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Current and Future Challenges Facing Chinese Defence Industries*

John Frankenstein and Bates Gill

Together, the vast numbers of defence science technology workers and all the Chinese people, under the leadership of the Chinese Communist Party, and adhering to the Four Cardinal Principles and to reform and openness ... will march on to realize strategic targets and more magnificent and brilliant triumphs. *From the official history of the Chinese defence industry, 1992*¹

Without advanced science and technology and people armed with advanced science and technology, modernization is empty talk. *Liu Huaqing, Chinese Politburo Standing Committee member and Vice-Chairman of the Central Military Commission, 1992*²

The fundamental questions are simple. Can the Chinese defence industries make what the People's Liberation Army (PLA) needs? Can they develop and produce systems to allow the PLA first to overcome its problem of "short arms and slow legs," secondly to move from brown-water coastal defence to green-water offshore defence (and eventually blue-water power projection), and thirdly successfully to conduct "limited wars under high-tech conditions"? Indeed, in a larger sense, can the defence industry, under the conditions and pressures of economic reform, survive except by "converting"? The answers, however, are not as simple as might be thought.

Evaluation of the once and future status of the Chinese defence industries is clouded by two very obvious elements. First, there is the incomplete and often contradictory nature of the evidence which can be gathered from China. Complicating matters, a part of these investigations suggest that China does not necessarily follow a "traditional" model for defence production –

Security environment → Threat perceptions → Strategy → Doctrine → Requirement → Procurement → Deployment

– meaning that efforts to join theory with Pekingology often lead only to further confusion. Secondly, and more fundamentally, there are the assumptions that we bring to piecing this evidence together. In other

*The authors would like to acknowledge the helpful insights and comments offered at the initial presentation of this paper in Hong Kong.

1. Xie Guang *et al.* (eds.), *Dangdai Zhongguo de guofang keji shiye (Modern China's Science and Technological Undertakings of National Defence)*, Vol. 2 (Beijing: Dangdai Zhongguo chubanshe, 1992), pp. 503–504 (authors' translation).

2. Quoted from British Broadcasting Corporation, *Summary of World Broadcasts: Far East* (SWB-FE), 11 November 1992, p. B2/4.

words, how we see China: as a regional, if not international, threat driven by the twin forces of nationalism and Marxism-Leninism-Mao Zedong Thought; a strained but modernizing country developing a nationalistic, conservative, and defence-oriented professional cadre of politicians and military officers; a polity split by bureaucratic, factional and personal politics. To borrow Chinese phraseology, we take modernization and professionalism as the core, with nationalism and personalism as key themes, while recognizing persistent contradictions. These assumptions are not mutually exclusive; rather they are mutually reinforcing.

To organize this approach, we first briefly consider certain domestic and international background developments which have profoundly affected the Chinese military-industrial complex (CMIC). The remainder of the study is devoted to three principal sections: organization, production and procurement, and a consideration of probable future developments for the CMIC.³

Domestic and International Environments

The reforms of the Deng era and changes in China's domestic and international environments have had a profound effect upon the country's defence industries. Paradoxically, while these developments have had an overall positive effect upon China's comprehensive security, they have tended to have a negative effect upon Chinese defence production capabilities.

The CMIC could not escape the remarkable socio-economic changes brought about by the Deng reforms. As China demobilized one million Chinese soldiers in the 1980s and redefined the security environment, demand for military goods took a downturn. "Defence" was placed last in the priorities of the 1980s Four Modernizations programmes; meagre political and material resources were devoted to improving the Chinese defence industrial base and shepherding it through the difficulties of reform. Thus as a result of the reform measures of the 1980s and the rush to profits in the 1990s, significant portions of Chinese defence production capacity have diversified into civilian production. Today, according to

3. On the historical development of the modern Chinese defence industry, see Xie Guang *et al.* (eds.), *Science and Technological Undertakings of National Defence*; Wang Li *et al.* (eds.), *Dangdai Zhongguo de bingqi gongye (China Today: Ordnance Industry)* (Beijing: Dangdai Zhongguo chubanshe, 1993); Western sources include Gideon Chen, *Lin-Tse-Hsi: Pioneer Promoter of the Adoption of Western Means of Maritime Defense in China* (Beijing: Yenching University, 1934); Thomas L. Kennedy, *The Arms of Kiangnan: Modernization in the Chinese Ordnance Industry, 1860-1895* (Boulder: Westview Press, 1978); John Frankenstein, "The People's Republic of China: arms production, industrial strategy and problems of history," in Herbert Wulf (ed.), *Arms Industry Limited* (Oxford: Oxford University Press, 1993); Bates Gill and Taeho Kim, *China's Arms Acquisitions from Abroad: A Quest for "Superb and Secret Weapons"* (Oxford: Oxford University Press, 1995), ch. 2. See also Mel Gurtov, "Swords into market shares: China's conversion of military industry to civilian production," *The China Quarterly*, No. 134 (June 1993), Eric Hyer, "China's arms merchants: profits in command," *The China Quarterly*, No. 132 (December 1992), and Paul Humes Folta, *From Swords to Plowshares? Defense Industry Reform in the PRC* (Boulder: Westview Press, 1992).

both Chinese and foreign estimates, only about 10 per cent of China's defence production capacity is utilized for defence production, with the remainder either lying idle or producing civilian goods.⁴ Of that 10 per cent, some subsectors appear to be in crisis: the State Statistical Bureau reported that in mid-1994, 81 per cent of the "weapons ammunition" (*wuqi danyao*) producers were losing money.⁵

The contemporary international environment also shaped the current status of the CMIC in critical ways. Most important was the strategic understanding which developed in the early 1980s that China would face a prolonged period of relative peace, and that world war or armed confrontation with the capitalist or revisionist superpowers was not inevitable. Secondly, Chinese strategists recognized in the 1980s that strength and influence within the international system were grounded in the development of the national economy and national technological capability, rather than military capability alone. Moreover, the achievement in the late 1980s and early 1990s of bilateral confidence-building measures and the steady improvement of relations between China and former adversaries – the Soviet Union/Russia, India, Vietnam – marginalized defence priorities. Under these circumstances, Beijing could justify diverting resources away from the military toward civilian needs.

However, in the early 1990s, as the Chinese economy went into overdrive and in the wake of the allied coalition victory over Iraq, the Chinese have been forced to accelerate their strategic reassessment. A large, antiquated, land-based force is inadequate for Chinese security needs as China's interests have shifted seaward towards the Korean peninsula, Japan, Taiwan, ASEAN and even the Indian Ocean. Numerous reports in the early 1990s indicate growing Chinese concerns over an immediate American and longer-term Japanese challenge to China's regional security interests.⁶ Following the allied coalition victory over

4. Zhou Jianshe, *Guofang ziyuan nixiang kaifa: Zhongguo junzhuanmin wenti yanjiu* (*Changing Course of National Defence Resources: Research on Chinese Defence Conversion Issues*) (Changsha: Hunan chubanshe, 1992), p. 205; "Making a modern industry," *Jane's Defence Weekly*, 19 February 1994, p. 28.

5. "Guoyou qiye ku sun mian zaidu kuoda" ("State enterprises still face increasing losses"), *Zhongguo guoqing guoli* (*China's National Conditions and Strength*), October 1994, p. 7.

6. See for example, Ross Munro, "Eavesdropping on the Chinese military: where it expects war – where it doesn't," *Orbis*, Vol. 38, No. 3 (1994), p. 356. While the publication analysed in this article is not an official document, and appears to resemble the kinds of studies produced by middle grade officers attending military academies as strategic planning exercises, the views are consistent with those we have heard expressed by Chinese security analysts. For other expressions of the U.S. threat to China, see the *People's Daily* year-ender editorial in Foreign Broadcast Information Service, *Daily Report: China* (FBIS-CHI), 7 January 1994, pp. 27 ff; *Zhengming* report in "Hong Kong: CPC seminar views U.S., Japan as leading archenemies," FBIS-CHI, 25 January 1994, p. 4: the conference concluded that "for the present...the major target of U.S. hegemonism and power politics is China and the Third World countries in Asia," but 60% of those attending thought that by the year 2020 Japan would be the major enemy. Apparently many of those attending, including those in the military, favoured playing "the Russian card" against Japan and the U.S. For quotations of Chinese leaders Liu Huaqing, Ding Guangen and Hu Jintao on the U.S. threat to China, see, for example

Iraq, the Chinese increasingly spoke with concern about the PLA's ability to fight a "limited war under high-tech conditions," a belated recognition of the so-called "revolution in military affairs."

In short, as Chinese security interests shifted, so new demands were placed upon the military and the CMIC to meet the new challenges. Not only will China need to develop its force extension and force projection capabilities,⁷ but Chinese military leaders also recognize that the very nature of warfare in the future will be different; they term it "five-dimensional warfare" – air, land, sea, space and electronic warfare backed up by real time strategic intelligence.⁸ For some, the urgency apparently suggests that priorities be realigned: as Defence Minister Chi Haotian declared in 1994, "while promoting the overall interests of economic construction, we should strive to increase national defence capacity..."⁹

But, to address these challenges and operate in this new environment effectively, major shifts in strategy, doctrine, logistics and tactics are needed. In support of these changes, the CMIC will also need to undergo significant – and painful – adjustments and modernization. Chinese military strategists apparently understand the fundamental change which is necessary, and speak openly about the need to "overcome the enemy in ourselves" in order to address the "severe historical requirement" set by modern high-tech warfare.¹⁰ But while there is evidence the Chinese recognize the problem, there is less to suggest they are prepared to address it adequately.

footnote continued

Zhengming, 1 May 1994 cited in "Hong Kong: military said behind 'hard line' policy," FBIS-CHI, 5 May 1994, p 12; *Cheng bao*, 5 May 1994 cited in "Hong Kong: Liu Huaqing stresses antihegemonist policy," FBIS-CHI, 5 May 1994, p. 5: "U.S. hegemonism now takes China as its main enemy, and tries to interfere in China's internal affairs."

7. It is useful to distinguish between force extension and force projection. The latter term, as Paul Godwin and others have argued, means the ability to insert and sustain military force in theatres distant from the homeland. Force projection thus requires the development of forces capable of operating on their own and the logistics capability to sustain them. Force extension, on the other hand, would require only the ability to employ force at a distance for a short time and without the intention or requirement to sustain it. An extension strategy might be suitable for certain scenarios in the South China Sea, but would be inadequate for an invasion and necessary occupation of Taiwan.

8. See, for instance, Zhao Chengmou, "A prediction of future battlefield and weaponry in the early 21st century," China Defence Science and Technology Information Centre Papers Nos. 4 and 5, Beijing, 1990.

9. *Jiefangjun bao*, 12 March 1994 cited in "Defense Minister views defense building, army work," FBIS-CHI, 17 March 1994, p. 21.

