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Is China a Threat? A Defense Industry Analysis

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Since the end of the Cold War, the "China threat" has become an issue of debate, and different policy proposals have been drawn accordingly. By reviewing two rounds of defense industry reform in China and the resulting defense industry capability level, this paper argues that China is not likely to pose a long-term threat to the United States, because China does not have strong indigenous defense industry capability. China cannot, moreover, sustain competition with the United States without a strong defense industry.

KEYWORDS: **"China threat"; China's defense industry; defense industry; defense S&T**

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Since the end of the Cold War, the "China threat" issue has appeared,[1] creating heated debate. This exchange of quite contrary views has resulted in the creation of a diverse range of policy proposals.

The debate originated due to the behavior of the People's Republic of China (PRC) in the post-Cold War era.[2] Note that China has substantially

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[1]For a background analysis on the origin of the "China threat" debate, see Andrew Marble's introduction to this special issue: "The PRC at the Dawn of the Twenty-first Century: Why the 'China Threat' Debate?"

[2]For an excellent analysis of the debate, see Denny Roy, "The 'China Threat' Issue: Major Arguments," *Asian Survey* 36, no. 8 (August 1996): 758-71.

increased its defense budget after the crackdown on June 4, 1989. Moreover, China's orientations in terms of human rights, the free flow of information, multilateralism, the peaceful resolution of disputes, and the responsibility of global citizenship differ starkly from the general world trends of the post-Cold War era. Additionally, China's great-power mentality is similar to that of nineteenth century Germany, the former Soviet Union, and Pacific War Japan, creating potential apprehension in the world. All these factors have contributed to the "China threat" argument.

An increased defense budget, great-power mentality, and different values are, however, issues quite separate from the question of capability. A "threat" has to be based upon, and backed up by, sufficient capability. This is particularly the case in Western culture, which emphasizes "capabilities" more than "intentions." In other words, there may be a gap between prediction or expectation on the one hand, and reality on the other.

This paper observes China's capabilities from the perspective of the PRC's defense industry. This paper assumes that the capability of China's indigenous defense industry, including the capability to absorb and assimilate imported technology, plays the key role in determining China's level of both capabilities and thus threat to the world.

This paper has yet another assumption: that the capability of the defense industry cannot be improved across-the-board in the short term. If that is the case, without real indigenous capability, China's military modernization cannot be sustained for long, and thus may soon reach a plateau. This assumption is important. Attempting to shorten the time required for military modernization, China has imported quite a few hardware systems and technologies from abroad in recent years. This importation will inevitably improve China's military capabilities, leading many people to fear that China is growing into a power on par with that of the United States in terms of military strength.[3]

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[3]China's importation of hardware systems and technologies has helped create new concerns about China's defense industry capability. For an excellent review of analyses on China's defense industry, see Bates Gill, "Chinese Military-Technical Development: The Record for Western Assessments, 1979-1999" (Paper delivered at the 1999 CAPS-RAND PLA Conference on the State of the PLA on the Eve of the Millennium: A Retrospective of the Last Twenty Years, Washington, D.C., July 8-11, 1999).

This paper thus argues that China is not likely to pose a long-term threat to the world, particularly to the United States. First, China is not likely to make across-the-board improvements in the capability of its defense industry in the short term. Second, the United States is making every effort to continue improving its own defense industry and thus military capability in every aspect.[4]

This paper is divided into four parts. The first part discusses historical defense industry legacy of the PRC, spanning the three decades from 1949 to 1978. The second outlines the post-1978 defense industry reform. The third section assesses the post-1978 reforms through a comparison of China's indigenously manufactured versus imported weapons systems. The fourth part will discuss and assess China's further defense industry reforms that have been undertaken since the mid-1990s. The paper concludes with a preliminary assessment of these latest defense industrial reforms.

Historical Barriers in the Pre-Reform Era

Many studies have pointed out that several chronic problems[5] impeding the development of China's defense industry were generated in the pre-reform era.[6] The first difficulty is related to an *irrational procurement*

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[4]It should be noted that the above argument only follows conventional wisdom, and does not preclude the possibility that China may find a good niche in its military competition with the U.S. force. Some Chinese military analysts believe that the United States may overindulge in the victory of the Gulf War and thus neglect new concepts and military strategies. China can take advantage of this opportunity. For a relevant argument, see Zhu Xiaoli and Zhao Xiaozhuo, *Mei-E xin junshi geming* (The new revolution in military affairs in the United States and Russia) (Beijing: Junshi kexue chubanshe, 1996), 40-45.

[5]Bates Gill correctly argues that "Probably the single most consistent theme in the literature of Chinese military-technical development stresses the problems which China faces rather than its accomplishments in this field." See Gill, "Chinese Military-Technical Development," 4.

[6]For analyses of China's defense industry, see John Frankenstein, "The People's Republic of China: Arms Production, Industrial Strategy, and Problems of History," in *Arms Industry Limited*, ed. Herbert Wulf (Oxford: Oxford University Press, 1993), 271-319; John Frankenstein and Bates Gill, "Current and Future Challenges Facing Chinese Defense Industries," in *China's Military in Transition*, ed. David Shambaugh and Richard H. Yang (Oxford: Clarendon Press, 1997), 130-63; Wendy Frieman, "China's Military R&D System: Reform and

process. A logical procurement process should begin with an analysis of the security environment and be followed by consideration of such areas as threat analysis, strategy and doctrine, requirement and operational needs of new hardware systems, procurement, and deployment. Along the procurement course, emphasis should be placed on finding the right mix of technological and engineering factors. In other words, a rational procurement process should have a logical relationship between systems procured and missions to be executed.

However, available materials show that China has not followed this course. Many accounts show that in China, the process has been dominated by technical staff from the perspective of the technical sector, while the end user, the Chinese People's Liberation Army (PLA), has not played a crucial role. This phenomenon was described vividly in a milestone book by John W. Lewis and Xue Litai on China's nuclear submarine development:

> 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. . . . The doctrines emerged as a response to domestic dilemmas even as the projects proceeded in fits and starts and sometime stopped altogether.[7]

In other words, there had been no integration between defense R&D, production, and deployment of weaponry.

