2. China

*Chinese Country Study Group**

I. Introduction

National security decisions leading to arms procurement are considered confidential in most, if not all, countries. Nevertheless, a modern national military establishment requires that arms procurement decision-making processes be based on considerations of military strategy, threat assessment, the defence budget, military accounting and auditing, testing and evaluation, military industrial production, and so on. Arms procurement involves various departments and agencies, and the policies on confidentiality of different departments undermine a balanced analysis of the processes in their entirety. A rational and coordinated arms procurement decision-making process will increase a nation's military deterrence and security capabilities.

This chapter argues that modern arms procurement requires trade-offs among different considerations and interests, involving a balance between military transparency and confidentiality and between economic development and defence capability. Although a certain degree of military transparency can help in building up mutual confidence between China and its neighbours, China must also protect the confidentiality of its arms procurement decisions. In a similar manner, constraining the defence budget can save capital for economic development, but the military cannot be modernized without major investment. It is strategically important for China to maintain a balance between these competing interests.

Section II of this chapter outlines the current Chinese arms procurement decision-making process, including the participants and their roles. Section III examines economic and industrial issues and their influence on Chinese military modernization. It deals with the defence budget in relation to threat assessment and allocations in the defence budget for arms procurement. Also examined are the balances between military and economic modernization, between arms imports and domestic production, and between military and civilian production. Section IV introduces the principles and criteria influencing Chinese arms procurement and military production, providing an overview of the priorities of Chinese military modernization.

* This chapter was compiled by the editor with the help of research assistant Inger Buxton and on the basis of a preliminary draft by Yan Xuetong. The editor would like to thank the experts who contributed the papers which formed the basis of the chapter. See annexe C for the biographical details of the contributors. The editor also extends his gratitude to Bates Gill, Wang Shaoguang and Andrew Yang for their useful reviews of this chapter.

Finally, section V argues that China will continue to adjust its policy to improve the balance between conflicting requirements. The principle of maintaining a balance implies that the level of Chinese arms procurement will not increase dramatically. Until 2010, it is projected that it will remain moderate and will lag far behind that of Japan, Russia and the USA, both in terms of the quality of the items procured and in monetary value. However, given the size of the People's Liberation Army (PLA), Chinese arms procurement in terms of volume is likely to remain high.

II. The arms procurement decision-making process

The Chinese politico-military hierarchy can be described as operating in three political arenas: the Communist Party, the executive and the legislative.

1. The Communist Party of China (CPC) and the CPC Central Committee are the overarching structures. The highest functionaries of the Central Committee are the members of the Political Bureau (Politburo), whose top leaders make up the core of the Chinese leadership as members of the Standing Committee. The Central Committee represents a high level of interaction between the party and the military.[1]

2. The executive has two parts—the State Council and the Central Military Commission (CMC). The CMC has two components—the CMC of the CPC and the CMC of the People's Republic of China (PRC). Although these are made up of the same members and called by the same name, the former deals with party–military relations and the latter with defence policy making and executive functions relating to the PLA.[2] The President of the People's Republic of China is the Chairman of the CMC and General Secretary of the CPC. The State Council is headed by the Prime Minister and is responsible for the Ministry of Foreign Affairs and the Ministry of National Defence (MND).[3]

3. In the legislative arena, a number of committees of the National People's Congress (NPC) monitor laws relating to most of the functions of the State Council. Although there is a Foreign Affairs Committee, there is no committee to oversee the military.

The Chinese arms procurement decision-making process is complex, ambiguous and non-linear, which makes graphic presentation difficult. Decisions are the result of consultations between subordinate and superior units and among different agencies. Two aspects are described below: the participants in and the stages of the process.

[1] The 15th Central Committee of the CPC, held in Sep. 1997, was attended by 191 members and 151 alternate members. Of these, 22 members and 2 alternate members were voted into the Political Bureau. The Standing Committee at the top of the hierarchy is composed of only 7 members. *South China Morning Post*, 20 Sep. 1997; and *China Daily* (Beijing), 20 Sep. 1997.

[2] China Handbook Editorial Committee, *China Handbook Series: Politics* (Foreign Languages Press: Beijing, 1985), p. 125.

[3] *China Directory 1997* (Radiopress: Tokyo, 1996), pp. 4, 38, 41, 149 (in English).

