su-30 fighters . . . ." (Fong and Lee, 1999.)

[29]Indeed, some Russian sources have expressed puzzlement over China's desire to invest billions in hardware without making the relatively minor additional commitment needed to train an adequate number of appropriate personnel. See Chen (1997) and "China Should Receive Its Third 'Kilo' by November" (1997,) p. 16.

It should also be recalled that these purchases fill a second need beyond any operational requirement: serving as technology demonstrators for Chinese industry. Any operational difficulties, while undoubtedly worrisome to the PLA leadership, may be secondary to the exploitation of these systems for technologies, techniques, and components that can be incorporated in China's own arms production. It is to these domestic initiatives that we now turn our attention.

Chinese Military Modernization: Building at Home

Although the goal has proven elusive, China has long sought self-sufficiency in military production. The first jet aircraft built in China was the MiG-15, and the J-5 version of the MiG-17 became the first modern fighter put into serial production in China in 1956. Similarly, the Chinese began building the T-59 variant of the Soviet T-54 tank in the late 1950s. By the 1970s, Chinese industry was producing a fairly broad range of weapons and systems, including aircraft, ships, armored vehicles, artillery, and submarines.

A Mixed Track Record. China has enjoyed imperfect success in its various weapon development programs. Most of its efforts to date have focused on learning to manufacture systems, via either reverse engineering or licensed production, that were initially imported. Table 3.4 lists some of these aircraft and vehicles, as well as the approximate length of time it took from when the PLA first acquired

Table 3.4

Selected Chinese Arms Production Programs

Chinese Name	Original	Type	Date Acquired	Entered Production	Elapsed Time (years)
T-59	T-54	Tank	1953(?)	1957	4
J-6	MiG-19	Fighter	1958	1963	5
J-7	MiG-21	Fighter	1961	1967	6
Y-7	An-24	Transport	1976	1984	8
H-6	Tu-16	Bomber	1957	1968	11
Z-9	*Dauphin*	Helicopter	1980	1992	12
Y-8	AN-28	Transport	1969	1986	17

the item for it to enter production. Given the timelines shown, it is no mystery why the PLA finds itself fielding mostly obsolescent weapons: Even when the system being copied is top of the line when the process begins, the design will be 10 or more years old by the time the Chinese version enters service.

The Chinese have demonstrated considerable patience with their development projects, pursuing incremental upgrades and improvements even after the basic design has exceeded its useful life. This can result in systems that are, as one analyst said of the J-6, "the most highly perfected, obsolescent aircraft in the world." (Allen, Krumel, and Pollack, 1995, p. 148.) The same observation would probably hold true for the J-7, a MiG-21 derivative whose most recent variant only entered production in 1989, 30 years after the original FISHBED was brought into Soviet service.[30]

TChina's indigenous development programs have not been limited to reverse-engineering Soviet designs; Beijing has also fostered numerous undertakings of greater originality, with similar histories of mixed results.

Nuclear Weapons. The development of nuclear weapons certainly ranks among modern China's greatest technological accomplishments. Despite some initial technical help from the Soviets, China's development of nuclear weapons was based almost entirely on indigenous resources and expertise. Even after the withdrawal of all Soviet technical assistance by 1960, China still detonated its first fission weapon in October 1964, only eight years after beginning construction of its first research reactor. Perhaps even more impressively, China's first thermonuclear test took place just two-and-a-half years later, in June 1967. And, unlike the first U.S. hydrogen bomb, the Chinese device was not the size of railroad tank car; it was an air-dropped bomb.

Ballistic Missiles. Ballistic missiles have been another area in which the Chinese have demonstrated significant technical competence. As noted above, the PLA has a large and varied inventory of missiles, from the short range DF-11 to the DF-5 ICBM. Recently, China

[30]China continues to work on updated versions of the J-7. The J-7FS reportedly first flew on June 5, 1998; according to reports, it features upgraded avionics, a new engine, and GPS access.

indigenously developed the technology for solid-propellant missiles and has advanced to the point where its road-mobile, short-range, solid-propellant missiles are sought-after export items. While it has not yet fielded multiple-warhead missiles, China succeeded in launching multiple satellites from a single booster in 1984. This suggests that China may not be very far from acquiring the technical prerequisites for MIRVed payloads.