An analysis by U.S. Army Captain Joseph Gallapher has offered a similar conclusion. Gallapher stated that the Commission on Science, Technology, and Industry for National Defense (COSTIND) has not played the expected role of objective mediator between defense contractors and the PLA. He finds that because technical staff was frequently transferred between the COSTIND and defense contractors, one result was that the COSTIND staff frequently sided with defense contractors whenever disputes between the PLA and the defense contractors arose. This left the

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Reorientation," in *Science and Technology in Post-Mao China*, ed. Denis Fred Simon and Merle Goldman (Cambridge, Mass.: Harvard University Press, 1989), 251-86; and Eric Arnett, ed., *Military Capacity and the Risk of War: China, India, Pakistan, and Iran* (Oxford: Oxford University Press, 1997).

[7]John W. Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age* (Stanford, Calif.: Stanford University Press, 1994), 20.

PLA's representative unable to defend the PLA's interest, and the needs of the armed forces were thus often not transmitted into defense contracts.[8] The end result was that defense contractors produced weapons systems that did not fit the PLA's operational needs.

Top Chinese science and technology leaders understood this problem well. Dr. Qian Xuesen, the "Father of China's Atomic Bomb," mentioned this point in 1989, and called for better coordination in the defense manufacturing process. He says "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."[9]

The second problem involves the *organization of the defense industry*. In the first thirty years after the regime was established, China adopted the socialist command economic system. Under this closed and hierarchical system, every economic activity was planned by the state, and all aspects of economic activity—such as finance/capital, materials, product development, and personnel—were centralized in the hands of the state, and all economic resources were allocated uniformly according to the state plan. Enterprises were but an arm of the supervising ministries, charged with carrying out production in line with the ministries' orders, and thus lacking the autonomy enjoyed by Western enterprises under the free economy system.

The defense industrial enterprises also had to operate under this socialist system.[10] Each ministry of defense industry was in charge of the development of one type of weapons system ranging from nuclear weapons, aircraft, shipbuilding, military electronics, conventional ordnance, and space systems. Each ministry had its own staff to cover everything from

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[8]Joseph Gallapher, "China's Military Industrial Complex: Its Approach to the Acquisition of Modern Military Technology," *Asian Survey* 27, no. 9 (September 1987): 991-1002.

[9]Qian Xuesen, "Military Systems Engineering" (China Defense Science and Technology Information Center Paper, Beijing, 1989, no. 2), cited in Frankenstein and Gill, "Current and Future Challenges," 144.

[10]For a Chinese analysis of their own defense industry problems, see You Qianzhi et al., eds., *Zhongguo guofang jingji yunxing fenxi* (An analysis on the operation of China's defense economy) (Beijing: Zhongguo caizheng jingji chubanshe, December 1991), 106.

basic design to production, and each ministry covered the manufacturing of components and spare parts as well as the final assembly of the finished products.

This type of management system created severe drawbacks for China's defense industry.[11] One such shortcoming was the existence of completely independent and self-sufficient systems (both large and small) and a lack of division of labor and horizontal coordination among different sectors. These divisions created tremendous redundant capacity in research and development as well as in production facilities, with such facilities lacking economies of scale.[12] Second, because each enterprise was guaranteed production orders and faced no competition, there was no need for innovation and initiative. This phenomenon hampered the combining of research and production, thus helping to age the conventional weapons systems in the PLA's inventory. The third effect was a heavy burden on the central government because of this overcapacity problem; local governments were also affected, having to provide the necessary logistical support to these defense industrial factories yet being unable to recoup resources in the terms of levying taxes.

The third problem impacting the development of China's defense industry is related to *technological hurdles*. When the regime was established in 1949, China had neither sufficient indigenous technological nor decent production facilities,[13] but instead was forced to rely on foreign technology. China has passed through four phases of military equipment development, moreover, with no phase including indigenous innovation. The four phases are: Soviet assistance leading to the production of Soviet equipment; indigenous development based on Soviet prototypes with substantial local input; purchases of Western technology, leading in some cases

[11]Ibid., 106-9.

[12]For a picture of this overcapacity, see Yitzhak Shichor, "Converting the Military-Aviation Industry to Civilian Use," in *Mixed Motives, Uncertain Outcomes: Defense Conversion in China*, ed. John Frankenstein and Joern Broemmelhoerster (Boulder, Colo.: Lynne Rienner, 1997), 101-33.

[13]For an analysis on the development of China's production facilities in the past four decades, see You Guangrong, *Zhongguo keji guoqing baogao* (Report on China's S&T situation) (Changsha, Hunan Province: Hunan chubanshe, 1998), 144-63.

to unlicensed copying; and licensed production of Soviet-developed equipment following the collapse of the Soviet Union.[14]

Chinese management of civilian science and technology has exacerbated the difficulty of enhancing innovation and diffusing the resulting products of S&T.[15] First, the fragmentation of the Chinese S&T system created by the command economic system into different administrative lines tended to undermine the development of networks that link R&D units with production units. Second, Chinese policies tended to encourage the supply of new knowledge and technological inputs (though these inputs were outdated) yet failed to address the pertinent issues of absence of demand from major industries.

Importing technology has not helped China out of difficulty. Importing technology from abroad can help China immediately increase production capacity. However, China has mainly relied on turn-key types of technology transfers without going through the learning process necessary to really absorb the imported technology. The end result has been that importing technology has not contributed to China's enhancement of S&T.

A reasonable assumption is that the problems in managing civilian S&T also existed in the development of military technology. In his analysis of China's absorptive capability, Baark argues that

> . . . the systems for production, procurement, and external linkages of the military sectors in China . . . are suffering from many of the same defects as civil R&D. These relate to the lack of a concerted and continued learning process, combining foreign and domestic inputs to achieve and maintain technological capabilities in core networks. These weaknesses are exacerbated by the problems of putting domestic R&D results into actual production. Production in China is often segregated from R&D in ways that make the transfer of technological know-how very difficult. . . . The segregation of research from production and from users in domestic and international markets tends to inhibit the accumulation of technology in the units that deliver major systems to the Chinese armed forces.[16]

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[14]Norman Friedman, "Chinese Military Capacity: Industrial and Operational Weaknesses," in Arnett, *Military Capacity and the Risk of War*, 64-65.