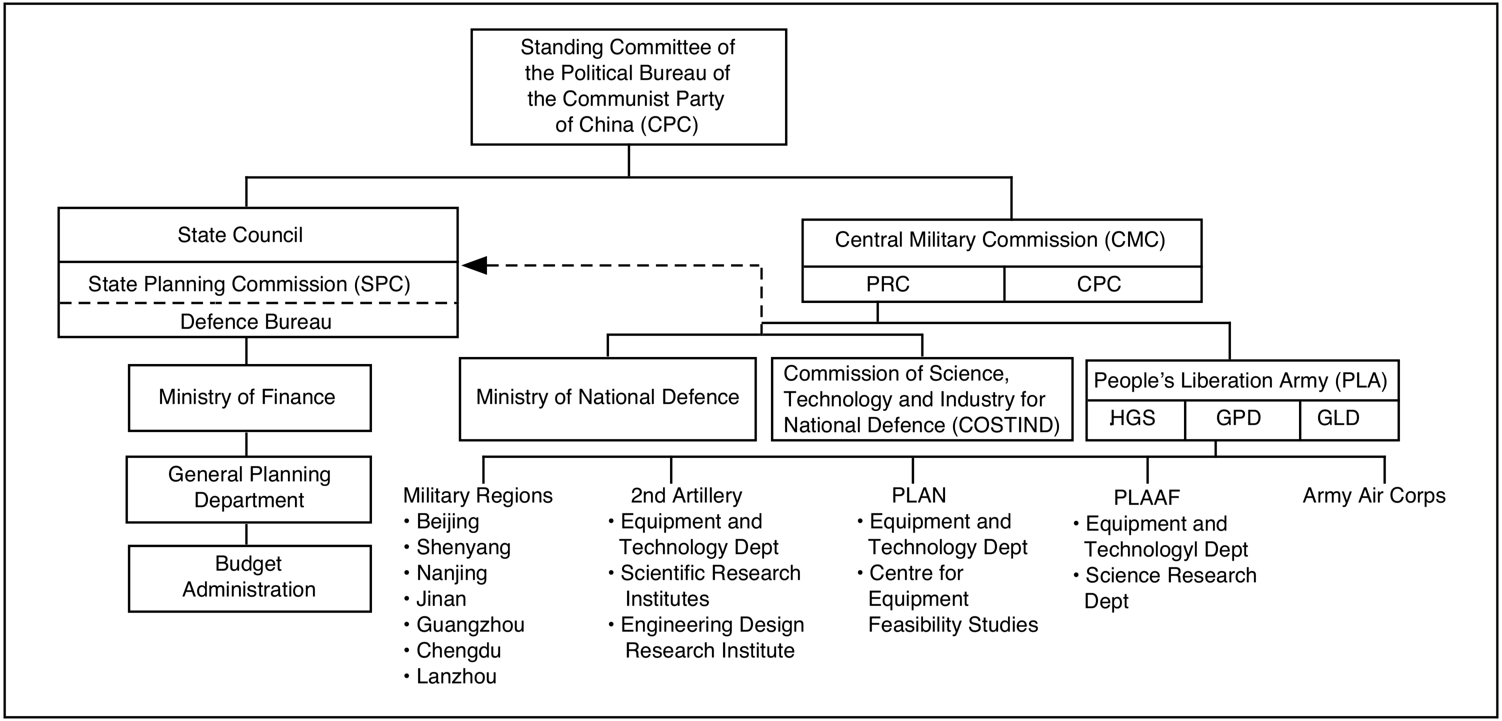

Figure 2.1. High-level organizations in Chinese arms procurement decision making

Notes: PRC = People's Republic of China; HGS = Headquarters of the General Staff; GPD = General Political Department; GLD = General Logistics Department; PLAN = People's Liberation Army Navy; PLAAF = People's Liberation Army Air Force.

Sources: China Directory 1997 (Radiopress: Tokyo, 1996), pp. 158–59 (in English); and *Directory of PRC Military Personalities* (US Consulate General; Hong Kong, Oct. 1995), p. vi.

The actors

The Chinese military and civilian official agencies are part of a highly hierarchical and disciplined system in which various organizations involved in arms procurement make their recommendations to their superior levels. The different recommendations of the lower-level organizations are studied and combined to form comprehensive proposals at successively higher levels. A hierarchical structure consisting of five tiers can be identified.

