

THE REFORM OF CHINA'S DEFENCE ECONOMY

ABOUT

The Chinese have long been obsessed with strategic culture, power balances and geopolitical shifts. Academic institutions, think tanks, journals and web-based debate are growing in number and quality and give China's foreign policy breadth and depth.

China Analysis, which is published in both French and English, introduces European audiences to these debates inside China's expert and think-tank world and helps the European policy community understand how China's leadership thinks about domestic and foreign policy issues. While freedom of expression and information remain restricted in China's media, these published sources and debates provide an important way of understanding emerging trends within China.

Each issue of China Analysis focuses on a specific theme and draws mainly on Chinese mainland sources. However, it also monitors content in Chinese-language publications from Hong Kong and Taiwan, which occasionally include news and analysis that is not published in the mainland and reflects the diversity of Chinese thinking.

The French version of China Analysis can be accessed online at www.centreasia.eu.

Introduction by François Godement

China's defence budget, which stands at \$115 billion and growing, is more often considered in relation to acquiring new hardware than for the opportunity it offers for process modernisation and improving operational capacity. The People's Liberation Army (PLA) is racing to develop command, control, communication, computerisation, information, surveillance and recognition (C⁴ISR) capacities and improve its logistical chain. And China's mobilisation model allows the country's defence industries and procurement bodies to interact with the civilian sector. This issue of *China Analysis* shows that the country's defence experts and policy makers are now addressing systemic reform and modernisation issues, and are talking about breaking down barriers to cooperation with civilian industry and market-driven management.

Historically, the defence sector's interaction with civilian industries has been a function of political developments. Since the Cultural Revolution, the PLA has acquired civilian industries, which it has helped to protect in stormy times, and which have become a source of profits for the military. Beginning in the 1980s, streamlining the arms industry entailed converting some military firms to civilian production, spinning off mostly second-grade sectors and technologies. Dual sector development has also provided an indirect way to acquire foreign technologies, which could eventually be transferred to weapons production.

The sources in this issue of *China Analysis* go much further, suggesting a degree of management reform and civilian-military integration that can only be compared with the West's most sophisticated defence sectors. The ownership of defence firms is itself questioned, with a view to instating private equity financing and competitive R&D management. Spin-off, the transfer of military technology to the civilian sector, should be matched by spin-on, the integration of civilian technologies into defence. But the culture of ignoring intellectual property issues inside the defence sector is an obstacle to integration. And the need for secrecy clashes with market requirements for financial transparency. The sources suggest restructuring defence industries to separate those that should be tightly controlled from those that would benefit from more open financing and management.

China's entire industrial sector has always been, from its socialist origins, a collection of vertical silos that do not allow for systems integration and competitive management. This is even more true of the defence industries, and the sources point out that the barriers between industry sectors will need to be broken down to fulfil the need for informatised defence – a full C⁴ISR capacity enabling real-time data mining to provide relevant information on the battlefield. The need for change applies to the PLA's branches as well: a computerised battlefield requires horizontal integration of land, air, sea, and space forces in order to promptly acquire and exploit information.

The implications from these reports are obvious. In spite of quantitative progress, China's defence industries and military are still a far cry from their role models in the West. The sources give little attention to asymmetric defence, often seen as a way to compensate for backwardness. But there is no doubt that defence experts – perhaps in contrast to some of the sector's main stakeholders – see a need for major structural reforms to bridge the gap with international best practices. In the future, China's expanding defence budget will be invested in ensuring quality as well as quantity.

1. Breaking down the defence industry bunker

Emmanuel Puig

Sources:

An Puzhong and Wang Wowen, “Addressing the issue of the implementation of education at the centre of our research work. The quality of personnel training and the defence capability of indigenous innovation must be improved”, *Jiefangjun bao – People’s Liberation Army Daily*, 13 October 2012¹.

Liu Tao and Guo Shizhen, “Study of technology innovation system construction for weapons equipment”, *Zhuangbei xueyuan xuebao – Journal of the Academy of Equipment*, Vol. 24, No. 1, February 2013².

Ping Yang, “Research into a method of defence science, technology, and industry open innovation, from the perspective of Civil-Military Integration”, *Keji jinbu yu duice – Science and Technology Progress and Policy*, Vol. 30, No. 2, January 2013³.

Xu Yanhua, “The course and strategy of our country’s science and technology innovation from the view of globalisation”, *Keji guanli yanjiu – Science and Technology Management Research*, No. 10, 2012⁴.

Zhang Fuyuan, Li Yuqiu, and Liu Zhanling, “Strategic considerations about independent innovation within our country’s national defence science and technology”, *Zhongguo junshi kexue – China Military Science*, Vol. 30, No. 3, 2009⁵.

In October 2012, General Guo Boxiong stepped down as vice-chairman of the Central Military Commission and gave up his membership of the Politburo of the Communist Party of China. A few weeks before his retirement, Guo visited the National University of Defence Technology (NUDT) at Changsha, one of China’s most important centres of research and development in defence science and technology. An Puzhong and Wang Wowen write that Guo’s visit provided the perfect backdrop for his pre-retirement assessment of China’s strengths and weaknesses in defence research and innovation.

¹ An Puzhong and Wang Wowen are journalists at *Jiefangjun bao*.

² Guo Shizhen is a professor in the Department of Equipment and Command at the Academy of Equipment. Guo, a major-general, is chief advisor at the military equipment theory research centre of the Academy of Equipment. He is also an expert for the China Military Equipment Maintenance Unit, where he is the deputy chief of the working group on Civil-Military integration reform. Liu Tao is one of Guo’s PhD students, specialising in equipment management and development.

³ Ping Yang is a researcher at the Institute of Finance and Economics Research at the Shanghai University of Finance and Economics. He is also a senior engineer at the Naval Equipment Research Academy, specialising in the theory and practice of military standardisation, normative economics, and defence economics.

⁴ Xu Yanhua is a lecturer and researcher at the Shandong University of Finance and Economics. He specialises in technological policy and technological management.