Cruise Missiles. Cruise missiles, primarily of the antiship variety, have also figured prominently in China's repertoire. Beginning with the HY-1—based on the Soviet P-15 (SS-N-2A STYX)—which entered service in 1974, China has developed a series of increasingly sophisticated weapons. Current programs may include

- The YJ-1, or C-801, has a solid propellant booster and is similar in appearance to the French *Exocet*, reportedly reflecting similar design requirements rather than reverse engineering.
- The YJ-2 (C-802), which may be entering service now, replaces the solid propellant sustainer motor of its predecessor with a turbojet and as a result has a much longer range (120 km versus 40 km). (Periscope, 1998.)
- An even longer-range version (180 km) of the YJ-2 is reportedly under development, as is a land-attack version that incorporates a GPS guidance system and terrain contour-matching.[31]

Two new long-range land-attack cruise missiles are also being worked on, and one or both will likely enter service after 2000. There are reports of extensive Israeli and Russian involvement in these programs, including assertions that the Chinese hired an entire cruise missile R&D team from Russia in 1995 (Blank, 1997). Both air- and sea-launched variants are anticipated.[32] Beijing's efforts in this area may be expected to benefit from China's acquisition of a number of SS-N-22/3M80 SUNBURN/*Moskit* missiles to equip its *Sovremenny* destroyers.

Nuclear Submarines. The Chinese have also invested heavily in nuclear submarine technology, building at least five *Han*-class nuclear attack submarines (SSNs) and one *Xia*-class SSBN. All have

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[31]Lennox and Starr (1996) and Bowen and Shepard (1996).

[32]U.S. Department of Defense (n.d.), p. 4.

been plagued with problems with their power plants, although the *Han* fleet has reportedly been significantly more active in the mid-1990s than heretofore (Sharpe, 1997, p. 11X).

The PLAN is currently developing two new nuclear submarines that are slated to enter service after the turn of the century. The Type 093 SSN is believed to be comparable to the Soviet VICTOR III class and will benefit from Russian quieting technology, as will the Type 094 "boomer."[33]

SAMs. As in other areas, China's first forays into SAM development involved reverse engineering Soviet systems. Today, China fields a number of indigenously manufactured SAMs both on land and at sea; most are still evolutionary developments of foreign missiles, as shown in Table 3.5.

The current centerpiece of the PLA's SAM development is the HQ-9, which is reputed to be a highly modified version of the SA-10 GRUMBLE which the Chinese purchased from Russia earlier this decade. The HQ-9 is alleged to incorporate guidance and propulsion technology from the U.S. *Patriot*, which Israel supposedly provided to Beijing (Fulgham, 1993b).[34] The *Patriot* know-how is thought to serve mainly to enhance the HQ-9s capabilities against ballistic missiles and may make the system considerably more attractive to potential export customers (Fulgham, 1993a).

New Fighter Aircraft: The J-10, FC-1, and XXJ. Currently, China is developing at least two new fighter aircraft. The J-10 is a high-performance single-engine fighter with a clear family lineage back to the canceled Israeli *Lavi* and, in turn, to the Lockheed-Martin F-16. Israeli assistance has reportedly been centered on avionics, radar, and flight controls, and Israel may have supplied a *Lavi* prototype as well. The engine is reputed to be the same AL-31 that powers the Su-27. After a prolonged gestation, the first flight of the J-10 occurred in March 1998, and the aircraft is expected to be in PLAAF service by 2005.

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[33]"Russia Helps China take new SSNs into silent era" (1997).

[34]If such a transfer did indeed occur, it could also have helped the Chinese develop ballistic-missile reentry vehicles that could defeat current and future U.S. anti-missile systems.

Table 3.5

Chinese SAM Systems

Name	Type	Based On
HQ-2	Medium-to-high altitude, radar guided	SA-2 GUIDELINE
HQ-7	Low-to-medium altitude, radar guided	*Crotale*
HN-5	Man-portable, infrared guided	SA-7 GRAIL
QW-1	Advanced man-portable, infrared guided	FIM-92 Stinger
HQ-61	Low-to-medium altitude, radar guided	None
LY-60	Low-to-medium altitude, radar guided	None
HQ-9	Advanced all-altitude, radar guided	SA-10 GRUMBLE, Patriot

The FC-1 is a lightweight, single-engine, multirole fighter being developed primarily for export, with Pakistan as the main customer. Some reports indicate that the PLAAF will buy some number of the aircraft as part of a "high-low" mix strategy with the more capable Su-27 and J-10.