At the top are the CMC and the State Council, which function under the Standing Committee of the CPC. The CMC is responsible for formulating military strategy according to the national security objectives of the CPC's Standing Committee. Its responsibilities also include long-term defence planning and force structure planning in the context of future threats and economic constraints. In the case of domestic arms production, the CMC makes initial deliberations before coordinating with the State Council.[4] Their joint recommendations are then submitted to the Politburo's Standing Committee for a final decision. The Minister of National Defence, as one of the Vice-Chairmen of the CMC, also serves on the State Council. Unlike the ministries of defence in other countries, in China the MND provides a high-level point of contact between foreign policy makers and the military executive, which in this case is the PLA. The MND is also responsible for coordination between the research and development (R&D) and industrial establishments and the PLA for development and manufacture of weapon systems. The various elements in the high-level organizations that are involved in Chinese arms procurement decision making are shown in figure 2.1.

The second tier is the PLA. It consists of three general departments: the Headquarters of the General Staff (HGS), the General Political Department (GPD) and the General Logistics Department (GLD).[5] They function as advisory organizations and executive bodies of the PLA and their main responsibilities involve ensuring the implementation of the strategic direction with respect to operations, arms procurement, and other general and specific policies as directed by the CMC.[6] The PLA Navy (PLAN), the Air Force (PLAAF) and the Second Artillery (responsible for the strategic rocket forces) are not independent entities as in other countries but report to the CMC through the PLA.[7]

[4] Deng Liqun, Ma Hong and Wu Heng (eds), *China Today: Defence Science and Technology*, vol. 1 (National Defence Industry Press: Beijing, 1993), pp. 33–37.

[5] The term General Staff Department (GSD) is often used in Western literature to describe the functions of the HGS. In this study the term HGS is used. For discussions of successive levels of hierarchy, see also Chai Benliang, 'Development and reform issues of China defence, science, technology and industry', SIPRI Arms Procurement Decision Making Project, Working Paper no. 5 (1995), p. 10.

[6] Ku Guisheng and Zhan Wei, 'National defence policy and arms procurement budget', SIPRI Arms Procurement Decision Making Project, Working Paper no. 2 (1995), p. 2.

[7] The armed services, comprising the artillery, armoured forces, engineers and anti-chemical weapon troops, make up over two-thirds of the ground forces of the PLA, indicating an emphasis on equipment-intensive forces. Hua Chun, Chang Hung and Tu Hsueh-neng, [Arms of service have become ground force's principal force: interviewing Major General Xiao Zhentang, Director of Arms Department of General Staff Headquarters], *Wen Wei Po* (Hong Kong), 5 Sep. 1997, p. A5, in 'China: General on PLA

The Equipment and Technology Departments of the PLAAF, PLAN and the seven Military Area Commands of the PLA develop their arms procurement requirements on the basis of operational and technical assessments provided by their scientific research institutes.

The third tier consists of the equipment departments of the armed services and other defence agencies, including the test and evaluation ranges and *matériel* commands, which develop weapon systems and implement defence R&D programmes.[8]

While the first three tiers mainly deal with decision making, analysis and planning, the last two deal with manufacturing and R&D. The fourth tier consists of major military industrial corporations and defence prime contractors, which are responsible for the implementation of military contracts. The fifth is made up of numerous defence manufacturers and R&D institutes which carry out defence R&D and production projects and programmes under contract. This tier also includes operational user services, which conduct trials and field tests and report the shortcomings of weapons under development.[9] Previously, military R&D and production were conducted by serially numbered Ministries of Machine Building and Industry (MMBI). However, with the introduction of market reforms in the late 1970s, these ministries were reorganized and converted into corporations with more specialized subsidiaries replacing erstwhile departments. The corporations, which are engaged in both defence and civilian industrial production, function under the State Council. (The term 'military industry' is used here to identify industries under the direct control of the CMC; 'defence industry' describes the industries under the State Council.) The research academies, which were attached to each of these ministries, have been redesignated as research institutes.[10] Appendix 2A lists examples of Chinese military manufacturing and trading entities controlled by three major structures: the CMC, the State Council and the Commission of Science, Technology and Industry for National Defence (COSTIND).