⁵ Zhang Fuyuan, Li Yuqiu, and Liu Zhanling are engineers at the Ordnance Technological Research Institute at the General Armament Department.

Guo restated that it was important that the army upholds the ideological and political basis of the Party’s rule (思想政治建设是我军的根本性建设, *sixiang zhengzhi jianshi shi wojunde genben xing jianshi*). He said that the 18th Party Congress, which was held two weeks after his visit, would likely bring with it a new spirit (十八大精神, *shibada jinshen*), which should trigger a new phase in ideological and political education. Guo said that this new momentum should encourage military research academies to stick to their key purpose: training new generations of scientists and engineers who can rejuvenate the country’s research and development (R&D) capacity and foster “indigenous innovation” (自主创新, *zizhu chuangxin*). The general said that the talented students, experts, and scholars at China’s defence universities should form the backbone of the country’s military modernisation.

China needs to keep up with other countries’ defence achievements. But to improve the operational capabilities of the People’s Liberation Army (PLA), it also has to focus on domestic innovation. Guo thinks the evolution of defence R&D must be founded on this sort of home-grown thinking: as he put it, “Innovation is the soul of the nation’s development and progress” (创新是一个国家, 一个民族发展进步的灵魂, *chuangxin shi yige guojia, yige minzu fazhan jinbude linghun*).

Zhang Fuyuan, Li Yuqiu, and Liu Zhanling agree that indigenous innovation is crucial to the development of national defence science and technology. The recent evolution of China’s military capabilities seems to prove them correct. A huge number of new programmes and a wide range of new equipment have been developed and operationalised over the last 15 years. But for various reasons, largely involving inherited structures, China does not have a robust system of innovation that could give it a competitive advantage in defence technology.

China’s weak defence innovation system

In the February 2013 issue of the PLA General Armament Department’s *Journal of the Academy of Equipment*, Liu Tao and Guo Shizhen assess the weaknesses of the existing technological innovation system in arms production. They see four major shortcomings in the system. They say that the system governing requirements in weapons procurement is defective (需求牵引机制存在缺陷, *xuqiu qianyin jizhi cunzai quexian*). Operational requirements are poorly defined, broad, and unclear, and do not provide effective guidance for the development of new technologies. And there is not enough contact between the people in charge of operationalising the weapons and the people involved in their development. Next, integration capacity is weak (集成整合能力较弱, *jicheng zhenghe nengli jiao ruo*). Not enough information sharing takes place between civilian and military enterprises. Third, the industrial infrastructure for innovation is weak (原始创新能力及工业关键基础环节薄弱, *yuanshi chuangxin nengli ji gongye guanjian jichu huanjie*

boruo). Industries are reluctant to invest in basic research, and basic research is too disconnected from the industrial sector. China's defence innovation system lags behind that of most advanced countries because of the absence of incentives for communication and cooperation between civilian and defence industries. China has good military design and production capacities, but its inability to pursue dynamic indigenous innovation is a severe limitation. Finally, both incentives for innovation and constraint mechanisms are inadequate (创新的激励与约束机制不完善, *chuangxinde jili yu yueshu jizhi bu wanshan*). Liu and Guo say that even though a market economy has been instated in China, the defence research sector remains sheltered from market pressures. Without any real constraints, there is no competition and no incentive for innovation. Ping Yang also suggests that greater integration of the defence R&D system into the civilian market could foster research and innovation, as well as injecting new ideas into the defence sector. The authors agree that China's defence R&D system

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The need for openness

The defence industries in China are usually thought of as closed, bureaucratic, and secretive institutions. Ping Yang points out that flexibility, responsiveness, and smart management are crucial to industrial success under market conditions. So, to improve its capacity for research and innovation, the defence industry should shift from "closed innovation" (封闭式创新, *fengbi shi chuangxin*) to "open innovation" (开放式创新, *kaifang shi chuangxin*). To help achieve this new way of doing things, defence industries and military research institutions should be able to expand beyond their traditional boundaries and make use of external resources to overcome their limits. Zhang, Li, and Liu add that the complexity of modern weapon systems necessitates "cross-sector cooperation and multidisciplinary approaches" (多学科、多专业的交叉融合, *duoxueke, duozhuanyede jiaocha ronghe*).

Ping calls for "a strategic alliance" (策略联盟, *celiuelianmeng*) between defence and civilian industries. In developing large weaponry systems, the defence industry should be able to make use of external competencies at every stage of development. Linkages between the sectors throughout the R&D process, and even during the production phase, could enable defence contractors to externalise some of

their activities and to cooperate on demand with civilian entities. This would require the formalisation of new management rules for non-confidential defence-related technology. For example, technology transfer to civilian subcontractors should be authorised. The introduction of defence technology into the civilian market could bring improved technologies to market, and, in some cases, trigger innovation. But Ping sees a major problem here: in the defence sector, intellectual property management is unreliable. The risk of losing intellectual property to the state-owned defence industry could prevent civilian entrepreneurs from entering the defence market. Zhang, Li, and Liu add that the difficulty of high-technology weapon development is made worse by the absence of appropriate policies and operational mechanisms (技术政策和运行机制, *jishu zhengce he yunxing jizhi*) that could ease industrial processes such as transformation and application.

Ping, Liu, and Guo think greater openness in the defence sector is needed. But structural constraints such as bureaucratic tradition, isolation, and self-reliance are difficult to overcome. Liu and Guo say that the state has an important part to play in breaking down the silos in its defence industry. All the authors agree that this is a crucial step to foster innovation. But they also agree that innovation requires competition – and competition can only come from the market.

Competition: the key to improving innovation?