10. *Jiefangjun bao*, 28 May 1993 cited in "'Roundup' on high technology warfare tactics," FBIS-CHI, 2 July 1993, p. 22; quotations are on pp. 24 and 27.

*Organization*¹¹

The CMIC is huge and its organization difficult to grasp analytically. While the basic organization of the CMIC can be described and some information gleaned about its parts, the basic details of its investment base, numbers and names of subunits, and employment remain sketchy. Chinese secrecy is a factor here, but the growth, diversification and, in particular, the geographic dispersal of the industry also contribute. In this section some of the fundamental points of CMIC organization are discussed, including its size, the chain of decision-making, the importance of the Commission on Science, Technology and Industry for National Defence (COSTIND), and the influence of certain highly-placed officials and “princelings” of the regime.

Basic organization and size. The constitution of the CMIC has been fluid, as much subject to the vagaries of Chinese politics as to economic or military necessity. Today it is comprised of two distinct structures: ministries and corporations under the State Council on the one hand, comprising at least 2,000 enterprises, and PLA organizations on the other. The first might properly be called “defence industries”; the second, in the PLA chain of command, “military industries.”

The “defence industries” are based on the Korean War-era Military Industry and Aviation Industry Commissions and the 41 of the 156 Soviet “key projects” that were for weapons production. Following the disasters of the Great Leap Forward, the PLA National Defence Science and Technology Commission (NDSTC) and the State Council National Defence Industry Office (NDIO) combined to set up a joint system of R&D, supervision and co-ordination among a collection of numbered machine building industries (MBIs), a structure that survived even the Cultural Revolution. Today those formerly secret MBIs have evolved into an array of civilian-run and profit-seeking corporations that increasingly seek to diversify and “corporatize” their activities. PLA production units are similarly diverse and numerous. PLA economic activity began as units devoted to military supply, distribution and logistics; many have expanded their operations to the civilian consumer and service sectors on the one hand and to sensitive activities, such as high tech acquisition and arms trading, on the other.

Table 1 clearly shows the trend toward corporatization. However, the process has not been smooth: insiders at Aviation Industries of China (AVIC) and other sectors of the CMIC say that these organizations still behave less like profit-seeking corporations and more like bureaucratic

11. This section is based on John Lewis and Xue Litai, *China's Strategic Seapower* (Stanford: Stanford University Press, 1994), ch. 4; Frankenstein, “The People's Republic of China”; Wang Li, *Ordnance Industry*; Xie Guang *et al.*, *Science and Technological Undertakings of National Defence*; Duan Zijun *et al.* (eds.), *China Today: Aviation Industry* (Beijing: China Aviation Industry Press, 1989). Lewis provides a fascinating account of the politics, often driven by personal animosities fuelled by the paranoid manoeuvrings of elite survival politics in Mao's court, that led to the CMIC's “bewildering array of bureaucratic organs.”

ministries. Indeed, they say, there is a problem of identity: one day they are told to go out and make money, and the next told to pay attention to political objectives.¹² Tensions over these conflicting goals are increasingly apparent: we learned at a late 1995 defence industry conference in Chongqing that efforts by China North Industries Corporation (NORINCO) plant managers to achieve profitability have clashed head-on with State Council attempts to force NORINCO's adherence to state military production targets.¹³

These developments throughout the CMIC are in large part a consequence of the economic reform policies initiated in 1979. They reflect the structural diversification, driven by rapid economic growth and opportunity, found elsewhere in the economy, as well as the requirement that the inefficient CMIC "convert" to civilian production. The problems of these trends also reflect a persistent tension between the economic and ideological agendas of the regime.

Table 2 shows the basic organization and reporting relationships of the CMIC. Overall military direction comes from the Party Central Military Commission; the Ministry of National Defence, which is not in the direct chain of command, is a spokesman for PLA needs in the State Council. COSTIND, the keystone and link between the PLA and the CMIC, was formed in 1982 by the combination of the old NDIO, the NDSTC and the Science and Technology Equipment Commission of the Central Military Commission (STECO). State economic organizations, such as the State Planning Commission, the State Science and Technology Commission and the China International Trust and Investment Corporation (CITIC) supply policy and financial input as well.

Within the CMIC, individual sectors are large and diverse. For instance, under the general rubric of the aviation industry there is Aviation Industries of China and its subsidiaries, which include more than 200 trading companies and enterprises employing over 500,000 workers, of whom 200,000 are engineers or qualified technicians, 30-plus research institutes, and six universities and colleges. Enterprises in this structure show similar scale: for instance, the Chengdu Aircraft Engine Corporation, a "backbone" enterprise, employs 20,000 engineers and works in 16 factories, 4 research institutes, 11 "branch companies," over 40 joint ventures and 6 "window" operations – companies set up in the open coastal cities and special economic zones.¹⁴

12. These remarks were relayed through private conversations with knowledgeable foreign observers in Beijing.

13. Interestingly, the Ministry of Electronics, which nominally oversees one of the most successful "converting" sectors, has not "corporatized." Industry sources suggest that since most electronics factories have been placed under provincial and local control, there remained little if anything for the Centre to corporatize. As in the NORINCO example, the Centre's absolute authority over production wanes as decentralization and commercialization continue. Even so, given its responsibilities in the development of telecommunications and technology acquisition, the MEI remains.

14. Data from *China Aviation News*, 2 June 1994 cited in *Defense Science, Technology and Industry Monthly Report (DSTI)* (Hong Kong: U.S. Consulate General, Defense Liaison Office, June 1994), p. 5.

Table 1: The Evolving CMIC

<i>MBI</i>	<i>1982</i>	<i>Ministry/Corporation</i> <i>1988</i>	<i>1993</i>
2	Nuclear Energy Ministry	Ministry of Energy Resources	China National Nuclear Corporation (CNC) broken into Coal and Electric Power Ministries)
3	Aviation	Ministry of Aerospace (MAS) (Combines Aviation and Space Industry Ministries)	Aviation Industries of China (AVIC) MAS broken into AVIC and China Aerospace Corp (CASC)
4	Electronics Ministry	Machine Building and Electronics Industry Ministry (MMBEI)	Ministry of Electronics Industry (MEI) (MMBEI broken into MEI and Ministry of Machine Industry, a reversion to the first MBI, or civilian, MBI organization).
5	Ordnance Ministry	MMBEI	NORINCO (Group) (Ex-Ordnance, MMBEI)
6	Ship Construction Corporation	No change	No change
7	Space Industry	MAS	CASC
8	Missiles (merged with 7 in 1981)		

Table 2: China's Military Industrial Commercial Complex

<i>Central Military Commission</i>		<i>State Council (input from CITIC, SPC, SS&TC)</i>			
General Staff Dept. (GSD)	General Political Dept. (GPD)	General Logistics Dept. (GLD)	People's Armed Police (PAP) (Joint Public Bureau command)	Commission on Science Technology & Industry For National Defence (COSTIND)	Ministry-level Corporations
Poly Group Corp. (CITIC connection; arms technology trade)	(The GSD & GLD oversee and co-ordinate with external military sales)	Xinxing Corp. (clothing, food construction materials)	Jingnan Equipment ImpEx Corp (police/security equipment, small arms, ammo)	Xinshidai Corp (exchanges, publications planning, marketing)	Ministry of Machine Building
China Huitong Corp. (telecoms)	Kaili (Carrie) Corp. (communications equip., publications)	Tiancheng	999 Enterprise Grp. (pharmaceuticals)	(ex-1 MBI, not much defence-related activity)	China National Aviation Industries of China (AVIC) (ex-Aerospace Min.)
<i>2nd Artillery (Strategic Forces)</i> Shanhaidan Co			San Ding Trading Corp.	Impex (Electro-optics, radar, crypto, EW)	China National Aero-Technology Impex (CATIC)
<i>Air Force</i> Lantian Corp.			Anhua Development Corp.	Xiaofeng Technology and Equipment Corp. (computers, other high-tech)	China Aerospace Corp (ex-Aerospace Min.)
United Airlines				Yuanwang Group plus at least 100 other company's such as Shenzhen Heli S&T Development, China Galaxy.	China Precision Machinery Impex (optics, missiles)
Navy: Songhai Corp.				<i>Conversion Enterprises</i> "Defence conversion" has led to the creation of new companies and enterprise groups, including "window" operations on the coast, joint ventures (such as NORINCO's motorcycle factories), industry-based groups (such as the Huanghe and Zhenhua electronics groups), regionally centred	Great Wall (space launch)
Bureau of Military Equipment and Technology (BOMETEC)					Beijing Wan Yuan Ind. Corp. (space services)
Ping He Electronics (connections with Everbright)					Chinese Academy of Space Technology (satellites)
<i>Communications Department</i> China Electronic Systems					Chang Feng S&T Ind. Group*
Zhuhua Corp (connections with Ministry of Foreign Trade & Economic Co-operation)					China National Nuclear Corp. (CNNC)
					China National Nuclear

Table 2 Continued

Plus numerous PLA enterprises under the 7 Military Regions, 24 Group Armies and local authorities, including the Special Economic Zones, including:	groups (such as Guizhou's conglomerates), and new cross-sectoral groups such as the COSTIND sponsored Hainan Heping Corp. which draws on investments from the aviation, space, shipbuilding and nuclear sectors. (Defence conversion efforts are directed by a three commission group (COSTIND, State Planning Comm. and Science and Technology Comm.) aided by two COSTIND organizations, the China Defence Science and Technology Information Centre and the Chinese Assoc. for the Peaceful Use of Military Industrial Technology.)	Instrumentation and Equipment Corp. (CNIEC)	China State Shipbuilding Corp.
Beijing MR: Huabei Jinghai Ent. Corp.		China Nuclear Energy Industry Corp. (NBC protection equipment)	China North Industries Group (NORINCO (G))
Shenyang MR: Dongbei Jincheng Ind. Corp., Songliao Ent. Grp.		China Nuclear Equip. and Materials Corp.	(Ex-Ordnance: small arms, armour)
Nanjing MR: Huangdong Ind. Corp.		Rainbow Development Corp. (nuclear power)	China General Industrial Material and Equip. Supply Corp.
Jinan MR: Shandong Dongyue Corp.			China Yanxing National Corp.
Chengdu MR: Southwest Great Wall Devel. Corp.			China North Optics & Electric Corp.
Lanzhou MR: Northwest Ind. and Trading Corp.			NORINCO (ImPex)
Guangdong MR: Nanfang Industrial, Cuicun Ent. United Grp.			