The leading organization responsible for arms procurement is the Headquarters of the General Staff of the PLA (see figure 2.2). It is in charge of the operations of the PLAN, the PLAAF, the Second Artillery and the seven Military Area Commands. The staff of the Operations, Equipment and Specialized Arms Departments of the HGS are responsible for drafting operational plans and the requirements for arms procurement.[11]

technical arms', Foreign Broadcast Information Service, *Daily Report–China (FBIS-CHI)*, FBIS-CHI-97-248, 9 Sep. 1997.

[8] *China Directory 1997* (note 3), pp. 158–59. Over the past few years the Equipment Department of the HGS has been referred to as the Equipment and Technology Department. *Directory of PRC Military Personalities* (US Consulate General: Hong Kong, Oct. 1995), p. vi.

[9] Deng Liqun, Ma Hong and Wu Heng (note 4), pp. 46–47.

[10] Frankenstein, J. and Gill, B., 'Current and future challenges facing Chinese defence industries', *China Quarterly*, no. 146 (June 1996), p. 401; and *China Directory 1997* (note 3), pp. 80–81.

[11] The Equipment Department—also called the Armament Department—is the key department responsible for arms procurement functions and coordination. As shown in figure 2.2 there is also an Armament Department in the GLD, which is presumably responsible for holding weapons and equipment stocks. In Apr. 1998, the Equipment Department of the HGS became part of a new General Equipment Department in the PLA.

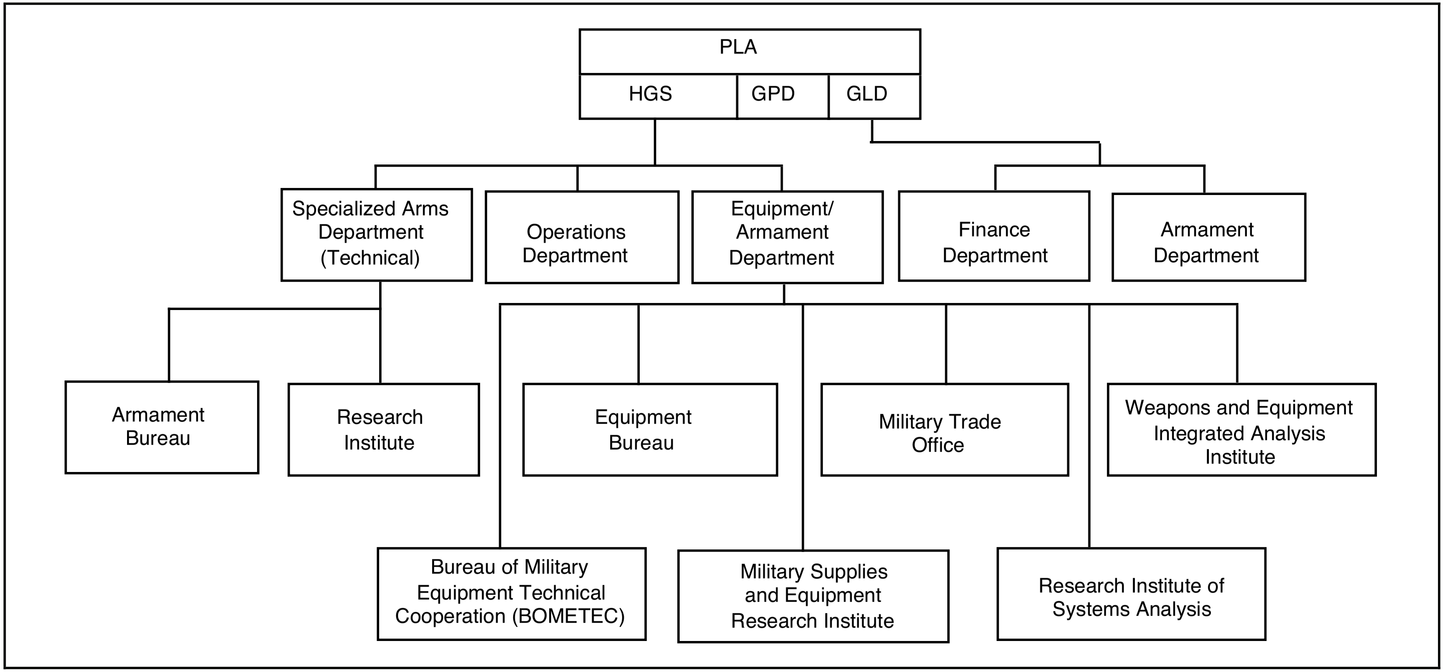

Figure 2.2. Organization of arms procurement bureaux and institutes in the PLA

Notes: PLA = People's Liberation Army; HGS = Headquarters of the General Staff; GPD = General Political Department; GLD = General Logistics Department. In Apr. 1998 a major reform of the Chinese military was announced and a General Equipment Department was established in the PLA to incorporate the former Equipment/Armament Department of the HGS.