Liu and Guo say the current weapon development and procurement system in China is outdated. They believe that if competition mechanisms were introduced, it could help to foster innovation in the technological process of weapon development. Ping thinks that the defence procurement system needs to be made more open and competitive. Outsourcing is an essential part of the marketisation process. Ping says civilian subcontractors should be integrated within the defence industry architecture, even if they are not allowed to pursue research on core technologies. They could supply extra technological expertise, introduce new ideas, and enhance innovative thinking. Liu and Guo think that to achieve this, "civil-military integration" (军民结合, *junmin jiehe*) must be deepened, which means encouraging the "localisation of military capacity within the civilian sphere" (寓军于民, *yujun yumin*)⁶. Combined civil-military management should be implemented in many equipment and technology projects.

Ping thinks introducing competition mechanisms to the weapon procurement system would enhance the potential for innovation and help to reduce costs. Rather than the state-owned defence industry bearing the cost of the entire R&D process alone, outsourcing, market competition, and subcontracting could substantially reduce investment and increase cost effectiveness. Liu and Guo say that the nature

⁶ On this topic, see the article by Brian Lafferty in this issue of *China Analysis*.

of weapon production means the scope of competition and subcontracting should be narrow, and the state should play a central role in regulating the process. Ping says, however, that competition must be implemented, since “the more versatile the mechanism, the stronger the links and the greater the profits” (技术的通用性越强, 关联性越好, 收益就越大, *jishude tongyongxin yue qiang, guanlianxing yue hao, shouyi jiu yue da*). To prove the feasibility of such a system, Ping points to recent progress in the United Kingdom and the United States, where civil-military integrated institutions have been created to bridge the gap between civilian and defence industries, such as, for example, the US National Center for Manufacturing Sciences (NCMS). Xu Yanhua says that China is still developing the conditions necessary to achieve a global innovation capability. But in order to do so, the defence sector must adapt to the “Socialist Market Economy” (社会主义市场经济, *shehui zhuyi shichang jingji*).

Liu and Guo say that the foundations for evolution have already been laid, in theory. But political will and management capacities are both still missing. Liu and Guo’s article was written four years after Zhang, Li, and Liu’s piece, but their diagnosis and their conclusions remain largely the same. The decompartmentalisation and the marketisation of the defence economy is a long-term process that may well be delayed for a few more years. This means that the innovation capacity of China’s defence industry may not increase dramatically in the years to come.

2. The financing of Chinese defence companies

Agatha Kratz

Sources:

Luo Yan, “A brief analysis of the main problems in listing defence enterprises”, *Dangdai jingji – Contemporary Economics*, March 2013⁷.

Yao Guangning, “Research into the financing of modern state-owned military-civilian companies”, *Jungong wenhua – Military Culture*, No. 8, 2011⁸.

Ma Rui and Fu Jianshe, “Evidential research on the ease of accessing debt financing for listed defence companies”, Tianjin Business School, *Heilongjiang External Trade Review*, No. 6, 2012⁹.

Fan Zhaozhen and Jiang Zhaohong, “The historical transformation of China’s defence investment and finance system”, *Junshi jingji yanjiu – Military Economic Research*, November 2008¹⁰.

Hou Yunliang and Lu Yue, “Several opinions on how defence enterprises could expand financing channels”, *Junshi jingji yanjiu – Military Economic Research*, March 2010¹¹.

Yang Shaoxian and Wang Suxiu, “Research into China’s listed defence enterprises”, *Keji he chanye – Science Technology and Industry*, January 2013¹².

Two trends have influenced the financing of Chinese defence companies over the past 30 years, and especially over the past decade: the reorientation of defence companies towards military-civilian activities and products (军转民, *junzhuannmin*), and the promotion of “non-traditional” means of financing, involving a shift from debt to equity financing (债转股, *zhaizhuangu*). The government has encouraged both developments. According to Yang Shaoxian and Wang Suxiu, the scale of civilian products being produced has expanded rapidly: today, they represent over 70 percent of the total output of defence enterprises. So, defence companies have found themselves in urgent need of significant funds to support technological

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⁹ Ma Rui is a researcher at Tianjin University of Commerce. Fu Jianshe is vice-dean and professor of Accounting at Tianjin University of Commerce. He specialises in theory and practice of financial management, financing, and investment; cost accounting and management; and intangible assets.

¹⁰ Fan Zhaozhen is a lecturer at the Institute of Defence Economics and Management at the Central University of Finance and Economics, Beijing. Jiang Zhaohong is a lieutenant colonel and chief of the finance section of PLA unit 73821.

¹¹ Hou Yunliang is a postgraduate student at the China Aerospace Engineering Consulting Centre. Lu Yue is a researcher and consultant at the China Aerospace Engineering Consulting Centre.

¹² Yang Shaoxian is a postgraduate student at the School of Management and Economics at Beijing Institute of Technology, specialising in securitisation of assets, civil-military fusion, and innovation. Wang Suxiu is a postgraduate student at School of Management and Economics at the Beijing Institute of Technology, researching organisational management.

innovation, R&D, production, and management. And the government also wants to reduce their reliance on public and bank funding. As a result, many Chinese defence companies have listed on the market.

China's defence industry financing before 2007

Fan Zhaozhen and Jiang Zhaohong say that until 1979, China's national defence industry had a well-established investment system. The defence industry development fund (国防工业发展基金, *guofang gongye fazhan jijin*) oversaw state investment in the defence sector and channelled public funds through direct investment, loans, and bank and financial discounts. The money came from tax revenues. It was used to finance a series of large-scale industrial projects, as well as the associated administrative expenses. Funded only by the government, defence industries were directly accountable to the government and had no independence in decision-making. So, according to Fan and Jiang, the companies did not operate efficiently until the early 1980s¹³.

The situation changed dramatically in 1979, when, as part of reform based on the principle of decentralisation of power (放权让利, *fangquanrangli*), state-owned banks became the main funding source for defence companies. But defence companies were also allowed to use a variety of financing tools, from government subsidies to bank loans, non-public investments, self-financing mechanisms, and even equity and bonds. Fan and Jiang say that this change created the right conditions for the marketisation of defence enterprises.