Finally, it has recently been reported that another new fighter, the XXJ is in the early stages of development with a target service entry date of right around 2015. The XXJ is assessed as a twin-engine fighter in the Su-27/F-15 class with multirole capabilities and some low-observable characteristics.

Other Programs

The Chinese are also pursuing a number of other defense-related development efforts that could reach fruition in the early part of the next century.

Space. China is one of the world's space-faring nations, with a demonstrated capability to launch and operate Earth-orbiting spacecraft. Since 1970, China has successfully flown a variety of satellites, including communications, meteorological, and surveillance systems. In addition, China today offers commercial launch services to a variety of customers and may even conduct manned spaceflights in the next few years. While China's space program appears to be in something of a hiatus—only five Chinese spacecraft are operational on orbit as of this writing—this by no means reflects a lack of interest in space-related technology.

For example, China is developing a new generation of photoreconnaissance satellites, the FSW-3 series, which will provide 1-meter

resolution, and the Chinese National Remote Sensing Center also receives imagery from U.S. LANDSAT, French SPOT, Israeli EROS, and Russian remote-sensing satellites (Stokes, 1997). Although the Chinese have yet to launch a radar-surveillance satellite of their own, the National Remote Sensing Center does receive downlinks from the Canadian RADARSAT platform.

China, too, is well-positioned to exploit the emerging era of widespread commercial exploitation of space. With its large economy and foreign-exchange reserves and its relatively advanced technological base, China is participating in a number of international space ventures, including the *Iridium* and *Globalstar* satellite communication systems. China's financial resources could also make its military a major consumer of "pay-for-play" commercial remote sensing systems such as Quick Bird, Orbview, EROS, and advanced SPOT, which will come into service in the next few years and offer on-demand high-resolution multispectral imagery. So, the Chinese may be able to derive many of the advantages of space exploitation even if they do not build or launch a single satellite of their own.

The Chinese may also benefit as something of a free rider on space capabilities developed by other parties. The U.S. GPS and Russian GLONASS systems, for example, appear to be evolving into global geolocation utilities, freely accessible to all comers. China is reportedly already exploiting GPS/GLONASS to improve the accuracy of its ballistic missiles.

Finally, there is an extensive Chinese literature on the importance of antisatellite weapons in future war, along with evidence that the PLA is interested in fielding such weapons. One likely candidate would be a ground-based laser; one analyst has concluded that "China has the basic technologies needed to move to more advanced R&D stages" of such an antisatellite system (Stokes, 1997).

Directed Energy. China is devoting significant attention to R&D in the area of directed energy. While little has been disclosed publicly about its efforts in this area, Chinese writings suggest that Beijing is working in a variety of areas, including high-powered microwave weapons, as well as lasers. The Chinese have also conducted extensive research on electronic countermeasures.

Information Warfare. It is perhaps most difficult of all to say anything useful about PLA work on offensive and defensive information

warfare. After all, Beijing does not have to marshal its information warfare brigades for parades or maneuvers, and new information warfare weapons, unlike new fighters or frigates, are invisible to overhead observation. However, the evidence that has come to light is suggestive of great interest.

Once again, the body of Chinese writing on information warfare–related issues is quite copious; much of it focuses on information warfare as a way for a "weaker" power to defeat a "superior" adversary. The Chinese have explicitly discussed the perceived vulnerabilities of some U.S. military information systems. Indeed, one Chinese-language book on Internet hacking is full of screen shots depicting successful penetrations into computers in the U.S. ".af.mil" domain.

Summing Up: The Chinese Military in 2015

It is obviously impossible to make any definitive pronouncements on the shape of the Chinese military in 2015. There are simply too many variables—such as China's economic growth rate, its political evolution, and the overall East Asian security environment—that affect the final result. We can, however, by assessing the PLA's current shortcomings and examining its modernization efforts, draw some tentative insights about what China might or must do to create a modern military in the next two decades.

At present, China is not on a trajectory to become a global military competitor to the United States by 2015. Today's PLA is so far behind the United States in so many dimensions—quality of equipment and personnel across the board being the most obvious—that nothing short of total national mobilization seems likely to enable Beijing to attain such a status, assuming of course that the United States does allow its own military power to atrophy.

China could, however, emerge as a formidable power, one that might be labeled a *multidimensional regional competitor*. As such, China would possess more than just a big army; it could credibly

- exercise sea denial with respect to the seas contiguous to China
- contest aerospace superiority in a sustained way in areas contiguous to China's borders

- threaten U.S. operating locations in East Asia with a variety of long-range strike assets
- challenge U.S. information dominance
- pose a strategic nuclear threat to the United States.