Notes:

This table indicates rough relationships within the bifurcated Chinese military-industrial complex. The Central Military Commission has primary authority over the military enterprises on the left; the State Council has primary jurisdiction over the ministries and corporations on the right. CITTIC, the State Planning Commission and State Science and Technology Commission also provide input at the State Council level. COSTIND provides guidance and co-ordination to the Ministries and corporations, and acts as a bridge between the military and civilian authorities, although its authority may be waning as the CMC increasingly diversifies and converted defence plants come under provincial control. "Defence conversion" in China has many meanings, including the diversification of old State Council/Ministerial defence firms into civilian production and use of PLA assets to provide goods and services for the larger economy. In the former case, new enterprises may be created; in the latter, the PLA maintains ownership and control. However, as with any chart, not all connections can be shown. Informal relationships based on family, personal or factional ties may often transcend the formal chain of command. Furthermore, the chart does not attempt to resolve to the enterprise level (for instance, it does not name any enterprises that fall under NORINCO (G)); neither enterprise-level linkages between the defence and civilian sectors, nor links with organizations and enterprises outside China are shown. Data on PLA/MR companies from T. M. Cheung, "The Chinese army's new marching orders," in J. Brömmelhörster and J. Frankenstein (eds.), *Mixed Motives, Uncertain Outcomes: Defense Industry Conversion in China* (Boulder: Lynne Rienner, 1996). See also J. Frankenstein, "The People's Republic of China: arms production, industrial strategy and problems of history," in H. Wulf (ed.), *Arms Industry Limited* (Oxford: Oxford University Press, 1993).

*Chang Feng S&T Industry Group is typical of new forms of defence industry organization. It apparently is a kind of holding company that reports to the 2nd Aerospace Academy and collects 71 national research organizations under its wing. The enterprises under its direction belong to the space, aviation, ordnance, machine building and electronics industries and are spread out over 14 provinces. The product range will be broad: numerically controlled machine tools, medical and pharmaceutical manufacturing equipment, satellite and radar communications equipment, industrial process control systems, and "special components." (Source: *China Defense Industry*, 1 November 94 in DSTI, November 94.)

Third Front. In the 1960s and 1970s a large part of the CMIC was relocated to remote areas of southern and western China in a major effort to build a “Third Front” industrial base. The intention was one of strategic relocation, but in fact it was a huge expense: estimates are that over 50 per cent of Chinese national investment went to the Front, but the need for infrastructure and communications – roads, rail lines, tunnels – in those mountainous areas absorbed 80 per cent of the available funds. Indeed, the far-flung interior locations of such a large portion of China’s defence industrial base is often cited as one of the sector’s leading problems. In addition, their location in mountainous, out-of-the-way parts of China creates a serious socio-economic dilemma. Staggering under heavy debt, lacking highly skilled personnel and management expertise, and cut off from the rapid socio-economic development of urban and coastal areas, Third Front industries face difficult times ahead. Reports from the *Zhongguo jungong bao* (*China Defence Industry News*) routinely spell out the problems of Third Line industries: heavy debt load, poor leadership and management, the burdensome social obligations of the *danwei*, unmet payrolls, under-employment, declining living standards.¹⁵

These problems are monumental, and, since approximately 55 per cent of defence industries are in Third Front areas, affect the entire health of the CMIC. But the solutions offered appear piecemeal and inadequate: more state assistance, “liberate one’s thinking,” improved education, a modern enterprise system, moving the enterprises to cities and coastal areas. But even this latter solution cannot work for all: one report claims that of all ordnance factories relocated from the Third Line by the end of 1994, only four had made a profit, while some 40 enterprises had lost an annual average of 5 million *yuan* each.¹⁶ Today, the Front is deemed “irrational” and, despite incentives, can neither hold nor attract the technical talent needed for further development.¹⁷ Accordingly, these Third Front industries are encouraged to make a “triple jump” – “jump out of the backwater, skip to coastal areas, pole vault overseas” – and by 1992 it was claimed that they had established 800 enterprises along the coast and in cities and special economic zones. But to do this the state is spending over US\$1 billion and estimates are that it will take well into the 21st century to complete the process.¹⁸

15. Shao Mingjun, “Jiangxi sheng bufen kuisan qiye xianzhuang yu chulu” (“Current situation and way forward for some loss-making enterprises in Jiangxi province”), *Zhongguo jungong bao* (*China Defence Industry News*), 6 December 1994, p. 3; Lan Jiageng, “Junzhuanmin yinyang zhang biduan” (“Defence conversion should stress strong points, avoid weak points”), *Zhongguo jungong bao*, 27 December 1994, p. 2; Shen Ming, “Jingji cong zhong tang tiao lu” (“Making the way on a brambled path”), *Zhongguo jungong bao*, 27 December 1994, p. 1.

16. Shen Ming, “Making the way on a brambled path,” p. 1.

17. See Barry Naughton “The Third Front: defence industrialization in the Chinese interior,” *The China Quarterly*, No. 115 (September 1988), and commentary on the Third Front in *China Daily*, 5 December 1991, p. 1.

18. Xinhua report, 18 July 1992 cited in “Third Line military enterprises expand operations,” FBIS-CHI, 21 July 1992, p. 27.

COSTIND. The most important single body overseeing the CMIC is the Commission for Science, Technology and Industry for National Defence. Established in August 1982, *COSTIND* combined the NDSTC, the NDIO, and the STECO in an effort to bring more rationality and centralized decision-making to the development and output of Chinese military production. *COSTIND* officials in the late 1980s described the organization in this way:

The main function of the Commission is to organize defence science and technology research, developing, testing, design finalizing and manufacturing of new weaponry, and the research & development work of space technology. It is also the Commission's responsibility to supervise the export of defence products by various provinces, autonomous regions and municipalities, and other ministries under the State Council, and their co-operation and technical exchanges in the field of defence industry with foreign countries.¹⁹

By the mid-1990s, however, with the rising commercialization of enterprises and devolution of authority to profit-oriented and independently-minded provincial and local officials – who may not always see eye-to-eye with Beijing – *COSTIND*'s command over production and allocation of resources may be diminishing.

Still, *COSTIND* remains at the ministerial level. It answers to two masters: the State Council and the Central Military Commission, serving as a bridge to co-ordinate R&D and procurement between military producers under the former and military consumers under the latter. It also acts to mediate and help resolve disputes which may arise between various organs of the defence production sector, and, with the State Planning Commission and the Commission for Science and Technology, has a role in determining the longer-term priorities for China's military R&D and production.

In addition, *COSTIND* responsibilities include overseeing the financial resources of the defence research, development and production sectors, as well as operational oversight for conventional and nuclear weapons test sites, and for commercial and military satellite launches. *COSTIND* also appears to be responsible for leading the ongoing programme of defence "conversion" in China, but given the scale of the undertaking and increasing provincial involvement in the process, its financial and strategic contributions are limited. In addition to the departments, centres, testing sites and branch offices of *COSTIND*, an independent committee of approximately 50 defence R&D and production experts meets annually and provides policy planning and technical advice to the Minister. *COSTIND* officials do not reveal the number of persons working for the organization. Some Western sources claim that the basic staff numbers in the hundreds,²⁰ a figure which probably represents the persons at the headquarters in Beijing. But given *COSTIND*'s numerous responsibilities

19. Description provided by *COSTIND* to the U.S. Defense Attaché Office, Beijing.

20. Jonathan D. Pollack, "Structure and process in the Chinese military system," in Kenneth G. Lieberthal and David M. Lampton (eds.), *Bureaucracy, Politics, and Decision Making in Post-Mao China* (Berkeley: University of California Press, 1992), pp. 172–73.

and country-wide reach, the number connected with it nation-wide – though perhaps not directly employed – probably runs into several thousand at least.²¹ Many provincial COSTIND representatives we have met also sit on local economic development boards – an interesting, if minor, example of the habit of Chinese officials wearing two (or more) hats. The organization and functions of COSTIND are shown in Table 3.

Patronage. As in other parts of the Chinese hierarchy, it is important to recognize the linkages and networks which overlap the official lines of authority. This raises the interesting organizational question of whether the defence industries have benefited from the extensive connections that appear to exist between China's top political leadership and the sector. Jiang Zemin was, at one time, the Minister of Electronics; and most of the other Politburo members and Vice-Premiers have experience in the technical industries. Furthermore, the *taizi* – the “princeling” offspring of these leaders, such as Wang Jun (son of the late Chinese general Wang Zhen, former head of the arms trader Polytechnologies and now director of CITIC) – are also involved in the commercial side of the defence sector, where they can undoubtedly draw on their wealth of connections.²²

With regard to COSTIND, a number of interesting linkages appear. The head of COSTIND is invited to be a member of the Central Military Commission,²³ and, since the 14th CCP Congress in November 1992, sits as one of ten generals allowed to attend and advise meetings of the Politburo as non-voting members.²⁴ The current head of COSTIND, General Ding Henggao, has been a member of the 12th, 13th and 14th CCP Central Committees, and, through his wife, former COSTIND

21. According to the official history of the Chinese defence industry, the number of persons working in the area of national defence science and technology information (*guofang keji qingbao gongzuo*) numbers more than 20,000. See Xie Guang *et al.*, *Scientific and Technological Undertakings of National Defense*, Vol. 2, p. 392. In another example, the conventional weapons testing centre run by COSTIND at Baicheng employs “over 1,000 S&T [science and technology] personnel.” *Liberation Army Daily*, 8 April 1995 cited in DSTI, April 1995, p. 15.

22. For instance, Qiao Shi was Party Secretary of the Shaanxi Engineering Administration Office in the early 1960s during the initial period of the Third Front movement; Li Tieying is a former Minister of Electronics; Tian Jiyun had financial responsibilities in the south-west during Third Front construction; and Zou Jiahua, son-in-law of the late Marshal Ye Jianying, was Minister of the Ordnance Ministry, Minister of MMBEI and Vice-Minister of the Science and Technology Commission for National Defence. Admiral Liu Huaqing, the only military man on the Politburo, headed the Warship Design Academy, and was Deputy Director of the NDSTC (a COSTIND forerunner) as well as a Vice-Minister for the State Science & Technology Commission. Among the *taizi* we find Deng Nan, Deng Xiaoping's daughter, as a Vice-Minister for the State Science & Technology Commission, He Ping, Deng's son-in-law, with the PLA Equipment Department, which has connections with Polytechnologies, and relatives of Ye Jianying, Yang Shangkun and Zhao Ziyang with Polytechnologies.

23. Bao Chen, “Zhonggong tuixing (xiandaihua jianjun) suo baolu de nanti” (“Revealing the difficult problems faced by the Chinese Communists in promoting modernization in army building”), *Zhonggong yanjiu*, 15 June 1988, p. 108 cited in Benjamin A. Ostrov, *Conquering Resources: The Growth and Decline of the PLA's Science and Technology Commission for National Defense* (Armonk, NY: M. E. Sharpe, 1991), p. 99.