[15]Erik Baark, "Military Technology and Absorptive Capacity in China and India: Implications for Modernization," ibid., 84-109.

[16]Ibid., 109.

The 1978-97 Reforms

Chinese leaders well understood the problems in both the defense industry and the whole S&T process, and thus restructuring of this field was part of a two-decade reform program begun in 1978.[17]

There were several elements in this reform program. The first was to give technology a value so that technology could be regarded as a commodity that can be traded on the market. Relevant laws governing patent and intellectual property rights were established to facilitate this change. Individuals were allowed to make and keep profit from their own research.

The second was to conduct "defense conversion." The general principle of the conversion, spelled out as early as 1978 and articulated in Deng Xiaoping's sixteen-character slogan, was to "combine the military and civil, combine peace and war, give priority to military products, and let the civil support the military." However, amid unclear interpretation of the official slogan between spin-off and spin-on, defense industrial enterprises all diversified their production and rushed into manufacturing civilian products or applying military-related technology to civilian products.

The third reform was to adopt the responsibility system. Enterprise and factory managers were empowered to decide what civilian products were to be developed as long as military orders were fulfilled. Even research institutes were urged to find outlets of their own in addition to meeting instructed assignments from above. Along with the responsibility system, there were also reform programs in the sectors of finance, price, labor, and foreign trade.

The main goals of the defense industry reforms were parallel to those of regular state-owned enterprises: to promote industrial integration among enterprises in different industrial sectors and geographical regions. Chinese leaders expected that efficiency and efficacy could be drastically improved and, eventually, linkages between R&D and production as well as between military and civil production could be strengthened. These im-

[17]For a comprehensive analysis of the reform, see Paul H. Folta, *From Swords to Ploughshares? Defense Industry Reform in the PRC* (Boulder, Colo.: Westview Press, 1992), 81-152.

provements would relieve the state from endless budgetary subsidies to the defense industrial enterprises. Ultimately, an integrated defense procurement process could be established.

Defense Industrial Reform Assessment

Contrary to the expectations of Chinese leaders, the defense industrial reform program has not only brought limited effects, but, to some extent, might even have been detrimental to China's long-term goal of strengthening defense S&T capability.

China has made many positive evaluations of the effects of defense reforms. The media has reported that all defense industrial enterprises have developed major civilian products including automobiles, motorcycles, buses, textile machinery, hunting rifles, electric appliances, and other civilian products accounting for over 80 percent of total production capacity. Some enterprises have reportedly found key products—such as motorcycles—which have gained substantial shares of the domestic market. Some enterprises are said to even make a strong profit which is then fed back into supporting the military production line. The shipbuilding industry is one of those able to make profit from the conversion. By diversifying its production line to include the manufacture of commercial cargo liners and by taking advantage of the worldwide division of labor in the shipbuilding business and China's less expensive labor costs, China was able to land many manufacturing orders, thus gaining much needed experience in manufacturing commercial cargo liners.[18]

Perhaps the most realistic way to assess the end result of the reform program is to examine what weapons systems have been developed in the past two decades by China's defense industrial enterprises. Deng Xiaoping's sixteen-character defense conversion slogan indicates that Chinese leaders have anticipated that expertise gained from developing civilian

[18]Evan S. Medeiros, "Revisiting Chinese Defense Conversion: Some Evidence from the PRC's Shipbuilding Industry," *Issues & Studies* 34, no. 5 (May 1998): 79-101.

products would be fed back into the military production line, contributing to basic design, product development, and the manufacturing of weaponry. Given that roughly ten years are usually needed to develop a sophisticated weapons platform and given also that twenty years have passed since China started the reform program, we can now evaluate China's reform program for any accomplishments.

In the past two decades, China has indeed attempted indigenous development of several major weapons platforms. Their efforts have not succeeded for the most part, however, and the PLA has had to rely on imports from Russia. China's jet fighter series is a good case study.[19] Development of the J-10, which is reportedly equivalent to the U.S. F-16, began in the late 1960s as the J-9 program. After numerous technical difficulties, the Chinese asked the Israelis for help with a new design in the early 1980s, and full-scale cooperation was under way by 1984. The J-10 project was fully launched in 1987, with the fighter undergoing its maiden test flight in 1998. No further reports were announced after the first test flight, however, and the J-10 is unlikely to enter production until the middle of the twenty-first century.[20]

The J-8 series has exhibited similar problems. The development of the J-8 lasted from 1964 to 1979, with deployments being made in the early 1980s. China was not satisfied with the aircraft, however, and the modification of the J-8 into the J-8-II was undertaken, adding a new fire control system and a more powerful engine. The first J-8-II prototype flew in June 1984, and design flight testing was completed in October 1987. However, the new modifications still could not meet requirements. Thus, with U.S. approval of the collaboration project with the Grumman Corporation to develop a new fire control system, the "Peace Pearl" Foreign Military Sale program was undertaken. The upgrade program was suspended by the

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[19]For an analysis of the Chinese air force, see Kenneth Allen, Glenn Krumel, and Jonathan Pollack, *China's Air Force Enters the 21st Century* (Santa Monica, Calif.: RAND, 1999); and John W. Lewis and Xue Litai, "China's Search for a Modern Air Force," *International Security* 24, no. 1 (Summer 1999): 64-94.

[20]Kenneth Allen, "PLAAF Modernization: An Assessment," in *Crisis in the Taiwan Strait*, ed. James Lilley and Chuck Downs (Washington, D.C.: National Defense University, 1997), 240.