We believe the following would have to occur for China to accomplish this:

- Chinese defense expenditures would have to continue to increase in real terms.
- The PLA would have to be willing and able to trade quantity for quality.
- The PLA would have to open itself to doctrinal, operational, and tactical innovation.
- The Chinese defense industrial base would have to continue to develop and mature.

Increased Defense Spending. In the 1990s, Chinese defense budgets have begun growing in real terms after more than a decade of stasis or decline. Satisfying the PLA's manifold needs—for new equipment, additional training, better maintenance, and so on—will require that these increases continue for the foreseeable future.

Through the 1990s, China's military expenditures have grown at roughly the same rate as the Chinese economy as a whole, so that defense spending as a proportion of GNP has remained more or less constant.[35] If China's economy continues to grow at anything like the rates seen over the last 10 to 20 years—and economists differ on the likelihood of this—the PLA should be able to accomplish a great deal without creating an undue burden on the Chinese economy as a whole.[36]

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[35]The year-to-year increase in real defense spending in 1997 somewhat exceeded the increase in GNP. Most observers, however, believe this resulted more from unexpectedly low inflation than from a change in Chinese government policy.

[36]As of this writing, the effects on China of the ongoing Asian economic crisis remain uncertain. So far, Beijing's large economy and reserves of foreign exchange have helped China avoid a dramatic downturn, such as those that have struck Indonesia, South Korea, and other "tigers." How long these ill winds can blow without seriously buffeting China is an open question.

Trading Quantity for Quality. Put most simply, the PLA is too manpower intensive. With the requirement to defend an extensive land border against the might of the Soviet Union gone, there is little compelling military justification for fielding a 3-million-man army. Getting the maximum modernization "bang" for each budget "buck" will demand a significant reduction in the overall size of the PLA.

The PLA will also need to reduce the bewildering confusion of types of systems in its inventory. By fielding, as it does, numerous versions of tanks, aircraft, and other equipment, the PLA forgoes economies of scale in training and maintenance, as well as in production. The need to rely on so many disparate suppliers, foreign and domestic, has created this situation, as has the political imperative to provide adequate contractual support to the many SOEs engaged in defense manufacture. Larger defense budgets will have little impact if the money must continue to be spread across so many programs and if logistic and training programs remain fragmented and inadequate.

Pursuing Innovation. As it modernizes its hardware, the Chinese military must also update its software: the doctrine, operational art, and tactics that govern its functioning and the training that converts recruits into professional men-at-arms.

Although improvements are being made, such as the utilization of "blue teams," the PLA's approach to training is highly stylized and falls far short of the standards of most Western powers. To the extent that the divergent approaches and standards represent a simple extension of the difference in warfighting styles between China and, say, the United States, they are, of course, valid. However, when an Su-27 pilot is being trained only in one-on-one tail-chase intercepts against nonmaneuvering targets, he is being trained to waste his airplane. New equipment implies new concepts, and the Chinese will need to foment a doctrinal revolution to complement the technological one if the billions to be spent on modern weapons are to pay off in enhanced capabilities.

In particular, it is almost commonplace to observe that power projection is an inherently joint undertaking. If the Chinese wish to secure Taiwan by brute force, protect Beijing's proclaimed interests in the South China Sea, or contest control of the vital sea lanes of the southern Pacific and Indian oceans, the PLA must become competent in joint operations. Today, a "joint exercise" in China most often

means that the army, navy, and air force are in the same general area training independently. This must change dramatically if China is to achieve its potential as a military power.

Mature the Defense Industrial Base. Finally, an effective and thoroughgoing modernization of the PLA will rest on a well developed indigenous arms industry. Accomplishing this maturation will depend on many things:

- rationalization of the industry so that inefficient producers fall out
- selective integration of reliable foreign partners who bring key resources—capital or specific technologies—to the table
- development of an adequately educated, technologically competent workforce[37]
- promulgation of a strategic R&D vision that focuses scarce resources on areas where China has a pressing need—jet engines for example—and areas that appear critical to the conduct of future wars, such as microelectronics and information processing.

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[37]The disparity between China and the United States may be illustrated by the following: Each year, U.S. colleges and universities award three times as many bachelor's degrees as their Chinese counterparts, even though China's population is roughly five times that of the United States.