24. SWB-FE, 23 December 1992, FE/1571, p. B2/6.

Table 3: COSTIND Organization and Functions

COSTIND ORGANIZATION		Science and Technology
<i>Head Office, Beijing</i>		Committee (advises the Minister)
Ding Henggao, Minister		
Vice-Ministers: Shen Rongjun, Xie Guang, Huai Guomo, Zhang Xuedong, Shen Chunnian		
<i>Departments and Associated Centres</i>		
General Office	Comprehensive Planning	Standards and Measurements
Political/Personnel	Foreign Affairs	Logistics
China Defence Science and Technology Information Centre (CDSTIC)	China Association for the Peaceful Use of Military Technology (CAPUMIT)	Testing and Launch Centres
Nuclear Testing, Lop Nor	Conventional Weapons Testing, Baicheng	Satellite Launch, Jiuquan
Satellite Launch, Taiyuan	Satellite Launch, Xichang	Satellite Monitoring and Control, Xian
<i>Affiliated Companies</i>		
Xinshidai (New Era) Development	China Yuanwang	Galaxy New Technology
High and New Technology for Peace and Development	Xiaofeng Technology(?)	<i>Affiliated Universities and Academies</i>
National Defence Science and Technology University, Changsha	Defence Science and Technology University, Harbin	COSTIND Command Technology Institute, Beijing
(COSTIND allocates weapons R&D funds to other university facilities)		
<i>Branch Offices</i>		
COSTIND has branch offices at certain provincial, municipal and enterprise levels		
COSTIND FUNCTIONS		
Advise on mid- and long-term planning for defence S&T R&D, production, and procurement	Arbitrate and resolve problems within CMIC	Allocate funds and collect taxes for defence S&T R&D and defence production
Satellite launch, monitoring, and control		
Weapons R&D, standardization, quality control, and testing (including nuclear weapons)	Organization, promotion, research, and implementation on defence conversion	Oversee and regulate weapons imports and exports

Sources:

Interview, COSTIND Foreign Affairs Department, January 1995; Interviews, U.S. Defense Attaché Office, Beijing, November 1994, January 1995, March 1995, May 1995; Xie Guang *et al.* (eds.), *Dangdai Zhongguo de guofang keji shiye* (*China Today: Scientific and Technological Undertakings of National Defence*), Vol. 2 (Beijing: Dangdai Zhongguo chubanshe, 1992); *Directory of PRC Military Personalities* (Hong Kong: Defense Liaison Office, U.S. Consulate General, October 1995).

Deputy Director Nie Li, daughter of CMIC-godfather Marshal Nie Rongzhen, Ding also enjoys family ties to China's old guard.²⁵

Certain areas, such as strategic weapons programmes, have powerful friends in COSTIND. But, given the poor state of the defence industries, it seems that the defence sector overall has not been specially favoured. Indeed, the CMIC has perhaps received far less than its size would suggest. A 1995 study of Chinese defence by the OECD Development Centre reports that from 1979 to 1994 subsidies for conversion directed to the CMIC amounted to RMB 20 billion; but a *China Daily Business Weekly* article from early 1995 indicates that the state owned sector – of which the CMIC is a major part – received a total of RMB 1 trillion in subsidies for “technical upgrading” during the same period.²⁶ Thus the CMIC, receiving a small share of state industrial subsidies, is forced to turn to the banking system for loans – which may enforce commercial rigour into their operations, but is more likely to contribute to the huge problem of unpaid debt burdening Chinese industry.

Procurement and Production

While in theory, the Deng-era economic reform process is intended in part to enhance military modernization, in fact it may have impeded the development of the CMIC. The problems posed by reform, coupled with the more deeply-rooted and long-standing weaknesses of the CMIC, lead to the conclusion that military procurement and production processes in China have serious difficulties to overcome.

It is not possible to examine these difficulties in detail in this study. They range from the conceptual (adherence to “self-reliance” as a guiding principle, persistence of “leftist” thinking, aversion to foreign ideas and innovation) to the organizational (lack of horizontal integration, separation from commercial/civilian sector, rigidity), to the practical (scarcity of resources, lack of skilled experts, managers and labour, including the problem of “brain drain,” poor infrastructure, technology absorption problems, dwindling markets). Each of these problems is deserving of a thorough study. Here, their outlines will be seen in the discussion of contemporary military procurement and production processes in China.

Procurement doctrine? In theory, a procurement procedure exists in China to govern the acquisition of weapons. The process includes the development of annual, mid-term and long-term planning guidelines, tracking the development of foreign weapons systems, analysis as to

25. Nie Li is closely involved in defence science and technological issues, and well as in associated business activities. The most recent version of *Directory of PRC Military Personalities* (Hong Kong: Defense Liaison Office, U.S. Consulate General, October 1995) lists Lt. General Nie Li as an advisor to the Science and Technology Committee of COSTIND, and a member of the Standing Committee of the National People's Congress.

26. J. C. Berthélemy and S. Deger, *Conversion of Military Industries to Civilian Production in China: Prospects, Problems and Policies*, OECD Development Centre Report (draft) (Paris: OECD, June 1995), p. 26 and *China Daily* cited in FBIS-CHI, 8 May 1995, pp. 50–51.

technological feasibility, operational requirements and funding levels, and a co-ordinated process of design, trial production, serial production and deployment.²⁷

In reality, however, one of the principal problems – past, present and future – for the CMIC is the development of a more rational and effective procurement process. Our findings are consistent with the efforts of others, both Chinese and Western, who have investigated this aspect of the CMIC. Citing Chinese authors, Richard Latham writes that “little thought was previously given to linking threat and strategy to equipment manufacture.”²⁸ John Lewis and Xue Litai in their study of China’s nuclear missile submarine projects suggest, in somewhat oblique language, that perhaps we have a chicken-and-egg problem: “China’s current strategic doctrines are the product, not the cause, of the projects’ political-technical evolution.... The strategic doctrines did not shape the projects nor provide a coherent context for them.”²⁹ A researcher at the China Defence Science and Technology Information Centre wrote in 1989 that “in our weapons system acquisition process there are the following cases: though a weapons system has already entered into the engineering development state, its operational mode has not yet been determined.”³⁰ More recently, a Chinese researcher who has spent much of his career studying the procurement process in China writes of the “segmentation phenomenon”:

R&D evolves along the phases of basic research, applied research, development, production and deployment.... Should a problem arise in a certain link in the process ... productivity will be affected. Therefore it is very important that they should be organically co-ordinated. In this respect, China still has many problems.³¹

China’s highest ranking active military officer and leading advocate of military modernization, Liu Huaqing, has made a statement on this subject as well: “Improve co-ordination. When a new project is launched, in the very beginning, we must consider from an overall angle the related technological support, auxiliary facilities, training of personnel, and other problems....”³²

Formal procurement planning processes have been adopted in the PLA and the CMIC. There are the usual one-year and five-year plans which are, on paper at least, co-ordinated with the planning system for the larger economy; however, given the liberation of much of Chinese industry

27. See Ling Ruyong, “Procurement auditing of weapon systems,” unpublished manuscript, February 1995.

28. Richard Latham, “China’s defense industrial policy” in Richard H. Yang (ed.), *SCPS PLA Yearbook, 1988/89* (Kaohsiung: Sun Yat-sen University, 1989), p. 86.

29. Lewis and Xue, *China’s Strategic Seapower*, p. 20.

30. Qian Xuesen, “Military systems engineering,” China Defense Science and Technology Information Centre Paper No. 2, Beijing, 1989.

31. Chai Benliang, “Retrospect and prospect of defence R&D in China,” unpublished manuscript, November 1994, p. 6.

32. *Jiefang ribao*, 6 August 1993 cited in “Liu Huaqing writes on military modernization,” FBIS-CHI, 18 August 1993, p. 19.

from that system, co-ordination of these plans must be increasingly difficult. According to a RAND Corporation study of the Chinese air force, the PLA has implemented a five-phase development cycle – theoretical evaluation, programme definition, engineering development, design finalization and production – which involves the service, COSTIND, the General Staff Department, the Central Military Commission and, of course, the industry. But development times are long, stretching well over a decade. And even after production begins, operational deployment is hardly immediate; the study cites *Jiefangjun bao* as reporting that it took an air force unit three years to become operational after initial deliveries of new models. In fact success in the process requires high level interest and continued prodding from the top. “The airforce,” the study concludes, “lacks a clear concept and direction through which to shape its priorities and programs.... These difficulties are rooted heavily in the absence of a co-ordinated R&D process that can define initial tasks, mobilize the requisite resources and induce effective collaboration across the R&D process as a whole.”³³

As a part of the reform process, efforts are under way to introduce concepts of systems engineering, systems analysis, life-cycle management and more “scientific decision-making” into the procurement process. Courses and research institutes with this aim are being established in the General Staff Department, COSTIND and within the armed services. But in the words of one Chinese researcher, the creation of an environment favourable to the development of this kind of thinking will require “efforts by a generation of people.”³⁴

Pricing is one area of procurement reform which has made some headway. Some Chinese researchers report experimental efforts to implement contract bidding and limited market determinants for prices and profits rates, and that leading bodies of the state are undertaking studies of price reform in the military procurement system. At its most basic level, price reform would involve two principal changes. First, the determination of price for a military product would be made on the basis of “production cost” rather than “planned cost.” Secondly, profits would be determined more flexibly and in line with similar goods produced in the civil sector, a change from the traditional profit formula of “planned cost + 5 per cent.” Table 4 offers a simple depiction of the likely direction of price reform for military procurement.

But, while in theory the development of a more market-oriented system for military procurement pricing makes sense, the reality presents

33. See Kenneth W. Allen, Glenn Krumel and Jonathan D. Pollack, *China's Air Force Enters the 21st Century* (Santa Monica: RAND Corporation, 1995), especially ch. 8. The system described here has produced its share of failures – cancelled programmes, prototypes that never flew, failed production. One such was the FB-7, a twin-engined naval aviation fighter bomber, produced in prototype in 1988; a Beijing military attaché termed it “a programme that began with an engine looking for an airframe, and now is an airframe looking for an engine.” *Ibid.* pp. 184, 234.