U.S. government in 1989, however, as a result of the June Fourth suppression. Beijing thus decided to cancel the program in May 1990.[21] Beijing turned to Moscow for improving the fire control unit, however, and the maiden flight of the upgraded version—the J-8-IIM—was made in April 1996.[22]

The FC-1 program also dates to the 1980s. Employing a U.S.-made GE F-404 engine, the FC-1 was originally a joint Pakistan-U.S.-PRC program in the early 1980s. The United States withdrew its participation after the June Fourth suppression, and as a result the program became known as the Super-7 program. Later, the PRC-Pakistan-Russia program (as per present nomenclature) is designed to create a high-performance, low-cost, low-grade fighter to replace the 120 F-7MP fighters currently in service with the Pakistani Air Force. Under the new tripartite collaboration, a new Zhuk pulse Doppler radar and RD93 turbofans will be installed on the fighter. However, reports have indicated that the project might be delayed for an indefinite period.[23]

The above description of China's jet fighter programs demonstrates that in the past two decades after reforms began in the defense industry, China has failed to develop brand new fighters. The J-8-IIM, J-10, and Super-7 all originated in the 1960s. Despite the fact that China continued to improve the capability of these fighters in the 1970s and 1980s, capabilities could still not meet PLA Air Force need. Most astonishing is that no new fighter was developed in the past two decades. That fact alone can explain why China turned to Russia in the early 1990s for technology and arms transfers.

Regarding warships, China commissioned a new missile destroyer in 1999. The 6,000 tonnage missile destroyer—the Luhai class—reportedly has stealth capability and is indigenously designed and produced. However, the warship employs a Ukraine-made gas turbine engine, a German electrical system, Italian torpedoes, and Russian helicopters.

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[21]Allen, Krumel, and Pollack, *China's Air Force*, 150-51.
[22]Allen, "PLAAF Modernization," 242.
[23]Ibid., 241.

The above review points to two mutually complementary facts. First, China has not been able to indigenously develop sophisticated platforms in the past two decades. This is particularly the case in the jet engine, fire control system, and diesel marine engine sectors. Thus one can reasonably argue that reform in the defense industrial sector has not brought about the positive effects desired by Chinese leaders.

Second, without foreign assistance, including the sale of major subsystems such as jet engines and fire control systems, China's attempts at military modernization would have failed even more miserably. This assessment can be backed up with a brief review of China's military imports in the 1990s. In the 1990s, China faced an unprecedentedly favorable environment. The former Soviet Union collapsed, and Russia's nearly bankrupt economy drove Moscow to sell as much weapons system and technology as possible in order to earn direly needed hard currency and to support their crumbling defense industry. Beijing has thus imported a broad array of major weapons systems and technology from Russia, as well as from other foreign sources including Israel:[24]

* **Jet fighters:** The PRC has procured seventy Su-27 and sixty Su-30 fighters from Russia, and is licensed to produce two hundred Su-27 fighters. The first batch of indigenously assembled Su-27s has rolled off of production lines in Shenyang city. There have also been rumors that China will import Russia's fourth generation of jet fighter, the Su-37.[25] The deployment of the Sukhoi series jet fighters will enable the PLA Air Force to develop offensive capability.
* **Transport jets:** China has imported large-sized, Il-76 transporters from the Ukraine for carrying rapid response units for the purposes of conducting riot suppression and low-intensity warfare. Reports

[24]See Bates Gill and Taeho Kim, *China's Arms Acquisitions from Abroad: A Quest for "Superb and Secret Weapons"* (Oxford: Oxford University Press, 1995); Richard Fisher, "Foreign Arms Acquisition and PLA Modernization" (Appendix) (Paper delivered at a PLA Conference sponsored by AEI, in Wye Plantation, Maryland, September 1997). It should be noted that major subsystems, such as the RD-33 engines for the Super-7 jet fighters, GE LM-2500 gas turbine engines for Luhu-class destroyers, and so on, are not included here.

[25]*Zhongguo shibao* (China Times) (Taipei), January 23, 2000, 3.

hold that more Il-76s will be procured from Russia, greatly enhancing the PLA's mobility.

* **Reconnaissance satellites:** China has reportedly imported Synthetic Aperture Radar (SAR) technology from Canada and Russia for monitoring the deployments and movements of other militaries.[26]
* **Destroyers:** China ordered two advanced Sovremenny-class missile destroyers with powerful anti-ship "Sunburn" cruise missiles from Russia. The first destroyer was delivered last December. Reports indicate that China has ordered an additional two of this type of destroyer. China's capability to deny the U.S. naval fleet will be enhanced with the deployment of these missiled destroyers.
* **Submarines:** China procured four Kilo-class submarines from Russia, with reports holding that China may import the technology for indigenous manufacturing.
* **Airborne early warning system:** China has procured the Israeli-made Phalcon airborne early warning system which will be installed on the Russian-made Il-76.
* **Surface-to-air missiles:** Beijing has procured several hundred S-300PMU (SA-10) surface-to-air missiles from Russia, and reportedly has received Patriot missile technology from Israel. The technology from Israel will reportedly be used for the HQ-9 missile. The introduction of these missiles will extend China's air defense range.
* **Air-to-air missiles:** China imported AA-8 and AA-10 missiles from Russia along with the procurement of the Sukhoi series, and has reportedly been granted a license from Israel to produce Python air-to-air missiles.

All these foreign purchases demonstrate that China's defense industry has not benefited from the domestic reform program. China still cannot produce sophisticated, advanced platforms, but must rely on the importation of

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[26]For a comprehensive analysis of China's strategic modernization, see Mark Stokes, *China's Strategic Modernization: Implications for the United States* (Carlisle, Penn.: U.S. Army War College, 1999).

sophisticated weapons systems and technology to meet its growing military modernization demands.

Nevertheless, there is one area in which China has been able to develop a "pocket of excellence" in indigenous production: surface-to-surface missiles. In the past two decades, China has continuously developed several types of surface-to-surface missiles, ranging from the long-range mobile DF-31 to the short-range M-9 (DF-15) and M-11 (DF-11) missiles. Moreover, Beijing has the ability to produce the solid-fueled propellant used by these missiles.