Another factor that shook up the industry in the early 1980s was the launch of the "military to civil" strategy (军转民, *junzhuanmin*, also called the "defence conversion" strategy, or 军参民), aimed at developing the dual-use segment of China's defence industry. These two reforms led to a major surge in defence industry profits. Fan and Jiang say that the reforms brought about a 60 percent increase in sales of military products on the technology market¹⁴.

The 2007 reform: defence enterprises enter the market

Fan and Jiang say that China's 1997 state-owned enterprise (SOE) reform further transformed the financing of defence companies. Defence SOEs underwent a deep restructuring of their shareholding. The government launched a series of reforms, among them the debt-equity swap (债转股, *zhaizhuangu*) strategy, which paved the way for the diversification of defence companies' shareholding

¹³ In fact, they remained inefficient even longer, probably until the 1990s. See Tai Ming Cheung, *China's Entrepreneurial Army* (Oxford: Oxford University Press, 2001).

¹⁴ Some authors have been less positive in assessing the success of the defence industry over this period. See David Shambaugh, *Modernising China's Military: Progress, Problems and Prospects* (Berkeley: University of California Press, 2002), and Tai Ming Cheung, *China's Entrepreneurial Army* (Oxford: Oxford University Press, 2001).

structures.

The 1997 reforms created the conditions for the large wave of public listings in the late 2000s, but the immediate cause of the listings was the reform programme carried out in 2007. In that year, the working committee on national defence and technology, the development and reform committee, and the State-owned Assets Supervision and Administration Commission of the State Council (SASAC), with the agreement of the State Council, jointly published the "Interim measures for the implementation of shareholding reform in military industrial enterprises" (军工企业股份制改造实施暂行办法, *jungong qiye gufenzhi gaizao shishi zanxing banfa*). These regulations stated that, with the exception of fully state-owned companies, defence companies could seek financing on financial markets. Fan and Jiang say that this opportunity was eagerly taken up by defence companies¹⁵. As early as 2007, 18 defence companies had applied for private placement, and ten were filing for public listing¹⁶.

The reforms begun in 2007 were continued in 2011, when the Central Military Commission (CMC) published its report, "Observations on the establishment and improvement of combined military-civilian weaponry research and production systems" (关于建立和完善军民结合寓军于民武器装备科研生产体系的若干意见, *guanyu jianli he wanshan junmin jiehe yujun yumin wuqi zhuangbei keyan shengchan tixi de ruogan yijian*). This report said that, within three to five years, all properly functioning defence companies and military institutes with high-quality assets and stable revenues should embrace market-oriented reforms.

Issues in going to market

The reforms carried out since 2007 have opened up a route to marketisation for China's defence companies. They should have funded growth by adopting a diverse array of financing mechanisms. But this aim has not been fully achieved. Yang Shaoxian and Wang Suxiu say that by the end of 2012, 63 defence companies had listed on the market, among them ten defence corporations. However, most of these companies had an average securitisation of just 20 percent, with some listing as little as 10 percent of their holdings. By contrast, in other countries, the average rate is 70 percent to 80 percent. Moreover, the volume of assets listed has been very limited: out of the 63 listed companies, only about a quarter had assets totalling more than 5 billion

¹⁵ Although the authors say that this reform was successful, all of the core defence companies have remained fully state-owned. The only companies that filed for public listing and were eventually listed on the market were subsidiaries of those core defence corporations, and were not central to China's defence technology industry.

¹⁶ Private placement involves the sale of securities to a relatively small number of select investors as a way of raising capital. Investors involved in private placements are usually large banks, mutual funds, insurance companies, and pension funds. Private placement is the opposite of a public issue, in which securities are made available for sale on the open market.

yuan, and 20 percent had assets amounting to less than 1 billion yuan. And even though smaller markets such as the SME Board (中小板, *zhongxiaoban*), the Growth Enterprise Market (创业板, *chuangyeban*), and the New Third Board (新三板, *xinsanban*) would seem better options for young defence companies, most of the companies chose to list on the main Shanghai and Shenzhen stock exchanges.

Hou Yunliang, Lu Yue, Ma Rui, and Fu Jianshe point out that in spite of the regulatory changes in the 2000s, most defence companies still use traditional financing channels, i.e. loans from state-supported banks. Hong and Lu say that this is partly because of the problems defence companies faced when they tried to raise money on financial markets in the late 2000s and early 2010s. The authors cite Changcheng Securities' Research Centre's (长城证券研究所) "Report on China's Military Assets", which shows that between 2006 and 2008, 15 newly listed defence enterprises sought to refinance on the stock market, seeking a total amount of

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22.59 billion yuan. But they failed to raise that number, missing their target by around 15 billion yuan. Hong and Lu blame the incomplete marketisation of

China's financial sector for this disappointing result, along with the underdevelopment of China's financial markets. Many defence companies reported that they found indirect financing tools more costly than traditional financing means, which weighed on their returns and made them less likely to turn to the market for financing.

Luo Yan says that the nature of defence companies increased their problems in going to market. Ma Rui and Fu Jianshe discuss the special status of defence companies: although the government is pushing for their marketisation, the companies are closely linked to national security. So, it is hard to implement the usual information disclosure requirements for companies who want to issue shares on the market. Thus, according to Ma and Fu, a major conflict of interest exists between the requirements of state security and the needs of investors. So far, regulators have ruled in favour of state security, requiring defence companies to disclose simple, vague, and scanty information, which is often not released in a timely fashion, potentially decreasing the companies' attractiveness to investors. This is another reason why most defence companies still rely heavily on debt, rather than equity, to finance their operations and growth.

The quality of the defence companies has also affected their ability to raise funds. Luo says that most of the defence companies that had listed on the stock exchange by 2010 focused on civilian-use products. Fewer than ten of them specialised in military-use products. Most of the companies

producing civilian-use products were not very profitable, and had a limited range of products with only small-scale production capacity. Their assets were low in quality and they were not very competitive.