34. Chai Benliang, “Retrospect and prospect,” p. 5.

Table 4: Reform of Military Products Price System

<i>Current system ("planned cost")</i>	<i>Proposed reform ("production cost")</i>
Price determined by cost of	Price determined by cost of
Raw materials	Direct materials
Fuel	Direct salaries
Workers salaries/benefits	Other direct costs
Quality control	Production expenses
Special tooling and equipment	> workshop expenses
Losses to waste	> depreciation of workshop fixed assets*
Workshop management/fixed asset depreciation*	> technology transfer
Enterprise management/fixed asset depreciation*	> RDT&E
+ 5% fixed profit rate	> some enterprise management depreciation
	+ flexible profit margin roughly equivalent to that of similar goods produced in civilian sector
	*Depreciation of fixed assets set at 7%
*Depreciation of fixed assets set at 3%	
Under both systems, profits are roughly apportioned as 50% (upgrading plant); 30 % (O&M); 20% (personnel and administration)	

Sources:

Shen Zhihua, "Jianlun junpin jiage gaige" ("Discussing military price reform"), *Junshi jingji yanjiu (Defence Economics Research)*, January 1995, pp. 47-50; Ku Geisheng, "National defense budgeting procedure and price reforms of military products," unpublished manuscript, January 1995; Interviews, COSTIND and CAPUMIT, Beijing, November 1994 and January 1995.

difficulties to reformers. In the first place, a move to strictly market-determined prices is unfeasible. Since defence products are not marketable in the civilian sector and because they are considered a public good, some level of state control and intervention will be necessary in determining price. But it remains unclear what the mix of market and state regulation should be in the still-evolving development of “market socialism.” State control and subsidies are likely to remain the norm since even a half-hearted acceptance of market determinants would send the cost of military products far beyond the capability of the Chinese defence budget to pay.

If we accept the argument that no more (and probably less) than one-third of the amount that is publicly announced as the defence budget is available for procurement, we have to question how much China can really afford. In 1994 the total public budget was RMB 55 billion (US\$6.7 billion); for 1995 it is RMB 63.8 billion (US\$7.8 billion); one-third of these figures is RMB 18.3 billion and RMB 21.3 billion (US\$2.3 billion and US\$2.6 billion) respectively. Even if all China’s procurement needs can be met at bargain-basement, subsidized prices (J-7s are reportedly available for about US\$2–3 million a copy), meeting the total needs of a force of 3 million out of these amounts calls for extremely tight budgeting.³⁵ Moreover, the problem is further complicated by the fact that under current conditions of declining procurement in China, the per unit cost of military products will tend to rise because of shorter production runs. In other words, as the Chinese put it, there is a tremendous contradiction between military needs and economic resources.³⁶ Under these circumstances, the implementation of any kind of price reform in the CMIC can only proceed slowly.³⁷

Production. Production of military goods and weapons has been in decline or has remained stagnant in China for more than a decade. Under the conditions of strategic re-evaluation, cutting force structures and conversion, the defence industry is exhorted by such slogans as “more development, less production” and “contract the front and give priority to key projects.” One Chinese source reports that if a military production line does not receive a contract for production in three straight years, it

35. See Arthur Ding’s article in this issue for a further discussion of budget issues. See also K. P. Ng, “China defence budgeting: structure and dynamics,” in Lo Chi Kin *et al.* (eds.), *China Review 1995* (Hong Kong: The Chinese University Press, 1995).

36. Shen Zhihua, “Jianlun junpin jiage gaige” (“Discussing military price reform”), *Junshi jingji yanjiu (Defence Economics Research)*, January 1995, p. 50; Chai Benliang, “Retrospect and prospect,” p. 5.

37. There is another – if paradoxical – angle on the potentially negative effect of price reform, industrial structure modernization and the growing commercialization of the CMIC. According to a study of the Chinese airforce written by two former U.S. defence attachés, the export models of the F-7, a modified version of the MiG-21, which contained advanced Western avionics, were not purchased by the air force because the Ministry of Aerospace Industries required payment in hard currency. See Kenneth Allen and Richard Latham, “Chinese defence reform: the air force as a case study,” *Problems of Communism*, Vol. 40, No. 3 (1991), p. 30.

is to be shut down.³⁸ In short, Chinese military production is “downsizing,” and probably radically so.

Comprehensive information on the output of Chinese defence industries is not available. However, drawing from open sources, Table 5 provides basic estimates on the production of certain major conventional weapons by the CMIC. The table suggests that overall naval vessel, aircraft and land system production in China has declined or remained sluggish for at least the past 15 years.

Aircraft. Information on the production and modernization of Chinese combat aircraft is more comprehensive and detailed than for other Chinese weapons systems. According to a study on world-wide combat aircraft production published in 1994, Chinese production of fighters, bombers and trainers has dropped considerably. From a peak annual production level of 540 aircraft in 1974, output has gone down, particularly since 1979. Table 5 indicates that current Chinese combat aircraft production has fallen by more than half from the levels of the early 1980s. Production of a wide range of Chinese combat aircraft has been virtually halted over the past 15 to 20 years: Il-28 bomber (1976), J-6 fighter (1980), H-5 bombers and HJ-5 trainer bombers (1983), JJ-5 and JJ-6 trainers (1986), and H-6 bombers (1990). J-5 fighter production was halted in 1970 and the aircraft was pulled from service in 1980; Tu-2 and Tu-4 bombers were removed from service in the early to mid-1980s.³⁹

Currently, China produces approximately 70 to 80 aircraft per year, comprising 20 to 24 J-8I and J-8II aircraft, about 50 J-7 and a few JJ-7 combat trainers and Q-5 aircraft (the Q-5 is produced mostly for export). These are the only major military contracts the manufacturers of these aircraft have, and in some cases military production at these plants is expected to be cut further.⁴⁰ Other major aircraft production facilities, such as Xian Aircraft Corporation, have significantly curtailed or halted their military production. The main military output of the Nanchang Aircraft Manufacturing Company is dwindling numbers of the Q-5 and the K-8 jet trainer. In recent years Pakistan and Myanmar have been recipients of the Q-5; Myanmar received 24 in 1994 and Pakistan has received over 100

38. Ling Ruyong, “Procurement auditing,” p. 4.

39. Jonathan Cohen and Andrew Peach, *World Combat Aircraft Holdings, Production, and Trade*, IDDS Almanac 1994 (Cambridge, MA: Institute for Defense & Disarmament Studies, 1994), Table C-1.

40. Shenyang Aircraft Corporation produces the J-8; Chengdu Aircraft Corporation produces the J-7; Guizhou Aviation Industry Corporation produces the JJ-7 trainer. The Chengdu Aircraft Corporation reported in late 1992 that it “used to produce fighter planes” and that “the factory has cut back its output of military planes by a wide margin.” See “Military aircraft plant turns to civil aviation” in SWB-FE, 16 December 1992, p. A/3. The producer of the JJ-7 has also been identified in the Chinese press as the Shuangyang Aircraft Manufacturing Plant. See “Aircraft manufacturing plant resolves product quality problems,” in SWB-FE, 5 November 1992, p. B2/8.

Table 5: Estimated Chinese Production of Selected Major Conventional Weapons, 1981-94

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
<i>Aircraft</i>														
J-7 fighter	40	50	50	50	50	50	50	50	50	50	50	50	50	50
J-8 fighter	10	10	10	10	10	10	12	12	12	20-24	20-24	20-24	20-24	20-24
H-5 bomber	20-25	20-25	20-25	0	0	0	0	0	0	0	0	0	0	0
H-6 bomber	5	5	5	5-6	5-6	5-6	5-6	5-6	5-6	5-6	0	0	0	0
JJ-5 trainer	50	50	50	50	50	50	0	0	0	0	0	0	0	0
JJ-6 trainer	50	50	50	50	50	50	0	0	0	0	0	0	0	0
JJ-7 trainer	0	0	0	0	0	0	0	0	0	0	1	2	2	2
HJ-5 trainer	12	12	12	0	0	0	0	0	0	0	0	0	0	0
Q-5 attack	10-12	10-12	10-12	10-12	10-12	10-12	10-12	10-12	8-10	8-10	8-10	8-10	8-10	5
Total aircraft	197-204	207-214	207-214	169-178	169-178	169-178	77-80	77-80	75-78	83-90	79-85	80-86	77-81	77-81
<i>Ships</i>														
Destroyers	0	1	0	1	0	0	1	0	0	0	1	2	2	1
Frigates	2	2	2	3	3	2	3	2	2	2	4	3	2	2
<i>Submarines</i>														
Xia SSBN	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Han attack	0	0	1	0	0	0	1	0	0	1	0	0	0	0
Ming/Wuhan C patrol	0	0	0	0	0	0	1	0	1	1	1	1	0	1
<i>Land Systems*</i>														
Main battle tanks	300	500	400	650-700	600	300-400	200-250	50-100	150	150	200	200	150-200	100
Artillery (over 100 mm)	275	175	175	175	200-225	300	275	300-350	250-300	250	200-250	200	200	150-200

Note: * Approximately one-half of the land systems shown were exported.

Sources:

Richard Sharpe (ed.), *Jane's Fighting Ships 1995-96* (Coulson Surrey: Jane's Information Group, 1994) pp. 115-126; Jonathan Cohen and Andrew Peach, *World Combat Aircraft Holdings, Production, and Trade*, IDDS Almanac 1994 (Cambridge, MA: Institute for Defense & Disarmament Studies, 1994) Table C-1 and C-2; Kenneth W. Allen, Glenn Krumei and Jonathan D. Pollack, *China's Air Force Enters the 21st Century* (Santa Monica: RAND Corporation 1995); discussions with U.S. defence and arms control officials.

in the 1980s.⁴¹ Six K-8s were delivered to Pakistan in 1994, but the long-term viability of this programme is in question because of the poor quality of the engine and overall lack of sophistication of the aircraft.⁴² Changhe Aircraft Factory in Jiangxi may provide limited batch production of the Zhi-8 helicopter to the Chinese navy over the next few years, but this situation is clouded by reports in 1994 that CAF has “turned over its production facilities to civilian manufacturing [automobiles].”⁴³ In the case of the Zhi-9 helicopter (the Chinese licence-built version of the Aerospatiale AS-365N *Dauphin 2*) made at the Harbin Aircraft Manufacturing Factory, production has apparently been halted after the initial licensed production contract with France for 50 had been completed.⁴⁴

Looking ahead, production of Chinese military aircraft is likely to remain at low levels for the next ten to 15 years. It is possible that military aircraft production will take an improved turn with the serial production of China’s next generation combat aircraft, dubbed the J-10. However, for several reasons, the reported achievement of this milestone in CMIC history remains an open question and presents problems of its own. First, a decision to go ahead with the J-10 may mean scrapping the J-8II programme, which, until recently, was considered as the near-term stopgap solution for modernizing the Chinese air force. In any event, the decision to mass produce the J-8II has not been taken; the annual production rate for the J-8II will remain at around 20 at best.⁴⁵

Secondly, the problems which have consistently bedevilled previous upgrade and next-generation aircraft programmes – FC-1, J-9, H-7, Super-7, Q-5 upgrades – will also affect the success of the J-10. Difficulties in design, metallurgy, avionics and engine technology have been common and have prevented mass production. Past modernization programmes have also lacked export orders which might help finance the further development of advanced aircraft. Thirdly, the development and mass production of the J-10 may be complicated by the possibilities of direct imports and/or co-production of Russian combat aircraft. Chinese leaders are undecided on this point owing to the high costs involved and the ongoing debate in China between those who want to develop an indigenous capacity to produce advanced combat aircraft (COSTIND and the industries) and those who want to modernize through direct off-the-shelf imports

41. Allen, Krumel and Pollack, *China’s Air Force*, cites Jonathan A. Cohen, “China’s combat aircraft domestic and export production schedules for firm orders 1992–2000,” Memorandum to Glenn Krumel as saying that Pakistan will continue to receive Q-5s until 1998.