Of all the surface-to-surface missiles, the M-9 and M-11 are the most notorious. The former was used in the July 1995/March 1996 military exercises in the Taiwan Strait. Both were indigenously developed in the 1980s for tactical purposes, and were deployed in the PLA battle order in the early 1990s, particularly after the Gulf War when China began to envision the usage of tactical surface-to-surface missiles in military campaigns. Reports hold that China expects to incorporate Russia's GLONASS global position system into surface-to-surface missiles in order to improve accuracy. The media has also reported that China will eventually deploy 650 M-9 and M-11 missiles in the southeast coast against Taiwan by the year 2005.

Another pocket of excellence is the development of sea-based antiwarship cruise missiles. Based on the French Exocet ship-to-ship missile, China successfully reverse-engineered and then copy-produced C-801 and C-802 ship-to-ship missiles. China reportedly received a turbojet engine from France. These achievements indicate that China has the industrial capability to integrate advanced Western technology and absorb the technology into China's own missile designs.

Another Round of Reform

Not satisfied with the defense industry's accomplishments as a result of the post-1978 reform, China launched another round of reform in the defense industrial sector in the late 1990s. The reform was undertaken in three steps. The first was to create a new general department under the

Central Military Commission (CMC). The second was to set up a new Commission on Science, Technology, and Industry for National Defense (COSTIND) and to separate the government from state (including defense) enterprises. The third was to reconsolidate defense industrial enterprises.

The new general department created under the CMC was the General Armament Department (GAD). Created on April 5, 1998, the GAD was charged with centralizing the army's R&D effort, acquisition/procurement, and test and evaluation functions. The GAD was organized by combining testing and evaluation units and rocket-launching troops of the old COSTIND, as well as the Equipment Department of the General Staff Department.[27]

The second reform had its origin in the Chinese Communist Party's (CCP's) Fifteenth National Congress held in September 1997. The CCP's Fifteenth Congress announced a program of radically restructuring and downsizing the state-owned enterprises, and moving China's economic system toward a socialist market economy. Under this new banner, the market is to play an increasingly important role in appropriating resources, while state enterprises are increasingly being forced to be self-sufficient. The March 1998 National People's Congress ratified this reform program, which has also been applied to the defense industrial enterprises.

Unlike the old COSTIND, which was under the dual leadership of the State Council and the CMC, the new COSTIND is a purely civilian body directly under the State Council. The old COSTIND, created in 1982 by merging the Commission on Science for National Defense and the Science, Technology, and Equipment Department of the CMC, as well as the Office for National Defense Industry of the State Council, was mainly responsible for the entire research, design, development, testing, evaluation, and production process.[28] The old COSTIND also served as a bridge between the

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[27]The Equipment Department under the General Staff Department had jurisdiction over only equipment used by the ground forces while the new GAD has authority for weapons systems management in all the service branches of the PLA.

[28]For a detailed description of the function of the old COSTIND, see *Dangdai Zhongguo de guofang keji shiye* (Contemporary Chinese science and technology for national defense) (Beijing: Dangdai Zhongguo chubanshe, 1992), 133-34.

end consumer—the PLA—and the defense industrial enterprises to make sure that the end consumer's needs were met.[29]

The new COSTIND has been charged with, among others, overseeing military production, supervising the defense industrial enterprises, and taking over the governmental and ministerial responsibilities of those general corporations. One important modification, as will be elaborated on below, was that the new COSTIND was stripped of the authority to directly manage enterprise businesses.

A further reform was undertaken in May 1999. The reform split each of the big five defense industrial systems into ten groups. The big five defense industrial systems were the China National Nuclear Corporation, China State Shipbuilding Corporation, China Ordnance Industry Corporation, China Aerospace Corporation, and Aviation Industries of China.

The new "big ten" companies are: China National Nuclear Group Corporation (Zhongguo hegongye jituan gongsi); China Nuclear Engineering and Construction Group Corporation (Zhongguo hegongye jianshe jituan gongsi); China Shipbuilding Group Corporation (Zhongguo chuanbo gongye jituan gongsi); China Shipbuilding Heavy Industrial Group Corporation (Zhongguo chuanbo zhonggong jituan gongsi); China Ordnance Industrial Group Corporation (Zhongguo bingqi gongye jituan gongsi); China Ordnance Equipment Group Corporation (Zhongguo bingqi zhuangbei jituan gongsi); China Aerospace Science & Technology Group Corporation (Zhongguo hangtian keji jituan gongsi); China Aerospace Machinery & Electronics Group Corporation (Zhongguo hangtian jidian jituan gongsi); and China Aviation Industry Group Corporation I (Zhongguo hangkong gongye diyi jituan gongsi) and China Aviation Industry Group Corporation II (Zhongguo hangkong gongye dier jituan gongsi).

The restructuring was in line with China's state-owned enterprises reform program. Chinese Premier Zhu Rongji explicitly stated that the restructuring would tackle five specific problems, with the goal of being able to produce advanced weapons systems to meet the army's needs. The five problems were to separate government from enterprises; establish com-

[29]For an analysis of this role, see note 8 above.

petition among enterprises; concentrate S&T resources to ensure the success of R&D and the production of weapons systems; help the enterprises address their huge deficits; and promote defense industry-wide restructuring.[30]

Each of the "big five" groups was split into two roughly equivalent groups in terms of capability, with each of the two new groups being able to produce the same weapons system, a division which sought to promote intra-industry competition. Liu Jibin, the head of the new COSTIND, has explicitly stated: "Each general company [of the five] is divided into two roughly equivalent groups in terms of capability. It is expected that through proper competition, the new company's efficiency can be improved, and management mechanisms can be transformed."[31]

In addition, as part of the attempt to separate government from enterprises and in order to further the creation of the socialist market economic system, the Chinese government amended the new COSTIND's function. According Liu Jibin, the new COSTIND will no longer manage enterprises and neither will the enterprises shoulder government functions. Enterprises will have more power to manage their daily operations, and will also be responsible for their own profits and losses. The new COSTIND will, in turn, take up the functions transferred from the big five companies, including industrial planning and management, as well as being responsible for industrial regulations, standards, and oversight.[32]