Another issue in attracting investors is the fact that reforms have not sufficiently opened the shareholding structure. At the moment, 30.61 percent of the shareholders of defence companies have full voting rights, while 59.81 percent have restricted voting rights. Most shares are held by state-owned legal entities, while other shareholders are smaller and less unified, and usually do not hold significant shareholders' rights.

So, defence companies are still turning first and foremost to bank loans to finance their activities. In their research paper on the financing channels for state-owned defence SMEs, Ma Rui and Fu Jianshe found that most companies they studied used bank financing as their main financing channel. Ease of access to bank loans was directly linked to the relationships (关系, *guanxi*) the companies or their CEOs could leverage within banking or government. Ma and Fu say that the overreliance of defence companies on bank financing contributes to increasing overall banking risk. They believe the government needs to increase its efforts to help the companies diversify their financing channels.

Recommendations for reform

Fan Zhaozhen and Jiang Zhaohong suggest reclassifying defence companies according to their importance to national security. The companies should then be split into four ownership categories: full state ownership, partial state ownership with complete state control of decision-making, relative state control, and simple state participation. They also suggest simplifying and decentralising the process for approving investments. The government should have responsibility only for creating a favourable environment for financing and investment in defence companies. Because of the sensitive nature of defence companies, different forms of investment corresponding to the different categories of ownership should be allowed: direct investment, capital injection, and investment grants (直接投资, 资本金注入, 投资补助, *zhijie touzi, ziben jin zhuru, touzi buzhu*). Venture capital investment, foreign capital, and non-public investment should be allowed in some non-sensitive cases.

Fan and Jiang offer another possible option: the creation of "defence conversion non-banking financial institutions" (军转民的非银行金融机构, *junzhuamin de fei yinhang jinrong jigou*), or "defence conversion services within state-owned banks" (在国家政策性银行设立军转民融合业务, *zai guojia zhengce xing yinhang sheli junzhuamin ronghe yewu*). These bodies could set up "defence conversion special funds" (军转民专项开发基金, *junzhuamin zhuanxiang kaifa jijin*).

Fan and Jiang's final recommendation is to tighten links

between defence companies and the private sector and academia. Managers of defence companies need to be trained in market-oriented managerial and operational skills. Cooperation with universities should be improved, so that any increases in university budgets can benefit technological research within defence companies.

Yang Shaoxian and Wang Suxiu say that the government should improve legislation and regulations. It needs to abide by the Secrecy Law (保密法, *baomifa*), the Securities Law (证券法, *zhengquanfa*), and the Company Law (公司法, *gongsifa*), in order to prevent the loss of state assets. The government should follow the example of the United States, where it is obligatory to obtain approval before listing companies. The state should also strengthen its monitoring and guidance functions. In this way, it could be a minority shareholder, but it would still have a say in the companies.

Hou Yunliang and Lu Yue recommend allowing enterprise bonds and mid- or short-term bills to be issued. This could help bring down the cost of financing. The writers advise following the example of the Aviation Industry Corporation of China (AVIC), which issued a 5 billion yuan short-term financing bill in July 2008, with an interest rate 2 percent lower than bank interest rates. The authors say that this kind of short-term financing tool is widely used among international defence companies and offers an excellent way to reduce financing costs. In April 2008, China National Nuclear Corporation issued a mid-term financing bill, providing another precedent for the use of this kind of tool.

Hou and Lu want to see more mergers and acquisitions (并购, *binggou*, M&A) in the sector, to allow for the reallocation of defence companies' internal and external resources. They say that the assets of China's defence companies are too dispersed and their R&D resources are scattered. They develop redundant projects and their industrial chain is too long. This makes them inefficient and means that they cannot take advantage of economies of scale. Mergers and reorganisation of the industry over the next decade could help to alleviate these problems. To encourage this kind of consolidation, the government should support the development of a vibrant domestic private equity industry. Internationally, private equity funds have experience of dealing with high-tech, high-investment, and high-risk industries such as the defence sector.

The defence industry has had little success in modernising its financing channels. The authors say that this represents a major issue for the industry, particularly because debt financing creates serious financial risk for Chinese defence companies. Diversifying financing methods is a priority for the government, but unfortunately, the process often comes into conflict with the particularities of defence companies compared to other state-owned companies, in terms of, for example, intellectual property and national security. For

this reason, the government may find it very difficult to push for increased reforms in the sector.

3. PLA 2.0: informatising the army

Emmanuel Puig

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Liu Congxin and Zhu Guoqing, “The impacts of space armed forces on regional war in the Information Age”, *Guofang keji – National Defence Science and Technology*, Vol. 33, No. 1, 2012²⁰.

Shi Zongpeng, Sun Tiecheng, and Wang Zhanyong, “On the characteristics and production pattern of military battle effectiveness in the Information Age”, *Haijun gongcheng daxue xuebao – Journal of Naval University of Engineering*, Vol. 9, No. 1, 2012²¹.

Xu Xinzhaoh, Wang Sifu, Xu Jun, and Xie Nan, “Using the international environment in the important question of information superiority strategy innovation”, *Guofang keji – National Defence Science and Technology*, Vol. 33, No. 6, 2012²².

Along with civil-military integration (军民融合, *junmin ronghe*) and indigenous innovation (自主创新, *zizhi chuangxin*), informatisation (信息化, *xinxihua*) is a central focus of China’s military modernisation. In the 2006 White Paper on China’s National Defence, China’s leadership said that military modernisation was intended to ensure that the

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¹⁹ All these researchers are affiliated with the Air Defence and Anti-Missile College of the PLA Air Force Engineering University. Li Bingbing is a Masters student, Zhou Chuangming is associate professor, Guo Xinpeng is a lecturer, and Li Quanquan is a Masters student.

²⁰ Liu Congxin is a PLA captain and teaching assistant at the Aviation University of PLA Air Force. Zhu Guoqing is a senior colonel and associate professor at the Aviation University of PLA Air Force.