42. Barbara Opall, “Chinese tout trainers for global market,” *Defense News*, 7–13 March 1994, p. 16.

43. “Chinese aircraft group turns to small cars,” *The Financial Times*, 6 December 1994, p. 20.

44. Interview, Beijing, December 1994.

45. Cohen and Peach, *World Combat Aircraft*, Table 4.8.

or a licensed production or coproduction deal (the air force). On the other hand, the Russians are reluctant to part with production technologies. Nevertheless, reports persist that China and Russia will reach a coproduction accord. If so, it could throw the J-10 programme into question.

However, recent reports suggest that the J-10 may be gaining the upper hand as China's next-generation fighter. These reports mostly focus on the alleged provision of technology by Israel gleaned from the defunct *Lavi* fighter programme, and suggest that Sino-Israeli development of the J-10 is far advanced: a prototype is near completion and is scheduled to have test flights in 1996.⁴⁶ If China is able to accomplish the serial production of a next-generation fighter such as the J-10, then production is expected to be at a rate of about 75 per year, possibly beginning early next decade at the very soonest.⁴⁷ One report suggests that without foreign assistance, achieving operational capability for the J-10 by 2005 would be unlikely.⁴⁸

But ultimately, the combat aircraft production and modernization process in China must contend with the enormous difficulties which plague the entire CMIC. Lack of adequate funding, little co-ordination and definition at the early design and R&D stages, technological difficulties and long development cycles will significantly hinder China's quest for a next-generation multi-role combat aircraft.

Naval vessels. Development in the production of China's naval vessels is crucial to the country's strategic preoccupations. Chinese naval engineers have mastered the basics of shipbuilding, but have difficulties in developing advanced propulsion systems and must still contend with glaring quality control problems.⁴⁹ Moreover, Chinese naval vessels are armed with crude anti-air defences, and are vulnerable to enemy aircraft and anti-ship missiles. Significant improvement in naval defence, air patrol capabilities, command and control, and logistics will also be needed if China is to succeed in fielding a viable blue-water navy. Yet, the development of the *Luhu* class destroyer and the *Jiangwei* class frigate signal advances in Chinese naval capabilities. Two *Luhu* class destroyers have been launched as of 1995, and series production is expected to continue in order eventually to replace all or most of the

46. On Sino-Israeli development of the J-10, see David A. Fulghum, "New Chinese fighter nears prototyping," *Aviation Week & Space Technology*, 13 March 1995, pp. 26–27; Jonathan Mann, "Israeli sale of arms technology to China irks U.S.," *International Herald Tribune*, 29 December 1994, p. 1; David Barrie, "Chinese tonic," *Flight International*, 9–15 November 1994, p. 16; "Israel co-operates with China on secret fighter," *Flight International*, 2–8 November 1994, p. 4.

47. Cohen and Peach, *World Combat Aircraft*, Table 4.8.

48. David A. Fulghum, "China pursuing two-fighter plan," *Aviation Week & Space Technology*, 27 March 1995, p. 44.

49. Reports on the poor quality of Chinese naval production are widespread. See, for example, Stuart Slade, "Thailand push to blue water," *Naval Forces*, No. 6 (1990), p. 77; Gordon Jacobs, "Chinese navy destroyer Dalian," *Navy International*, September–October 1992, p. 263; Gordon Jacobs, "PLAN's ASW frigate Siping," *Navy International*, March–April 1993, p. 69.

ailing fleet of 17 *Luda* class destroyers. The new destroyers are to be powered by a combination of diesel and gas turbine engines, but this aspect of the programme may be on hold as the proposed gas turbines – the General Electric LM 2500 – were embargoed in the wake of the Tiananmen crisis after an initial shipment for the first two *Luhus*. The *Jiangwei* class frigate programme was begun in 1988, and by 1995 five vessels were launched. Some of the *Luhus* and *Jiangweis* are armed with Western sub-systems, and China is seeking to integrate more foreign systems into its naval vessels.

Submarine production is another question mark for the CMIC. Production of submarines has been beset with problems in the past, with the result an ageing fleet with few innovations. For example, continued production of the *Han* class nuclear submarine has apparently been cancelled owing to problems related to radiation levels and other difficulties. Reports suggest that in 1994 China launched a new diesel-electric submarine – the first new design to come out of Chinese shipyards in 20 years – dubbed the *Wuhan-C* by Western analysts.⁵⁰ The *Wuhan-C* is viewed as a possible follow-on to the *Ming* class submarine which experienced numerous production difficulties in the late 1970s and early 1980s. However, these reportedly new submarines may simply be modified versions of the older *Ming* class. The future of Chinese submarine production is clouded by the introduction of Russian *Kilo* class submarines to the PLA Navy, and the efforts by Beijing to gain a licence for its production. According to Jane's, Russian experts are working with the Chinese to develop new submarine designs.⁵¹

Scattered accounts from China and the West report a number of new developments and “breakthroughs” for Chinese defence production. But the fact remains that these new developments unfold within an environment which at present and for the foreseeable future faces severe difficulties which affect every aspect of the defence R&D and production cycle. As one evaluation of Chinese defence R&D finds, “the status of Chinese military technology projects and reform of the military technology base support the school of thought which sees the technology base as weak and weakening under present circumstances.”⁵² For Chinese and Western observers alike, the fundamental question facing the CMIC is not *what* advanced weapons it will produce, but *how* it will produce them.

Future Developments

From this survey of the organization, procurement and production of the CMIC, the difficulties China confronts in modernizing the defence

50. Barbara Starr, “‘Designed in China’: a new SSK is launched,” *Jane's Defence Weekly*, 13 August 1994, p. 3.

51. See Richard Sharpe (ed.), *Jane's Fighting Ships, 1995–96* (Coulson, Surrey: Jane's Information Group, 1995), p. 116.

52. Eric Arnett, “Military technology: the case of China,” in *SIPRI Yearbook 1995* (Oxford: Oxford University Press, 1995), p. 395.

sector are evident. The entire system requires a massive infusion of investment to improve the human and material resources available to the CMIC. Over the medium to long term, both Chinese and foreign observers point to three critical factors which will contribute most to this kind of investment in the CMIC. Probably the most important over the long term – and here the Chinese think in terms of five to ten decades – is continued economic growth, modernization and strengthening of the national resource base. It is well beyond the scope of this study to begin a comprehensive analysis of this crucial variable. But we may usefully consider the implications of the other two, more medium-term factors which have a more direct relationship to the CMIC: defence conversion and access to foreign weapons and military technology.

Defence conversion. “Defence conversion” is a popular theme in Beijing these days. For this study, it represents a process through which the CMIC might unload decades of ideological, organizational and technical restraints, and *eventually* place the defence sector on a more sound footing. But the defence conversion process is full of paradoxes which leave an open question as to whether it will benefit the CMIC. At present, the outlook is mixed at best.

Chinese defence conversion efforts got under way in the late 1970s. Beijing claims great success in the effort, with over 70 per cent of the output of the civilian-run defence industry under the State Council in civilian goods; some sectors claim even higher percentages.⁵³ But precisely defining “conversion” and “success” is a slippery exercise. Defence conversion has many meanings, but Chinese defence conversion seems to be following a somewhat unorthodox path. The “16 character slogan,” attributed to Deng Xiaoping and first articulated as early as 1978, spells it out: “Combine the military and civil, combine peace and war, give priority to military products, let the civil support the military” (*jun-min jiehe, ping-zhan jiehe, jun-pin you xian, yi min yang jun*). Of course the slogan is ambiguous, and could be interpreted to mean either (or both) a short-term strategy to use defence conversion proceeds for immediate defence modernization or a long-term strategy, argued in crucial debates of the early 1980s, to develop the civilian economy before investing in military modernization.

Commentary in the early 1990s suggests that for many leaders of the CMIC conversion means “spin-on” as much as it does “spin-off.” Remarkably, the man charged with the conversion effort, COSTIND deputy director Huai Guomo, said in 1993:

Since national defence high technology itself is frequently a field in which many overlapping technologies are involved, it is becoming increasingly indistinguishable from high technology used in civilian life. The trend toward the interchangeability of military and civilian technology is steadily increasing, and this provides a solid

53. For instance, the electronics sector claims that by 1992, 97% of its production was in civilian products. China Electronic Industry Trading Delegation Catalogue (Hong Kong: 1993), p. 1.

technological basis for the rapid modernization of national defence and for the constant updating of weaponry.⁵⁴

No less than CMC vice-chairman General Liu Huaqing was reported by *Jiefangjun bao* to argue at a January 1995 national conference on co-operation and co-ordination work in the military industries that “we must seize the opportune time of the end of the Eighth Five-Year Plan [1995] and the Ninth Five-Year Plan to push our national defence science and technology and weaponry on to a new state.” He added that contributions from civilian industry, the Chinese Academy of Science and the university system are “component parts” and the “foundation for developing science and technology industries for national defence.” China, he said, “should pay attention to turning advanced technology for civilian use into technology for military use....”⁵⁵ A Xinhua commentary, also dating from January 1995, noted a number of “spin-on” developments: civilian industry “solved a large number of sophisticated technology problems crucial to the production of nuclear weapons, nuclear submarines, guided missiles and satellites [and] new materials....”⁵⁶ According to a COSTIND official, dual-use technologies help keep military production lines warm, provide “the opportunity of developing military technologies in disguised form” and can be rapidly mobilized in war time.⁵⁷ Thus the broad strategy for “defence conversion” in China appears to be diversification in support of the larger defence modernization effort, and not a process of “industrial disarmament.”

But while it is one thing to urge conversion and seek the benefits of “spin-on,” it is quite another to achieve success in these efforts. Thus more important to this study is not the loose definition the Chinese employ for defence conversion, but rather to know if the strategy is working. The foreign visitor at plants with successful conversion projects under way will be impressed by plant managers’ enthusiasm (and overwhelmed by requests for market information and pitches for joint venture investment). American executives in Beijing who work with the Chinese defence sector feel that where the market is immature – such as transport or some high-end consumer goods like colour televisions and motor-

54. Xiang Wang, “Development of modern technology and defense conversion: interview with Huai Guomo, vice minister of the Commission of Science, Technology and Industry for National Defense,” *Commilit*, No. 196 (May 1993), p. 4. This perception may have been reinforced when Huai was a visiting fellow at the Stanford University Center for International Security and Arms Control, located in the heart of Silicon Valley, in 1993. COSTIND joint ventures with U.S. firms, such as Hua Mei Telecommunications, may have been set up with “spin-on” in mind. Projects like this aim at the acquisition of foreign dual-use technology in areas under active research by the CMIC. See Bruce Gilley, “Peace dividend,” *Far Eastern Economic Review*, 11 January 1996, pp. 14–16.