Sources: *China Directory 1997* (Radiopress: Tokyo, 1996, in English); Ku Guisheng and Zhan Wei, 'National defence policy and the arms procurement budget', SIPRI Arms Procurement Decision Making Project, Working Paper no. 2 (1995), p. 23; and Ling Ruyong, 'Procurement auditing of weapon systems', SIPRI Arms Procurement Decision Making Project, Working Paper no. 7 (1995), p. 10.

On the basis of mid- and long-term weapon development programmes, the armed services formulate plans for arms procurement according to the type, specifications and quality of weapons and equipment required.[12] The Departments of Equipment and Technology of each of the armed services then work out proposals for new weapons, defining their purpose, main combat performance and technical specifications, and providing planning schedules and budget estimates. These are based on studies covering operational, technological and financial aspects. The plans are then sent to the HGS for coordination. While doing this, each of the armed services has to compromise between operational requirements and technical and financial feasibility.[13]

COSTIND enjoys ministerial status and is accountable to both the CMC and the State Council.[14] Established to facilitate overall planning of science and technology for national defence, it coordinates conventional military R&D and the space and nuclear programmes (as between R&D establishments under the CMC and those under the State Council). After the HGS has designated a weapon for procurement, COSTIND coordinates the required R&D with the research academies and establishments and the various manufacturing entities and is responsible for weapon upgrading, technology testing, design, type approval, trial production, test batch processing, and so on. It is also responsible for outlining principles, policies, priorities, targets and courses for the development of defence science, technology and industry.[15]

The decision-making activities, information flow and interaction at the different levels in the process are managed through an information-management and decision-support system which is analogous to the planning, programming and budgeting system in the USA.

In addition to the bodies directly involved in arms procurement, the development of new weapons is based on a nationwide network of industries and research institutes, which requires cooperation between the military and civilian sectors. For example, the technologies for nuclear bombs, guided missiles and nuclear-powered submarines were developed with contributions from both the civilian and the military sectors with different production specializations and R&D capabilities. The Chinese Academy of Sciences and a number of universities and colleges are also organized in a nationwide network and their scientific and technological strengths combined with the engineering training given at the technical universities.[16]

[12] Luo Fengbiao, 'Development of defence science, technology and industries in China', SIPRI Arms Procurement Decision Making Project, Working Paper no. 8 (1995), p. 4.

[13] Luo Fengbiao (note 12), p. 7.

[14] Ku Guisheng and Zhan Wei (note 6), p. 3. To aid the development of China's missile and aircraft industry, the State Council and the CMC decided in Apr. 1956 to set up a Commission of Aviation Industry in the MND, which was redesignated as the Commission of Science and Technology for National Defence (COSTND) in Sep. 1958. In May 1958, the CMC established the Fifth Department in the MND to integrate and strengthen planning and R&D of weapons and equipment in the PLA. The 2 were merged in Apr. 1959, to avoid duplication of functions, along with the Scientific Research Section of the Equipment Planning Department of GSD. Deng Liqun, Ma Hong and Wu Heng (note 4), pp. 33–35.

[15] Luo Fengbiao (note 12), p. 7.

[16] Luo Fengbiao (note 12), p. 4.

Over 900 factories, R&D institutes, universities and colleges located in 20 provinces have participated in developing more than 80 000 kinds of military product in different industrial sectors, such as metallurgy, chemicals, light building materials, petroleum and machine building. These products mainly include new materials, electronic and machinery products, special equipment and optical products, as well as components of weapon systems.