²¹ Shi Zongpeng, Sun Tiecheng, and Wang Zhanyong are lecturers in the Teaching and Researching Sections of “Military Campaign” subject at the Second Artillery Command College.

²² Xu Xinzhaoh is a professor at the Department of Scientific Development of the PLA Electronic Engineering College. Wang Sifu and Xu Jun are Masters students at the PLA Electronic Engineering College. Xie Nan is a soldier in the PLA.

People’s Liberation Army (PLA) would be able to win “local wars under conditions of informatisation”²³. Since then, the development of the PLA’s information technology and communication capabilities has been seen as critical to the overall success of China’s defence modernisation. By now, every branch of the PLA has gone through an extensive informatisation process.

Shi Zongpeng, Sun Tiecheng, and Wang Zhanyong say that informatisation is the biggest evolution in modern warfare. As they put it: “no network, no army; no war without a network” (无网不成军, 无战不经网, *wuwang bu chengjun, wuzhan bu jingwang*). The rapid spread of information technologies within Chinese society has had an enormous effect on the modernisation of the PLA. Interconnection, interoperability, and multi-network integration have become common features of civilian society as well as of modern warfare. High-quality information sharing, information management, and network connectivity is crucial to combat effectiveness. Information has become a new factor in combat capability: as Shi, Sun, and Wang write, combat effectiveness depends on hardware and on information processing. So, one of the PLA’s biggest challenges is to integrate this new element into its overall modernisation process, while at the same time keeping pace with technological progress taking place in the civilian sphere. The authors say that the PLA has so far dealt well with the process. Some major achievements have been made, especially in C⁴ISR (Command, control, communication, computerisation, information, surveillance, and recognition; 指挥、控制、通信、计算机、情报及监视与侦察; *zhihui, kongzhi, tongxin, jisuanji, qingbao ji jianshi yu zhencha*). But the process must continue. Now that the PLA has completed the early stage of informatisation development, Chinese strategists say the army needs to conduct further technological integration and explore new tactical uses on the battlefield.

Implementing informatisation: more is better

Shi, Sun, and Wang say that battlefield outcomes no longer depend on strike effectiveness, mobility, and mobilisation. The “information confrontation” (信息的对抗, *xinxi de duikang*) of modern war can only be won through successful information gathering and management. Li Bingbing, Zhou Chuangming, Guo Xinpeng, and Li Quanquan talk about the complexity of the “high-dimensional, uncertain, and non-linear” dynamics (高维, 不确定, 非线性; *gaowei, buqueding, feixianxing*) of informatised warfare. The shift from building material superiority to managing intangible information has been one of the greatest changes, if not the greatest change, in the PLA’s history. To achieve this transformation, the PLA is trying to train a new generation of soldiers and to upgrade the army’s information capabilities.

²³ “China’s National Defense in 2006,” Information Office of the State Council, People’s Republic of China, 29 December 2006, <http://www.fas.org/nuke/guide/china/doctrine/wp2006.html>.

The human factor in combat is still essential. Combat effectiveness depends on information processing, and the quality of information processing depends on the skills of operators. So, soldiers need to be better trained to operate new technologies. Shi, Sun, and Wang say that the link between equipment development and military training is vitally important. Along with basic training, they say that soldiers need “comprehensive training” (综合训练, *zonghexunlian*) and “comprehensive integration” (综合集成, *zonghe jicheng*) to achieve a fully informatised operational capacity. Comprehensive training is designed to ensure that operators have the skills to perform within a complex system. Comprehensive integration aims to build interoperability between the various different PLA forces. Troops must be trained to share information and to respond to command. In other words, the goal is to reach “horizontal convergence and vertical integration” (横向衔接, 纵向一体, *hengxiang xianjie, zongxiang yiti*). Huang Renquan and Li Weimin say that in conflict situations, different

The PLA is developing an integrated defence capability in which its ground, naval, and air forces will be capable of interoperating on the battlefield.

battlefields such as air defence and cyberspace are in play at the same time. This dramatically increases the need for integrated training and

operational readiness. So, along with bringing about technological advances, informatisation has increased the need for training and proper management in the PLA.

The most important concept in operationalising informatisation is integration (综合, *zonghe*). Integration means the capacity to use different forces with different capabilities to fulfil separate missions under the same command at the same time. Those involved need to be able to extract and communicate data as quickly as possible. Li, Zhou, Guo, and Li think data mining (数据挖掘, *shuju waju*) is the most important tool here: they say that “data mining technology will provide superiority in future information warfare” (数据挖掘技术是未来信息化战争中掌握信息优势, *shuju waju jishu shi weilai xinxihua zhanzheng zhong zhangwo xinxi youshi*).

Receiving relevant information is an essential factor in decision-making and operational capability. Unsophisticated information systems can clutter communication lines with useless traffic. So, to deal with the large amount of information collected and transmitted during operations, data mining processes must be used to select and extract reliable and useful information. In air defence operations, for example, data mining can facilitate decision-making by allowing battlefield commanders to access a wide range of data. Looking at sensory information, databases, and strategic patterns could help to develop appropriate air defence plans or even to take “preventive measures” (防患于未然, *fanghuan yu weiran*). Based on

tactical trends and strategic patterns, command units can get a strategic overview and potentially identify the enemy’s next move. Li, Zhou, Guo, and Li say that the PLA must implement effective data-mining systems as part of its informatisation process. If it does not, the informatisation of the PLA will not be effective.

New capacities, new strategies

Chinese analysts see new strategic possibilities in the development of PLA informatisation capabilities. A robust coastal C⁴ISR defence system and space armed forces could serve China well if regional war were to break out.

In November 2012, at the Zhuhai Airshow, the China Aerospace Science and Industry Corporation (CASIC) displayed a live simulation of its “defence confrontation system” (防务对抗体系, *fangwu duikang tixi*). This system is designed to respond to an air-sea attack on China’s mainland. Its architecture depends entirely on an integrated C⁴ISR capability. Jin Fang says CASIC’s display showed the substantial progress the PLA has made in implementing informatisation. When the system is completed, for the first time in the army’s history, the different branches of the PLA will be able to interoperate at the same time, under one central command, in responding to the same threat.