Another element of the restructuring has been the establishment of enterprise groups (*jituan gongsi*). Based on asset share, each of the big ten companies is to establish a "center and satellite system" so that each enterprise of the big ten corporations has their own specialized product line. In this way, the traditional "administrative hierarchy" management style will be replaced, and efficiency can be improved and redundancy avoided.[33]

It should be noted that defense industrial conversion has not been

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[30]*Ta Kung Pao* (Hong Kong), July 2, 1999, A2.
[31]Ibid., April 30, 1999, A4.
[32]Ibid.; *Wen Wei Po* (Hong Kong), July 1, 1999, A2; and *People's Daily*, July 2, 1999, 1.
[33]See note 31 above.

phased out in this round of reform. In his statement at the ceremony marking the establishment of the big ten companies, Zhu Rongji still urged the defense industrial enterprises to undertake defense conversion, combine military and civilian products, and develop dual-use technology under the precondition that military production goals have to be met.[34]

The third defense industry reform was consolidation. A trial experiment began in the early 1990s. The purpose of this consolidation is to reduce the burden of the central government and narrow the central government's support down to the core defense industrial enterprises. Specifically, there were two (not completely mutually exclusive) types of consolidation. One was the transfer in ownership of some defense industrial enterprises from the general companies of the central level to the local government level. Those companies transferred in their entirety were no longer involved in the production of military products. For instance, between 1986 and 1992, sixty-five enterprises under the China Ordnance Industry Corporation[35] were transferred to local governments.[36] A reasonable inference is that more of those enterprises no longer involved in the production of military products in other defense industrial sectors will be transferred to local governments.

The second and related type of reform was to separate military and civilian production lines via different management measures for each type of production line. These kinds of enterprises still produce both military and civilian products. The Chinese government has stepped up this type of reform in all defense industries since the CCP's Fifteenth Congress of 1997. In line with this type of reform, China has organized enterprise groups

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[34]*People's Daily*, July 2, 1999, 1; *Wen Wei Po*, July 1, 1999, A2.

[35]Among the five defense industries, the ordnance industry was the worst in terms of overcapacity. This is because the Chinese armed forces were traditionally ground-oriented. See Zheng Hong, "The Impact of Structural Reorganization in Defense Industry and Governmental Industrial Support Policies," *Junshi jingji yanjiu* (Research on Military Economy), 1995, no. 5:12. Chinese leaders have thus sought to solve the problems faced by the ordnance industry. See Wang Huilan and Wu Shaohua, "Tactics of Adjusting the Industrial Structure of National Defense Science and Technology on Condition of Disarmament," ibid., 1999, no. 4:35.

[36]Gu Feng and Gu Xianguang, "New Ideas of Systemic Reform of Transferring the Property Rights of National Defense Assets to Civilian Enterprises," ibid., 1999, no. 1:29.

based on the share of capital in the big ten defense industrial corporations.[37]

There are two reasons behind this second type of reform. The first is to scale down military production capacity, effectively phasing out outdated production facilities while keeping core military production capacity, quality personnel, and necessary facilities for military production. Second is to allow the defense industry to diversify into more civilian product fields, to encourage those civilian production lines to form joint venture business with foreign investors, and eventually to help defense industries begin to turn net profits.[38]

Barriers within Evolution[39]

There is no doubt that China's reform program is headed in the right direction. Summing up the reform of the big ten enterprise groups as one example, the Chinese government split each of the old big five defense industrial corporations into two enterprise groups of roughly equivalent capability and incorporated R&D, production, and marketing units into each of the new ten enterprise groups. The purpose is not difficult to understand: to boost competition within each defense industrial sector and to allow for the real integration of R&D, manufacturing, and marketing in each defense industrial sector so as to expose R&D staff to enterprise needs.[40]

New management measures introduced across the entire economic sector during the post-1978 reform era have, however, reinforced historical weaknesses in the defense industries. One new management measure taken during the post-1978 reform era, for instance, was the responsibility

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[37]Wang and Wu, "Tactics of Adjusting the Industrial Structure," 35.

[38]Ibid., 36.

[39]The term "within evolution" is borrowed from Chong-Pin Lin's book, *China's Nuclear Weapons Strategy: Tradition within Evolution* (Lexington, Mass.: Lexington Books, 1988).

[40]China has become aware of the unbalanced R&D personnel structure and how this structure affects the operation of the market economy. A survey shows that about 80 percent of R&D personnel work for state-sponsored research and other higher learning institutes. Being separated from enterprises, they do not have experience in product development to meet enterprises needs. See You, *Zhongguo keji guoqing baogao*, 101-2.

system. The new measure did help lift China's farmers out of poverty in the countryside in a very short period and boost up China's agricultural production. Moreover, many defense industrial enterprises adopted the responsibility system between different levels along the hierarchy. Chinese analysts note that "At present, the responsibility system is the main type for asset operations in defense industries. The system is adopted between the general headquarters and subordinate enterprises, between enterprises and subordinate factories/workshops, and between factories/workshops and production groups."[41]

However, there are some problems with the responsibility system despite the fact that the system can promote production and boost enthusiasm by linking production with profit. The first problem is that these reforms inevitably lead to a focus on short-term gains. Enterprise managers/factory directors take profit as the key link to exhaust production capacity while, at the same time, lowering the value of depreciation. The end result is that production facilities are totally exhausted without normal maintenance, and phony profit is created.

The second problem is that responsibility for profit and loss cannot really be implemented. This is because those under the responsibility system do not have much money for further capital investment. With limited capital resources, short-term profit-seeking is inevitable. Those investors cannot, moreover, afford loss, thus ensuring that the responsibility system cannot really be implemented.[42] This problem also exists in those enterprises adopting the leasing system.[43]

An additional measure was also introduced: the 1994 pilot project to adopt the modern enterprise system. Under this new institutional setup, China allowed the big five to become state-owned independent capital corporations (*guoyou duzi gongsi*). The new corporations, which are authorized by the State Council, can act like investors in its own subordinate

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[41]Xi Zhengzhong, Gao Yuying, and Shi Gaolei, "Asset Operations in Defense Industries," *Junshi jingji yanjiu*, 1997, no. 6:21.