Threat assessment

Arms procurement decision making involves a continuous process of threat assessment and goal setting, in accordance with modern operational doctrines and principles. Among the usual priority operational principles are: (*a*) a rapid and flexible response capability (only with this can the armed forces implement changes in operational directives); (*b*) winning the battle as quickly as possible; (*c*) attacking the key links of the enemy; and (*d*) obtaining electromagnetic and information expertise.[17]

Threat assessment in China involves three stages. First, various intelligence and research organizations collect information about the capabilities and military potential of foreign countries. This mainly includes information on diverse elements of national power including political, economic, military, technological, psychological and moral factors, the strategic intentions of potential adversaries and their deployment plans. Second, the information is carefully processed and systematically analysed to determine its accuracy and application and the reliability of the source. This is done by the intelligence agencies of the HGS and by the MND. Research and analysis conducted by other related institutions shown in figure 2.3 are also incorporated into the assessment as and when required.[18] The third stage involves consultations, analysis and assessment of intelligence data. This is done by the research organizations and concerned experts at joint meetings on specific topics in order to assess the accuracy of the information and the threat potential. These meetings usually result in suggestions to the appropriate policy-making body on national defence policies.

Research institutes that conduct international and security studies in China can be divided into two categories. The first consists of those which conduct political or strategic studies for the ministries under the State Council: these include the China Institute for Contemporary International Relations and the Ministry of Foreign Affairs' Institute for International Studies. The second category are institutes, including the Academy of Military Science (AMS) and the National Defence University (NDU), which have a military security orientation and report to the CMC. Founded in 1958, the AMS is a research institute for military theory in the PLA. It has 500 full-time researchers recruited from officers in combat units, graduates from the PLA's colleges and PhDs from

[17] Ku Guisheng and Zhan Wei (note 6), pp. 10–11.
[18] Ku Guisheng and Zhan Wei (note 6), pp. 11–12.

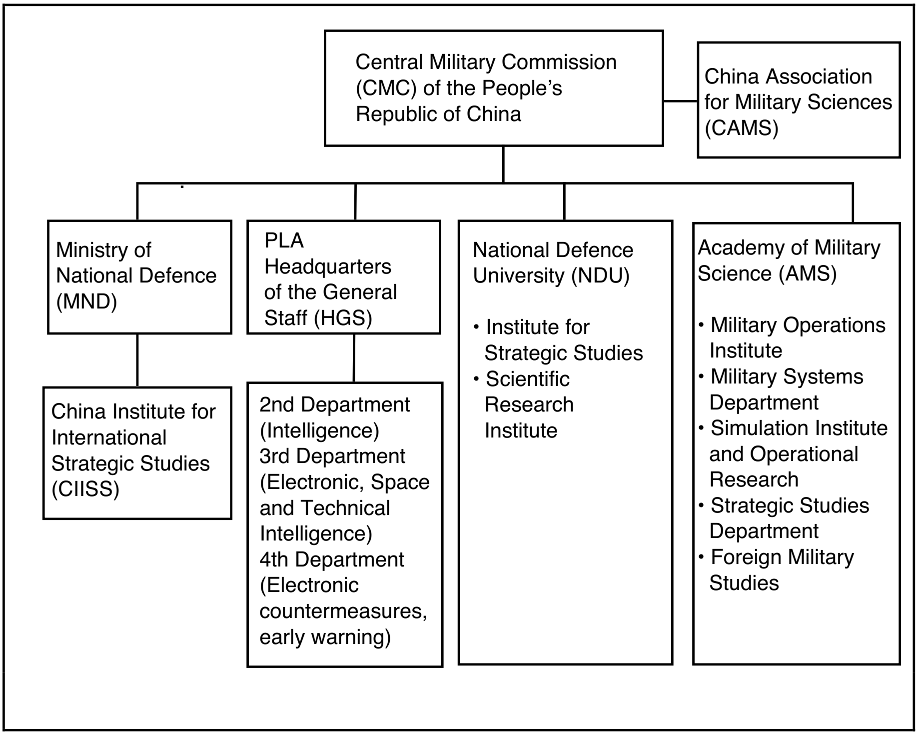

Figure 2.3. The research and information establishments of China's Central Military Commission

Sources: Swaine, M. D., *The Role of the Chinese Military in National Security Policy Making* (RAND: Santa Monica, Calif., 1996), p. 5; *China Directory 1997* (Radiopress: Tokyo, 1996), pp. 152–53, 176 (in English); and Information brochure about the Academy of Military Science, Beijing, 1994.