A demonstration is not the same thing as an operational system. But the display clearly shows that the PLA is developing an integrated defence capability in which its ground, naval, and air forces will be capable of interoperating on the battlefield. The system combines new weapons, such as the C-701 and C-704 anti-ship missiles, with specific surveillance, recognition, and communication systems, such as the WJ-600 Unmanned Aerial Vehicle. CASIC’s demonstration was evidence that one of PLA’s goals in informatisation is to achieve a new operational capability in coastal defence.

Liu Congxin and Zhu Guoqing see “space forces” (航天力量, *hangtian lilian*) as involving both civilian and military space competences. The writers note that space technologies are dual-use, so the nature of the technologies is blurring the lines between civilian and military uses. But civilian and military needs in space are different, even though they are connected. Military space forces have to be able to undertake surveillance, reconnaissance, and targeting from space to the ground. And they have to ensure the security of the space environment by monitoring space activity and responding to potential threats in space. Liu and Zhu think that regional war would necessitate dispersed deployment and high mobility. This implies an increasing reliance on communications networks.

Satellites are the cornerstone of telecommunications architecture. They provide telecommunications channels, and they are also used in meteorology, observation, and intelligence gathering. The ability to obtain comprehensive

and accurate information and dispatch it to the battlefield depends on satellites' data acquisition, processing, and transmission. As space becomes more important in warfare, Liu and Zhu say China should create a dedicated "space force as part of the defence organisation" (航天力量作为军事力量的一部分, *hangtian lilang zuowei junshi lilangde ibufen*). Following the example of the United States, China should conduct research into the militarisation of space. This could enhance its preparedness in the event of local war.

PLA leaders have great expectations of the informatisation process. Sometimes portrayed as the most important part of the overall modernisation, informatisation is seen as a perfect way to mitigate uncertainty in the battlefield. But security is an endless race: transforming the PLA into a fully informatised force will likely bring with it new vulnerabilities.

4. Challenges in military-civilian integration

Brian Lafferty

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²⁴ Dong Xiaohui is a lecturer, Zeng Li is a professor, and Huang Chaofeng is an assistant professor at the National University of Defence Technology's College of Humanities and Social Sciences.

²⁵ Yang Guodong is a Ph.D. candidate at the PLA Academy of Military Economics. Liu Chuanbin is an advanced engineer in the PLA Academy of Military Economics' Training Department.

²⁶ Gao Zhanjun is an assistant professor at the School of Economics and Management at Northwest University of Politics and Law. Chang Minghui is a high-level project manager at Northwest Industrial Technology Research Institute. Duan Lin is a lecturer at the School of Economics and Management at Northwest University of Politics and Law.

At the 18th Party Congress in October 2012, China's leaders continued to promote "military-civilian integration" (军民融合, *junmin ronghe*) as a core component of the country's military development strategy²⁷. Party leaders believe that coordinating development between military and civilian industries will enable government resources to be used more efficiently and will accelerate the creation of advanced strategic technologies. If the model can be successfully implemented, it should help China continue its rapid defence modernisation without creating too great a drag on its economic growth. At the same time, it should increase the rate at which advanced technologies are created and commoditised. Both would help speed up China's rise as a great power.

The Chinese government has prioritised military-civilian integration (MCI), elevating it to a national strategic priority in the 12th Five-Year Plan, which covers the period from 2011 to 2015. But its implementation is still a work in progress, and China is still studying ways to promote it effectively. Academic programmes and think tanks focused on producing MCI research have proliferated in the last few years, but so far, they have had a limited impact. This is largely due to the complexity of the MCI challenge in China. China's military and civilian systems operated for decades within separate, distinct frameworks, which caused them to develop in ways that are now at odds with the needs of MCI. Over the years, these different development paths created a wealth of deep-rooted barriers, redundancies, and incompatibilities between the military and civilian sectors. These divergences need to be resolved before the two sectors can be integrated.

Recent Chinese writing on the current state of MCI shows that implementation is still proceeding slowly. Guidance for reform is still being thought through at a strategic rather than an operational level. As a result, analyses of MCI's problems and prospects are not dramatically different from those written three or four years ago. They offer insight into the biggest barriers to MCI implementation, indicating where future reform efforts are likely to be concentrated.

This essay will first highlight two key issues in China's current academic debates about the problems and prospects for MCI: the lack of central management of MCI and the absence of appropriate regulations to govern the area. Then, it will review recent discussions of how MCI is being implemented in Shaanxi province. Implementing MCI in the places where it may have its largest impact – in the regions where the defence industrial base is a core component of

²⁷ The term is more commonly translated as "civil-military integration", but this obscures the emphasis that China places on the military element of the concept. As the Chinese phrase implies (and as China's application of it reflects), China is focused on merging a previously closed-off defence sector with the country's broader social and economic systems. The distinction may be subtle, but translating the term as 'civil-military integration' risks suggesting that the term has the same meaning in China as it does in the United States. CMI, as understood in the United States, places a greater emphasis on integrating commercial firms into the defence industrial base.

the local economy – may be the most important near-term challenge for MCI.

Dong Xiaohui, Zeng Li, and Huang Chaofeng's article and the piece written by Yang Guodong and Liu Chuanbin both discuss current problems in MCI implementation. Dong, Zeng, and Huang are concerned about the lack of central-level political management for MCI. Yang and Liu highlight the absence of laws and regulations governing MCI policies. These are, by now, relatively common insights in Chinese analyses. But despite widespread awareness of these longstanding problems, effective policies to address them have not been introduced. Clearly, China's political leaders have had serious difficulty in deepening MCI reforms even though there is a consensus on what needs to be done.