55. *Jiefangjun bao*, 15 January 1995, cited in “Liu Huaqing urges development of defense technology,” FBIS-CHI, 30 January 1995, pp. 30 ff.

56. Xinhua report cited in FBIS-CHI, 25 January 1995, p. 24.

57. See Jin Zhude and Chai Benliang, “Strategic thinking of Chinese conversion in the 1990s,” in *Proceedings*, Conference on International Cooperation in the Peaceful Use of Military Industrial Technology, Beijing, October 1991.

cycles⁵⁸ – there is some commercial success. But in markets where there is competition, the defence plants do not do well. Chinese sources, both private and published, confirm this picture, although Chinese statistics are difficult to analyse fully. We still do not have a census or inventory of Chinese defence plants or even a full accounting of the civilian sector. What we have are fragments that do not always support the official optimism.

Chinese sources often provide the greatest critiques of defence conversion: weak management, low product quality, no or poor market research leading to the production of over-priced goods already in the marketplace, unusable goods, inadequate economies of scale, and a lack of cost- and customer-consciousness are a few of the common complaints. There is a lack of financial responsibility: on the one hand, enterprises are under-capitalized; on the other, the sector is awash in debt. Furthermore, “defence conversion” is seen as a technological “quick-fix,” where in fact it requires fundamental strategic, organizational and cultural shifts. In sum, these critiques charge, the Chinese defence industry cannot seem to move beyond its planned economy mentality.⁵⁹ Predictably then, the industry has recognized these difficulties by its very reluctance to participate in the process. Since exhortations to defence conversion have been voiced for more than 15 years, there appears to have been some reluctance if not outright resistance. In 1991, *Renmin ribao* reported that only 40 per cent of the defence industry was engaged in some kind of conversion effort.⁶⁰

In addition to these problems, most of the sector continues to lose huge amounts of money. According to an early 1995 press report, “only” 38 per cent of China’s ordnance enterprises, a big target for conversion, lost money in 1994, as opposed to 50 per cent in 1993 and 70 per cent in an unidentified “worst year.”⁶¹ Speaking privately, a high NORINCO official

58. One such is Sichuan Chang Hong Electric, a former defence electronics plant that converted to the manufacture of colour televisions and was selected to rank among China’s top 100 listed companies by the China Shareholding Enterprises Evaluation Centre and *The Financial Times*. See Foo Choy Peng, “Asset-rich firms win mainland’s popularity stakes,” *South China Morning Post*, China Business Review section, 10 August 1995, p. 6.

59. This list of criticisms was put forth by Chinese engineers at a conference on arms control held in Beijing in the spring of 1994 attended by the authors. These criticisms are quite similar to other critiques made of defence conversion in other countries, including the U.S. and the former USSR. Interestingly, 1995 official evaluations of the conversion effort echo these criticisms, a remarkable shift from Beijing’s earlier rosy scenarios. See the paper by Jin Zhude, Vice-Chairman of CAPUMIT, “The development and policy of Chinese defence conversion,” OECD International Conference on the Conversion of China’s Military Industries, Beijing, June 1995. The same paper was distributed at the Workshop on New Business Opportunities in China sponsored by the UNDP and CAPUMIT in Chongqing, November 1995.

60. *Renmin ribao* cited in FBIS-CHI, 7 November 1991, p. 32; the 1995 OECD Report on Chinese defence conversion however, suggests that about 80% of the CMIC is somehow involved in conversion. Berthélemy and Deger, *Conversion of Military Industries*, p. i. Given the differences – a four-year time gap and a different sample – between these two reports, one should not be surprised by the discrepancy.

61. For reports of low plant utilization rates and loss-makers see Tai Ming Cheung, “On civvy street: China’s lumbering arms makers face market rigours,” *Far Eastern Economic Review*, 6 February 1992, pp. 40–43; Xinhua report cited in “Weaponry industry improving profit margin,” FBIS-CHI, 23 January 1995, p. 37.

told one of us in early 1995 that defence conversion in China was problematic: the few successes were vastly outnumbered by problems and potential bankruptcies. The greater part of the industry – “90 out of 100,” he said – was having problems meeting payrolls. The “successes” of conversion, he said, were exaggerations: the regime is “not telling the whole truth.” In a remarkably frank report on Sichuan-based defence industries, a Chinese investigator found that “most of the factories are on the verge of bankruptcy,” and concluded that in their turn to the market, “prospects for success are dubious.”⁶² More understated, another Chinese military researcher noted “the policy of stimulating civilian industry through military R&D and arms production, if not a complete failure, has many limitations itself.”⁶³

In sum, the “converting” Chinese defence industry exhibits problems faced by economies in transition from a planned to a market-oriented economy. The well-documented woes of China’s state-run enterprises are shown in the conversion effort: conflicting social and economic goals, looming social problems, the continuing need for subsidies, and poor comprehension of market demands.⁶⁴ Yet, on the whole, CMIC trends are towards greater diversification in structure and markets. As the economic reforms put greater pressure on the bureaucracy to achieve “good economic results” – the only true measure of successful “conversion” – and as societal values shift from “socialist responsibility” to those of the market, we can expect to see those trends intensify. There is a contradiction here, and its solution will probably be similar to that of defence industries in other countries that have found themselves faced by reduced military demand: consolidation and rationalization of the industry. The current organization of the CMIC will undoubtedly continue to be in flux as large segments eventually leave the defence sector entirely or are closed down, and a much smaller and efficient defence industry develops. But this will not be an easy task, and its successful implementation depends as much on political and military developments as economic. At the very least, when we consider that the defence industry makes up a sizable portion of the state sector – of which only one-third is profitable – we can see that the CMIC, converting or not, faces serious economic and strategic difficulties.

Expanding the resource base. A second near- to medium-term factor of critical importance to CMIC modernization will be access to an expanded resource base, especially in terms of capital and technology. The conversion effort will serve this goal to a limited extent, but this cannot be expected to bear the full burden of CMIC modernization. Rather, the defence production sector itself (as opposed to its commercialized

62. Pei Jiansheng, “Market solution eludes remote military-industrial complex,” *China Daily Business Weekly*, 6–12 November 1994, p. 7.

63. Fan Wei, “Arms procurement and national economic development in China,” unpublished manuscript, March 1995.

64. T. MacMurray and J. Woetzel, “The challenge facing China’s state-owned enterprises,” *The McKinsey Quarterly*, No. 2 (1994), pp. 61–74.

cousins across the shop-floor) will require a more direct infusion of investment and technology transfer. The sources of these inputs – Chinese government spending, the generation of funding through domestic and foreign sales, and foreign technology transfers – are possibilities, but are problematic.

Expanding the CMIC resource base through government spending appears to be a dead end. Very little evidence exists that the Chinese government will invest heavily in modernizing the defence industrial plant. Rather the focus, if any, appears to be on the identification and support of certain key R&D and production projects, such as modernization of the nuclear arsenal, missiles, C4I, and possibly bringing a next-generation fighter into production within the next decade. These are, like the rapid reaction units being formed in the group armies, “pockets of excellence” – but they are, in the final analysis, just that: isolated improvements that do not reach the majority of the forces.⁶⁵

The Chinese S&T press also carries accounts of the R&D being carried out by CMIC research institutes (see Table 6). There seems to be a degree of duplication of effort in R&D, which suggests that these research institutes are responding as much to the latest thing as they are marching to a focused vision of the PLA’s future – in a way, this is analogous to the “market chasing” activity seen in the economy at large, in which firms simply make what seems to be selling, without any real attempt to understand market forces. Just the same, it could be argued, this is exactly what one would expect to see in a defence economy that is moving toward contracts and competition. And in this, much of the effort does seem to be working on technologies useful for “force extension.” Still, it is unclear how much of these efforts actually result in deployed systems; failed projects are, in fact, the norm in this kind of activity. In any case, we should keep in mind, as one military observer told one of us privately, that the PLA is still an army in which learning how to drive is a major accomplishment for most recruits. Thus even if China is placing more funds behind military R&D, the services, defence plants and their larger bureaucracies will need to find their own funding for production, and cannot expect a government investment beyond that which now seeks simply to keep much of the CMIC afloat. Some of these technologies, especially those for more modern warfare capabilities – improved information, digitalization, and precision technologies – will be very costly to develop.

The second alternative – securing funding for investment through domestic and foreign sales – is also problematic. The discussion above outlined the decline in procurement and the slow process of price reform, which together will limit the resources available to the CMIC through

65. As Paul Godwin estimated at the Hong Kong meeting, between 15 and 25% of PLA forces are being modernized into these rapid reaction units – even if we pick the lowest percentage, that still means a relatively modern establishment of 450,000 troops, hardly an insubstantial force. But even RRUs are not fully equipped with the most modern equipment available to the PLA.

Table 6: Selected Chinese Defence R&D, 1993–95

Area	Item
Aircraft	Air combat simulator under development by AVIC's Blue Sky Aviation Simulator Technology Development Centre; upgraded version of the F-7 (the Super 7) announced as having assistance from Pakistan and Russia; composite materials research laboratory opens in February 95 at no. 621 aviation research institute; Aviation Industries of China Research Institute no. 613 of Luoyang conducting R&D in photo-electronic detection and tracking systems, head-up displays and helmet aiming and display systems.
Aircraft, ship-borne	PLA Navy Aviation Technology Academy studies flight safety, air stream dynamics at the stern of a moving vessel through modelling and actual flight operations of a helicopter flying from a missile destroyer; ship-borne aircraft flight dynamics studied at symposium sponsored by Beijing Aerospace University; participants were from PLA Navy Electronics Ministry, AVIC, other universities.
Air-to-air refuelling	1993 China Aircraft and Aviation Service Exhibition in Beijing shows advanced aviation technologies, including air-to-air refuelling. PLA tank factory (unidentified) develops a "new model" main battle tank; tank is tested not always successfully under severe and varied conditions, including amphibious environments.
C4I	R&D on advanced transmitters operating in the 900 MHz range; telemetry advances; General Staff Dept. research institute develops army-wide on-line communications network and advanced command automation; Zhuhai Kexing Development Co. develops command and control central and remote display systems using GPS; Academy of Military Sciences operations institute develops an expert artificial intelligence system to aid commanders; research institutes under the General Staff Dept., COSTIND, 2nd Artillery and aerospace jointly develop a ruggedized microcomputer for field use; reports of successful test of real-time remote-sensing image processor; Ministry of Machine Building Industry Research Institute no. 55 announces completion of China's first liquid crystal display panel.
Cruise missiles	No. 8359 Research Institute completes a cruise missile assembly and testing facility.
Fire control automation	Guangzhou MR field artillery unit claims complete automation of fire control for all systems from field guns to anti-aircraft weapons. Guangzhou MR engineering institute develops field combat railroad platform vehicle, which serves as a temporary loading platform; it can also be used as a bridge.
Long-range navigation	"Shanghe-2 Long-Range Radio Navigation and Positioning system" in operation; PLA Airforce develops airborne GPS system
Naval weapons	Seminar on ship artillery and missile systems held by China Shipbuilding Engineering research institute; delivery announcement of newly-designed supply ships for PLA Navy
RPVs	R&D on RPVs conducted by PLA at Northwest China Industrial University (termed China's largest R&D and production base for pilotless aircraft), National Defence S&T University and Guangzhou MR Logistics Dept. develops a drone with real-time photographic capabilities; Xian drone centre develops a new "B-7" drone with a 40 km/60 minute range; Xian Aisheng Technology Corp. develops unmanned reconnaissance aircraft equipped with cameras and infra-red scanners.
Radars	An electronics research institute under the Chinese Academy of Sciences working on synthetic aperture radar technology since the mid-1970s claims progress on airborne and satellite SAR applications; China National Aerospace Industry Corp. develops warning radar; Chinese Academy of Engineering Sciences develops inverse synthetic aperture radar technique.