civilian universities and is the main planning and coordination establishment for military research in China. It also provides the China Association for Military Sciences (CAMS) with administrative support. The CAMS, established in 1991, can be considered China's most influential think-tank on military affairs. Its members include senior generals of the CMC and of the PLA. The NDU was established in December 1985 from the former Military, Political and Logistics Academies and is the senior military institution of the PLA at which senior officers can study developments in military science, theories and strategies for national defence modernization. Annual meetings are held to discuss the sources and types of threat and to analyse countermeasures to such assessed threats.[19] Research at the China Institute for International Strategic Studies

[19] Xiao Xianshe, *Research of Military Forecasts* (National Defense University Press: Beijing, 1990), pp. 100–104; and Ku Guisheng and Zhan Wei (note 6), pp. 3–4. The Academy of Military Science includes the Military Operations Institute, the Simulation Institute, a Military Systems Department and a Strategic Studies Department. *Directory of PRC Military Personalities* (note 8), pp. 61–62; and Interviews

(CIISS), which functions under the MND, is largely done by former military attachés and some civilian experts.

In the early 1980s, the threat perceptions expressed by Chinese political leaders indicated that the military threats to Chinese security were receding. In a talk given in 1983, Deng Xiaoping told leading members of the Central Committee of the CPC, ‘War is not going to break out, so there is no need to fear it and no problem of risk. We have been worried about the possibility of war and have had to be on the alert every year. I think we overdid it. I don’t think there will be war for at least the next ten years’.[20] This threat assessment at the highest level resulted in China reducing its military manpower unilaterally by 1 million and sharp cuts in military expenditure in 1985 and 1986.[21] After the collapse of the Soviet Union in 1991, the direct military threat posed to China on its western border receded.

China and Russia have developed military cooperation and agreed not to target each other with strategic nuclear weapons,[22] and this is the likely policy for the foreseeable future. High-level exchanges between the two countries’ leaders since 1994, many bilateral agreements and the border agreements between China and Kazakhstan, Kyrgyzstan, Russia and Tajikistan have also generated confidence. Although a Sino-US strategic understanding broke down in 1989, the USA and China still avoid military confrontation. During a summit meeting between Chinese President Jiang Zemin and US President Bill Clinton in Seattle in 1993, the former communicated, that as long as the USA and Russia do not intend to invade China, its leaders have confidence in China’s security. In 1992, the report of the 14th Party Congress stated: ‘The People’s Republic of China has cemented good-neighbour relations with surrounding countries since its founding . . . For a long time to come, it will be possible to secure a peaceful international environment and avert a new world war’.[23]

Two schools of thought about the national defence concept are apparent. The first argues that in the new international environment national defence should be interpreted in a broader sense to include not only military threats or wars but also threats from the economic, scientific, technological, political and cultural spheres. The second views national defence in a more narrow sense, referring to the need to modernize the armed forces, including weapons and equipment, defence science and technology, the defence industry and installations. It also refers to the need to update the training and education system for both officers and soldiers, for example, through providing advanced technical education for commanders in information-based warfare.[24]

by the editor with Maj.-Gen. Sun Bailin, Deputy Director, Department of Research Guidance, Academy of Military Science, Apr. 1994.

[20] *Selected Works of Deng Xiaoping*, vol. 3 (Foreign Languages Press: Beijing, 1994), p. 35.

[21] *Zhongguo Waijiao Gailan 1987* [Outline of Chinese foreign affairs 1987] (World Knowledge Press: Beijing, 1987), p. 398. A large number of troops have since been employed in the paramilitary forces.

[22] ‘Zhong E Lianhe Shengming’ [Sino-Russian Joint Statement], *Renmin Ribao*, 5 Sep. 1994.

[23] Jiang Zemin, ‘Accelerating reform and opening-up’, *Beijing Review*, 26 Oct.–1 Nov. 1992, p. 26.

[24] Shi Zhongcai, [An elementary discussion on the maturity of modern military personnel], *Guofang*, 15 May 1996, pp. 11–13, in ‘China: discussion on developing personnel for modern war’, FBIS-CHI-96-240, 13 Dec. 1996; and Cheng Bingwen, [Let training lean close to information warfare], *Jiefangjun Bao*,

Setting the five-year and annual defence budget plans

The Chinese defence budget is drafted concurrently with and derived from the national budget, which is prepared by the Ministry of Finance.