Dong, Zeng, and Huang argue that the most prominent obstacle to MCI development is the central government's

disjointed leadership on MCI issues. They say that MCI policymaking and enforcement is held back by the fact that no one political institution is in charge of overseeing MCI. Instead, the various activities and organisations involved in MCI are under the jurisdictions of other managing institutions, making it difficult for any single government department to take charge. The primary central-level institution with a dedicated MCI portfolio is the Department of MCI Promotion (军民结合推进司, *junmin jiehe tuijin si*), which is subordinate to the Ministry of Industry and Information Technology (MIIT). However, the department is more involved in coordinating than in managing. It does not set MCI policy; instead, it acts as an intermediary for various government organisations involved in MCI-relevant policymaking, bringing public/government stakeholders together to find opportunities to deepen MCI development.

China's pursuit of MCI has so far mostly functioned as a way to boost the profits of the defence industries, while doing little to integrate the military and civilian sectors.

Successful implementation of MCI is also hindered by fuzzy lines of authority between civilian and military leadership. The defence industries are the principal agents for MCI. Management of these industries is handled both by the Central Military Commission (CMC) and the State Council, through their own, separate channels: the General Armament Department (GAD) and the State Administration for Science and Technology in National Defence (SASTIND). According to Dong, Zeng, and Huang, more than 20 departments within the State Council and the People's Liberation Army (PLA) have oversight of different aspects of MCI implementation. Without a clear sense of who is in charge, it can be difficult for them to cooperate. These problems extend to each of the dozens of state institutions involved in managing MCI activities. Dong, Zeng, and

Huang say that these divisions thwart efforts to realise the kind of integrated military and civilian development plans that senior leaders want to achieve.

Problems caused by the lack of an overarching authority could be mitigated by creating MCI-relevant legislation, which could clarify management roles and settle policy ambiguities. But no such legislation has been produced. The government has published “guiding opinions”, “notices”, and “methods” to clarify permissible MCI activities. But it has not supplied laws and regulations, which would be more binding and authoritative. Yang and Liu say that this has been a serious barrier to MCI implementation, and that the government needs to develop a comprehensive legal system to cover MCI. In the absence of such a system, the government has been unable to set rules for how non-state-owned enterprises can produce goods for the defence market. This activity was formally forbidden until 2005, and no specific laws or regulations have been drawn up to govern it. This makes non-state-owned enterprises in the defence field vulnerable to a prohibitively broad set of unresolved legal ambiguities in areas such as intellectual property rights protection, investment, and financing.

China’s leaders have been slow to address this kind of criticism. But two recent statements by senior leaders may indicate that the government is now prepared to engage more fully on these issues. After the 18th Central Party Congress, Minister of Industry and Information Technology Miao Wei discussed his ministry’s upcoming MCI tasks in his report at the ministry’s national working meeting²⁸. Miao’s report called for improved organisation and coordination of MCI tasks, stronger strategic planning for MCI development, and better use of inter-ministerial coordination mechanisms to improve the effectiveness of MCI systems. The report also stressed the need to improve MCI-related laws and regulations. Xi Jinping, in his discussion with PLA delegates at the first plenary session of the 12th National People’s Congress in March 2013, urged the PLA to form a “deeply integrated” (深度融合, *shendu ronghe*) military-civilian development structure. Xi’s call for deep integration, combined with Miao’s push for progress in resolving some of MCI’s basic problems, suggests that the government is intent on furthering MCI reforms in the near future.

Implementing a strategy can be more difficult than designing it. China’s pursuit of MCI has so far mostly functioned as a way to boost the profits of the defence industries, while doing little to integrate the military and civilian sectors. As a result, MCI’s impact on “defence conversion” (军参民, *juncanmin*) has been far greater than its impact on “spin-on technology transfer” (民参军, *mincanjun*)²⁹. Provinces with

an established defence industrial base, such as Shaanxi, may be especially vulnerable to this problem, given the entrenched interests that have developed as a result of the defence industries’ role in the local economy. In Shaanxi, it seems, the main result of MCI has been the defence industries’ success in expanding their markets for civilian-use products.

Gao Zhanjun, Chang Minghui, and Duan Lin say that joint military-civil innovation is rare in Shaanxi, and civilian-owned industries have little participation in the defence market. The various MCI industrial development bases in the province are supposed to be using a clustering model to advance MCI. But they have done little to integrate civilian-owned industries into the bases. Instead, they remain almost entirely dominated, both in sales and in revenues, by state-owned defence industries. Similarly, few civilian-owned enterprises have entered the defence market in Shaanxi. Nearly all of those that have were originally state-owned defence enterprises, which have been restructured and placed under civilian ownership. Gao, Chang, and Duan name only two purely civilian-owned companies in the defence market.

The Shaanxi Defence Science and Technology and Aviation Industry Office’s article about the key MCI-related tasks currently facing the province suggests that defence conversion will continue to be the main priority in 2013. After describing a series of near-term goals related to improving industrial performance through MCI, the Office’s article includes only a brief item on improving civilian-owned enterprise participation in the defence market. It says that Shaanxi will take steps to strengthen supervision, management, and guidance of spin-on technology transfer so that it can attract more civilian “work units” (单位, *danwei*) into weapons research and production areas.

This kind of token promotion of what should be a central aspect of MCI development, in contrast to the vigorous promotion of defence conversion, is relatively common among the departments and enterprises charged with pursuing MCI. It highlights the difficulties facing central government leaders as they try to advance a truly cohesive military-civil integration. If there is a tension about what the basic goals of MCI should be, it is hard to see how the government can establish either authoritative management over MCI, or a robust legal system to support it.

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²⁸ As the ministry that oversees the coordination of government activities on China’s industrialisation and informatisation work, MIIT is the highest civilian authority with specific responsibility for implementing MCI, most obviously through its Department of MCI Promotion.

²⁹ “Defence conversion” refers to the process by which defence industries are slowly integrated into (or progressively penetrate) the civilian

industries market. “Spin-on technology transfer” refers to the process by which civilian industries are slowly integrated into (or progressively penetrate) the defence industries market.

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