[42]Ibid.

[43]The leasing system is adopted in some enterprises, but fewer in number than those opting for the responsibility system. Ibid., 21-22.

enterprises, and shoulder the responsibility of boosting up the value of state assets. In other words, the new corporations own all their subordinate enterprises' assets and are responsible for all profits and losses.[44]

The new measure has not, however, been beneficial for the defense industries. One of the major reasons for this disappointing outcome is that there were only token changes at the enterprise level. Chinese analysts indicate that although boards of directors, chairmen of the boards, and the managers of the new corporations were created, these new institutions were merely a continuation of the old power structure, lacking any new blood and, consequently, fresh ideas.

There are other problems with this new measure. For one, the division of labor between the chairmen of the board of directors and managers was not clear, resulting in difficulty delineating responsibility and thus lack of accountability. Second, difficulty emerged regarding how to arrange the role of the party and labor union in the enterprises. Related to this problem is how to define the party's role in business administration. The third problem is that members of the board of directors were not diversified enough, leading analysts to propose bringing in people with financial, banking, and technical backgrounds.[45] The fourth is that the old relationships between the state and state-owned enterprises still continue. Because there is no fundamental change in the relations between the state and the *guoyou duzi gongsi*, the state and the general headquarters of the enterprise groups still seek to intervene in business operations.[46] This interference makes the separation between government and enterprises almost impossible.

There are also problems in the ways that China handles the R&D of its defense science and technology.[47] Chinese analysts have acknowledged many of these problems. The first is that the Chinese government pays

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[44]Li Jiamo, "On Establishing Modern Enterprise System in Defense Industries," *Junshi jingji yanjiu*, 1998, no. 5:28.

[45]Ibid., 28-29.

[46]Luo Kaiyuan, "A Study of the Western Joint-Stock Military Enterprises and the Systemic Reform of Our Military Enterprises," ibid., 1999, no. 7:14.

[47]For the defects of China's development of military technology, see Cai Shaoqing, Wang Wenhua, and Lu Tao, "Innovation in Military Technology: Problems and Solutions," ibid., 1997, no. 2:9-13.

more attention to *xin xinghao yanzhi* (model R&D), while the preliminary research (*yuxian yanjiu*, or *yuyan*)[48] of science and technology necessary for *xin xinghao yanzhi* is neglected. They point out that the budget for preliminary basic study is less than 10 percent of total S&T expenditure. Because of this negligence and subsequent lack of feasible theory, it frequently takes longer than expected to undertake model R&D, thereby increasing R&D costs and affecting the commission of new weapons.

China's official incentive mechanisms have also contributed to the above problem. Since the budget is prioritized to those related to model R&D and because staff undertaking new model R&D are easily promoted in rank and salary, new models based on old technology are frequently proposed without fundamental and meaningful technological breakthrough.

Secondly, China prefers technology transferred from abroad. Despite the stated ideal, the imported technology has not been indigenized or absorbed. Even worse is that China prefers turn-key types of technology transfer, with less attention paid to such relevant measures as the training of personnel. Consequently, no innovation based on imported technology can be made.[49]

A third problem is the brain drain and mismanagement of S&T personnel. The Cultural Revolution severely interrupted normal S&T and disrupted the education system for a decade. Moreover, since reforms began in 1978, people have become more interested in businesses that turn a quick profit and are thus less enthusiastic in undertaking defense R&D. These trends have all created a brain drain in the defense S&T field.

China's own research reflects the brain drain problem. According to a survey conducted in 1997, by the year 2000, 42 percent of full and associate professors and over 50 percent of senior engineers, researchers, and agricultural scientists will retire. Of the nation's more than one million senior jobs, 93.7 percent are held by those over forty-five years of age,

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[48]The translation is from Stokes, *China's Strategic Modernization*, 16-17. The preliminary research has two categories: generic technologies applicable to multiple systems, and technology applicable to a specific system. Model R&D is divided into four subphases: general systems design, prototype, flight model, and commission.

[49]Baark's research of China's S&T also indicates this problem. See note 15 above.

and 6.3 percent by those below forty-five (of this 6.3 percent, those below thirty-five years old account for about one-sixth (1.1 percent).[50]

Related to the brain drain difficulty is a management problem regarding human resources in China. According to a 1988 survey, of China's 10 million professional personnel (excluding elementary and middle school teachers), only 14.6 percent think their expertise and talent can be used, while about 34 percent believe their expertise and talent are wasted.[51] This vividly shows that despite having abundant professional human talent, China has not done well in the management of this resource.

The procurement process, moreover, has remained basically unchanged despite the fact that a slightly amended procurement process has been followed since the mid-1980s.[52] For the procurement process of weapons systems, there are mid- and long-term weapons development programs, which are probably proposed by the COSTIND and decided upon by the Central Special Commission, which, in turn, is under the dual leadership of the State Council and the CMC.[53] On the basis of mid- and long-term weapons development programs, the armed services formulate plans for arms procurement. The plans are then sent to the General Staff Department (GSD) for coordination, and guided by the five-year defense budget plan and the annual defense budget, the GSD drafts an annual arms procurement plan. This plan is, in turn, probably decided upon by the CMC. It should be noted that since the 1990s, China has developed a three-year rolling plan for arms procurement, the purpose of which is to link annual procurement plans closer to long-term plans.[54]

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[50]You, *Zhongguo keji guoqing baogao*, 96.

[51]Ibid., 95-96.

[52]China's procurement procedure as outlined below is from Li Gang and Yang Huansen, "Feasibility of the National Military Procurement System," *Junshi jingji yanjiu*, 1998, no. 3:27-28; and Chinese Country Study Group, "China," in *Arms Procurement Decision Making*, vol. 1: *China, India, Israel, Japan, South Korea, and Thailand*, ed. Ravinder Singh (Oxford: Oxford University Press, 1998), 8-47. The difference is the emphasis placed on long-term planning, including five-year defense budget and the three-year rolling plan for arms procurement.

[53]Zhao Keyi, Ding Kemou, and Jiang Zhenduo, "Deng Xiaoping's Thinking on National Defense Industrial Management System Reforms," *Junshi jingji yanjiu*, 1998, no. 4:10.