Source:

Defense Science, Technology & Industry Monthly Report (Hong Kong: U.S. Consulate General, Defense Liaison Office, several issues published 1993–95), citing a broad array of Chinese S&T news sources.

domestic sales. As to exports, the post-Cold War international market in weapons is an extremely competitive place where the troubled Chinese defence industry will have great difficulties appealing to potential customers. Indeed, statistics compiled by the Arms Transfer Project of the Stockholm International Peace Research Institute show that the volume of Chinese arms exports have declined and levelled off to around 40 per cent of peak levels reached in 1987 (see Table 7). China is more likely to find certain market niches in terms of supply (such as missiles and some military technology) and recipients (nearby states which might have difficulty getting weapons and technology from elsewhere), but probably not sufficient to improve significantly the technological level of the CMIC. Even if certain major deals are struck, it is not at all clear that the profits from the arms sales will be reinvested in the CMIC.

A third alternative is for the CMIC to seek inputs of foreign capital, know-how, technologies and material. But certain difficulties for both recipient and supplier will attend direct foreign investment of capital and technology into the CMIC. For China, the financial resources and acquisitions strategies available to the CMIC for foreign purchases are not capable of supporting widespread acquisitions of equipment and technology. Rather, limited by domestic financial constraints and in keeping with traditional "self-reliant" Chinese development strategies, foreign purchases will be kept small with an eye to reverse-engineering or integration into indigenous processes. Direct foreign capital investment in the CMIC seems highly unlikely, both from the Chinese and potential investors' perspectives.

But even if these barriers could be overcome, China cannot expect to receive top-of-the-line equipment and technologies because of sanctions or national security considerations invoked by potential suppliers. Because of security, financial and competitive concerns, Russia has thus far proved reluctant to part with its most advanced systems; Russian defence industry officials we met in Moscow in late 1995 claim to "carefully weigh" decisions to export weapons and technology to China. Reports of Sino-Israeli military production co-operation may have some merit, but remain ambiguous. The Israelis may ultimately be more interested in a *quid pro quo* to restrict the flow of Chinese weapons and technologies to Israel's adversaries rather than supplying China with the necessary means to arm them. Thus, while the prospects for continued Sino-Israeli military co-operation seem good, it is unclear just how useful this co-operation will be to the modernization of the CMIC.

Current thinking on Western supplies of technology to China appears to favour continued restrictions, at least in the near term. Ongoing technology control discussions in the West – such as the Missile Technology Control Regime and negotiations to establish the Wassenaar Agreement (follow-on to COCOM) – tend to treat China as a "country of concern." Changes in the restrictive Western policies of technology transfer are likely to be incremental and *ad hoc*, and will be slow to advocate the direct export of clearly military-use technologies and equipment. Looking further ahead, Western producers may move to increase

Table 7: Volume of Chinese Arms Exports, 1985-94 (SIPRI trend indicator values expressed in millions of constant 1990 US\$)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
	1,487	1,648	3,102	2,217	1,352	1,245	1,117	1,157	1,257	1,204

Note:

SIPRI arms transfer data are an index which indicate trends in deliveries of major conventional weapons. SIPRI arms trade statistics do not reflect purchase prices and are not comparable with economic statistics such as national accounts or foreign trade statistics. Sources and methods used in development of SIPRI arms trade figures are explained in the *SIPRI Yearbook* (Oxford: Oxford University Press, annual) and in *Sources and Methods for SIPRI Research on Military Expenditure, Arms Transfers and Arms Production*, SIPRI Fact Sheet, January 1995.

Source:

SIPRI arms trade database, 1995.

technology transfer to China and have begun to transfer some material which could have military applications. But if the past is any indication for the future, Sino-Western military technology co-operation will continue to be sporadic, limited and less than satisfactory for both sides.

In the United States, under pressure from the defence industries and parts of the government, the Clinton administration has taken decisions which would allow for a more liberal arms export policy, especially when it is seen to be in the national economic interest. Regarding China, some analysts have called for a return to the policies of the early to mid-1980s which allowed for the transfer of defensive weapons from the United States to China.⁶⁶ Other sources suggest the Clinton administration was considering such a policy.⁶⁷ However, should liberalization in exports to China occur, it is not likely to encompass weapons and weapons technologies, at least in the near term. Moreover, the traditionally uneven Sino-U.S. relationship holds out only slim promises for significant advances in this regard.⁶⁸

Taking a broad view, it will be important for China to seek foreign inputs if it expects to advance the CMIC. In times of rapid and costly technological advance on the one hand and dwindling markets on the other, the future success of defence industries the world over will increasingly depend on international co-operation with foreign partners. This trend is already widespread, and is likely to increase as defence manufacturers seek to make use of new technologies, spread R&D costs and guarantee future markets. It is also a trend which the closed Chinese CMIC and even more wary Chinese leadership is not likely to embrace quickly, all the more so because of lingering sour memories of past experiences – the abrupt withdrawal of Soviet assistance in 1960 and the costly but unsatisfactory results of the “Peace Pearl” avionics upgrade programme with the United States in the late 1980s. But in the globalized economy of the future, notions of “self-reliance” and aversion to foreign ideas can only be upheld to the detriment of national development, including the advancement of a nation’s defence industrial base.

Nevertheless, it appears the Chinese approach to these questions is unlikely to change in the near future. In the words of Liu Huaqing:

When we stress self-reliance, we do not mean we will close the door to pursue our own construction. What we mean is to actively create the conditions to import advanced technology from abroad and borrow every useful experience.... One of the basic principles of modernization of weapons and equipment in our Army is to mainly rely on our own strength for regeneration, while selectively importing advanced technology from abroad, centering on some areas.⁶⁹

66. See for example, Thomas L. Wilborn, *Security Cooperation with China: Analysis and a Proposal* (Carlisle Barracks: Strategic Studies Institute, U.S. Army War College, November 1994), pp. 24–25.

67. Barbara Opall, “U.S. lays groundwork to soften China sanctions,” *Defense News*, 19–24 December 1994, p. 21.

68. China might avoid potential problems with Western export restrictions by forming joint ventures for dual-use technology acquisition. See Gilley, “Peace dividend.”

69. “Liu Huaqing writes on military modernization,” FBIS-CHI, 18 August 1993, p. 19.

How much is enough? Perhaps, enough, already? We began with a series of questions about present and future CMIC capabilities, and the short-term answer as to whether the CMIC will be able to fulfil PLA requirements would seem to be no. It should be clear that the CMIC is weighed down by bureaucracy and limited by irrational planning and an inadequate technological infrastructure and resource base. In the shift from socialism to a marketized economy, the CMIC has had to scramble, and, in so doing, has been forced to move away from defence production.

However, there might be still another question to ask: does the CMIC have to move as quickly and as far as we, with a rationalistic, force structure oriented view, think? Here again, the answer is probably no. Even if China sees its adversaries as the United States now and Japan in the future, it is not preparing for immediate superpower conflict. Rather, China's concerns are, as they always have been, about internal security, borders and peripheral territory and, perhaps more important, influence. Immediate loci of conflict are not with the U.S. or Japan, they are with the claimants to sovereignty and territory in the South China Sea, and with Taiwan. With these players, China's sheer weight – cultural and historical as much as numbers of men under arms – is overwhelming. ASEAN, like Mexico, is too far from heaven and too close to a superpower. An invasion of Taiwan may not be necessary: bluster, *Kilo* submarine operations and a few missiles splashing in the sea may not necessarily result in reunification, but can block independence. (At the same time, this “cheap” solution could cost dear if the U.S. perceived threats to international sea lanes of communication.) The rest, perhaps, can wait. China's needs for the remainder of the decade may, in fact, be better served by this combination of intangibles than by rapid expansion and modernization of the CMIC. Indeed, pushing the CMIC with expectations far beyond its capacity to deliver can only be counter-productive and could lead to an even more serious crisis of confidence than the one already surfacing within the sector. Some in the CMIC seem sober enough about the situation:

The relationship between needs and possibilities should be correctly handled. China is a developing socialist country, and must concentrate on economic construction, and thus the contribution of defence science and technology can develop only slowly with the development of the national economy.... In a situation where the state is short of funds, then contracting the front and emphasizing priorities are important principles to be followed in the development of defence science and technology.⁷⁰

Behind this, however, lies a conundrum: is the true nature of PLA the modernizing, aggressive force seen in its “pockets of excellence” and recently imported weapons – the atomic weapons, missiles, fighters, submarines and rapid reaction units – or is it the bureaucratic, technology-inhibited organization that devotes at least as much time growing vegetables to make ends meet as it does to training? We find this duality

70. Xie Guang *et al.*, *Science and Technological Undertakings of National Defence*, pp. 493, 494.

in other aspects of the China scene: consider, for instance, the contrast between the China that is the world's fastest growing economy, and the China that is on the verge of peasant rebellion and worker unrest. Is China the emergent hegemon, the threat none of its neighbours will talk about, or the benign engine driving future regional economic growth? Perceived through Chinese lenses of theories of contradiction Beijing sees no conflicts here: one factor complements the other in a unity of opposites.

Similarly, the future of the CMIC is clouded. Its very nature – a closed, protected, state-within-a-state with only limited incentives and few resources to reform – will determine its future successes and failures. And in a future military and economic environment of accelerating change and conflicting demands, the CMIC will have to deal with a future of difficult demands and choices.