[54]Chinese Country Study Group, "China," 14, 18.

The COSTIND has its own mission. It is directly responsible for facilitating the overall plan of science and technology for national defense and for coordinating conventional military R&D and space and nuclear programs. After the GSD has designated a weapon for procurement, the COSTIND coordinates required R&D with the research institutes and establishments and the various manufacturing entities. The contract for production orders of weapons/equipment is signed by both the defense industrial enterprises and the procurement units of the armed services at the annual procurement meeting. The contract will be used as the basis for adjusting relevant S&T activity and the production plan. The COSTIND collects all contracts and passes them to the State Planning Commission, and these become state economic and social development programs. The State Planning Commission sends the programs down to various defense industrial departments and the general headquarters of the defense industrial departments instruct appropriate enterprises to implement the programs.

Even the amended process has not fundamentally changed the irrational one executed before the reform period:

> The R&D of new equipment is separated from production and procurement. A survey made by the China Ordnance Industry Corporation indicates that the percentage of model R&D that is successfully developed but not actually procured is very high, and this reduces the efficacy of defense investment. Some have also shown that most of model R&D money is not used for R&D, and portion of infrastructure investment money was used for paying tax and fee levied.[55]

Chinese analysts have other complaints. They point out that the budget for weapons/equipment may be changed in the second year, and this change may lead to change in the procurement plan, resulting in a vicious, never-ending R&D-to-production cycle. Thus, analysts have requested a comprehensive overhaul of the procurement process.[56]

In addition to the irrational process mentioned above, the contract and related competition bidding system have not been effectively imple-

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[55]Li and Yang, "Feasibility of the National Military Procurement System," 27.
[56]Ibid., 28.

mented despite the fact that China started to adopt this system roughly beginning in the mid-1980s. Chinese analysts have pointed out this cycle quite vividly:

> Although we adopted contract and bidding systems in recent years for military technology innovation, the process has not gone well. In practice, many of the projects were directly assigned from the top, the budget was appropriated unilaterally, there is no reward for successful accomplishment, and there is no competition.[57]

Another problem lies in outdated production equipment. Despite being unable to produce high-precision weapons systems, many of China's defense factories still use outdated facilities for manufacturing weapons. One analysis demonstrates this problem:

> Facilities at some defense factories are of the 1950s vintage, and even some are of the early Republican period (1920s-1930s) or early Showa era of Japanese colonialization. How can we produce advanced weapons systems with these facilities? We conducted a survey several years ago and found that military demand has substantially declined, and development of civilian products has encountered serious difficulties. We have lost our edge; we do not have capital for investment; we have a brain drain problem, while new blood cannot be kept. I think that there must be new investment for defense industries.[58]

Conclusion

There is no doubt that China's defense industrial sectors have made progress in the past five decades. Some new weapons systems have been adopted by the military. China's recent deployment of a new Luhai-class missile destroyer—which is said to have stealth capability—is testimony of this achievement. Moreover, the accomplishments are most visible in the missile sector: China already has a missile family covering all surface-to-surface, ship-to-ship, air-to-air, ground-to-air, and ship-to-air categories.

These achievements also indicate that China has some capability to

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[57]Cai, Wang, and Lu, "Innovation in Military Technology," 10.

[58]Liu Yichang, "Lifting Defense Scientific and Technological Industries out of Their Predicament," *Junshi jingji yanjiu*, 1998, no. 1:9. For a related survey on other state-owned enterprises, see You, *Zhongguo keji guoqing baogao*, 144-63.

integrate imported systems with domestically designed systems or to reverse-engineer. The Luhai-class destroyer employs Ukraine-made gas turbine propellant and other Western-made subsystems, while some China-made missiles are actually a product of reverse engineering. An example of the latter is the PL-9, which is a copy of the Israeli Python missile.

Nevertheless, these achievements also reflect defects in China's defense industrial capability. China cannot indigenously produce major subsystems for sophisticated platforms but rather must rely upon importation. As a few examples, China was forced to rely on the Grumman Corporation to design and produce avionics system for its J-8-II jet fighter in the mid-1980s; the imported Spey engine from Great Britain for its J-7 fighter; and on France to produce Z-9 helicopters.

The capability to produce surface-to-surface missiles is not as difficult to attain as the ability to produce more sophisticated subsystems. Many countries in the world already have the capability to produce surface-to-surface missiles. One country, North Korea, has a Taepoo Dong missile that has the potential to achieve intercontinental range. Even Taiwan—if not for U.S. pressure—could produce surface-to-surface missiles boasting a range of 1,000 kilometers.

Beijing is taking advantage of the predicament in Russia's defense industrial sectors since the fall of the Soviet Union to boost up domestic capabilities. In addition to directly procuring hardware systems from Russia, China is also undertaking technology transfers to indigenize the production of those weapons. China has also reportedly transferred many Russian weapons specialists, whose expertise ranges from nuclear to various conventional weapons. China's military capability will indeed benefit from these technology transfers and importation of Russian weapons specialists. With these new additions, China can produce advanced weapons systems that, if and when deployed by the Chinese military, will affect the military balance in the East Asian region. Neighboring countries will then face the difficulty of choosing between the United States and China.

However, China's real and sustained military capability still hinges on its ability to indigenize technology transferred from abroad; China cannot rely on limited "pocket of excellence" alone. The above analysis has indicated that the overall environment for China to develop the indigenous

technological capability necessary for sustained competition with the United States is not yet ripe. A lack of a rational procurement process, shortage and mismanagement of competent manpower, insufficient funding for defense R&D, outdated R&D and production facilities, and preference for turn-key types of technology transfer rather than indigenous effort all help to impede China's efforts to systematically upgrade the PLA.

In sum, China can make some progress in military modernization in the short period through technology and arms transfers from Russia and other sources. Such transfers may change the existing military balance in China's favor and create realignment among China's neighboring countries in East Asia. Figuring out when China will be able to move beyond this level to become a serious challenge to the United States is a much more difficult undertaking.