The coordination work for drafting the five-year defence budget is done by the Defence Bureau at the State Planning Commission (SPC), which functions under the State Council. This is initiated one to two years before the next five-year plan begins. According to arms procurement requirements provided by the HGS, the long-term (five-year) draft plans for military expenditure are submitted by the Finance Department of the GLD to the Defence Bureau, which holds intensive consultations with the Ministry of Finance and other concerned departments and agencies. After a general consensus has been reached the long-term defence budget plan is sent to the Politburo and the State Council for examination and finally to the NPC for approval.[25]

The annual defence budgets are based on the approved five-year plans. The actual process of annual defence budgeting starts when the PLAN, the PLAAF, the Military Area Commands and the Second Artillery formulate their own annual budgets and submit these to the Finance Department of the GLD. The GLD balances these budget plans in keeping with the defence strategy and the army development guidelines issued by the CMC. Finally, the annual defence budget is submitted to the CMC for approval.[26] It consists of the overall military expenditure and the budgets for departments at different levels, the various Military Area Commands and the services. There are three kinds of funds for arms procurement: (*a*) funds for earmarked procurement programmes; (*b*) 'constrained funds' for specific categories of expenditure (the departmental heads have a certain latitude with this category); and (*c*) discretionary funds.

Following approval of annual arms procurement budgets by the CMC, if the weapons are to be developed within China, orders are sent out to the relevant military services and the research projects are carried out by R&D institutions and industrial corporations.

Arms procurement planning

The HGS formulated seven five-year Weapons and Equipment Development and Procurement Plans between 1953 and 1987 and there is a long-term development plan under implementation for 1987–2000. Guided by the five-year plans and the annual defence budget, the HGS also drafts an annual arms procurement plan. This provides a detailed list of orders to defence industrial sectors, the contracts being coordinated by the MND. In the 1990s China has

12 Nov. 1996, p. 6, in 'PRC: column on training for information warfare', FBIS-CHI-96-230, 29 Nov. 1996.

[25] Ku Guisheng, 'National defence budgeting procedure and price reforms of military products', SIPRI Arms Procurement Decision Making Project, Working Paper no. 3 (1996), pp. 1–2.

[26] Ku Guisheng (note 25), p. 2.

developed a system involving a three-year rolling plan for arms procurement. This plan links annual procurement plans closer to long-term plans.[27]

In turn, based on the annual arms procurement plan, an allocation and supply plan is made based on the directives to the armed services and the Military Area Commands.[28]

A major reform in arms procurement is the emphasis placed on long-term planning. In 1986, a development strategy study programme was launched—'China Defence Science and Technology in the Year 2000'—as part of the state development strategy study project 'China in the Year 2000'. It was an inter-disciplinary and inter-organizational study, completed in 1989, and dealing with strategic guidelines and objectives, emphasizing the development of defence science and technology to the year 2000 and the policies to be adopted. This programme has improved the quality of long-term planning.[29]

Defence R&D and production

The R&D process has undergone several changes since the early 1980s with the launching of the general policy of reform and 'opening up to the outside'. Faced with a limited defence budget and resources, defence planners and analysts gradually came to understand the importance of improving the procedure for arms procurement with the aid of scientific tools and techniques. In the 1950s the application of scientific management to military administration was under-developed. In the case of the Chinese aviation industry, the practice since the 1960s has been to divide the process into: (*a*) conceptual studies; (*b*) system development and validation; (*c*) technical design and prototype evaluation; (*d*) engineering development; and (*e*) production and deployment. However, these stages were not mandated by state directives or military standards, which meant that they were not followed strictly and were sometimes neglected. Scientific management and decision making for procurement of major weapon systems has gradually improved since the early 1980s.[30]

In 1987 a government directive mandated that the defence R&D process should have five stages (see figure 2.4).[31]

1. *Feasibility study (concept design).* The operational users (military staff) and technical R&D institutes analyse and formulate the tactical–technical specification document (TTSD), which is then submitted for approval first to the HGS and the CMC and second to the SPC. The analysis includes: (*a*) operational tasks and mission parameters; (*b*) main tactical–technical performance

[27] Ku Guisheng and Zhan Wei (note 6), p. 20.
[28] Ku Guisheng and Zhan Wei (note 6), p. 19.
[29] Chai Benliang (note 5), p. 12.
[30] Wang Laoson, 'Suggestions to improve the R&D process of aircraft systems', *Aviation High Technology and Systems Engineering* (Aviation Industry Publishing House: Beijing, 1991), p. 268.
[31] Wang Laoson (note 30).

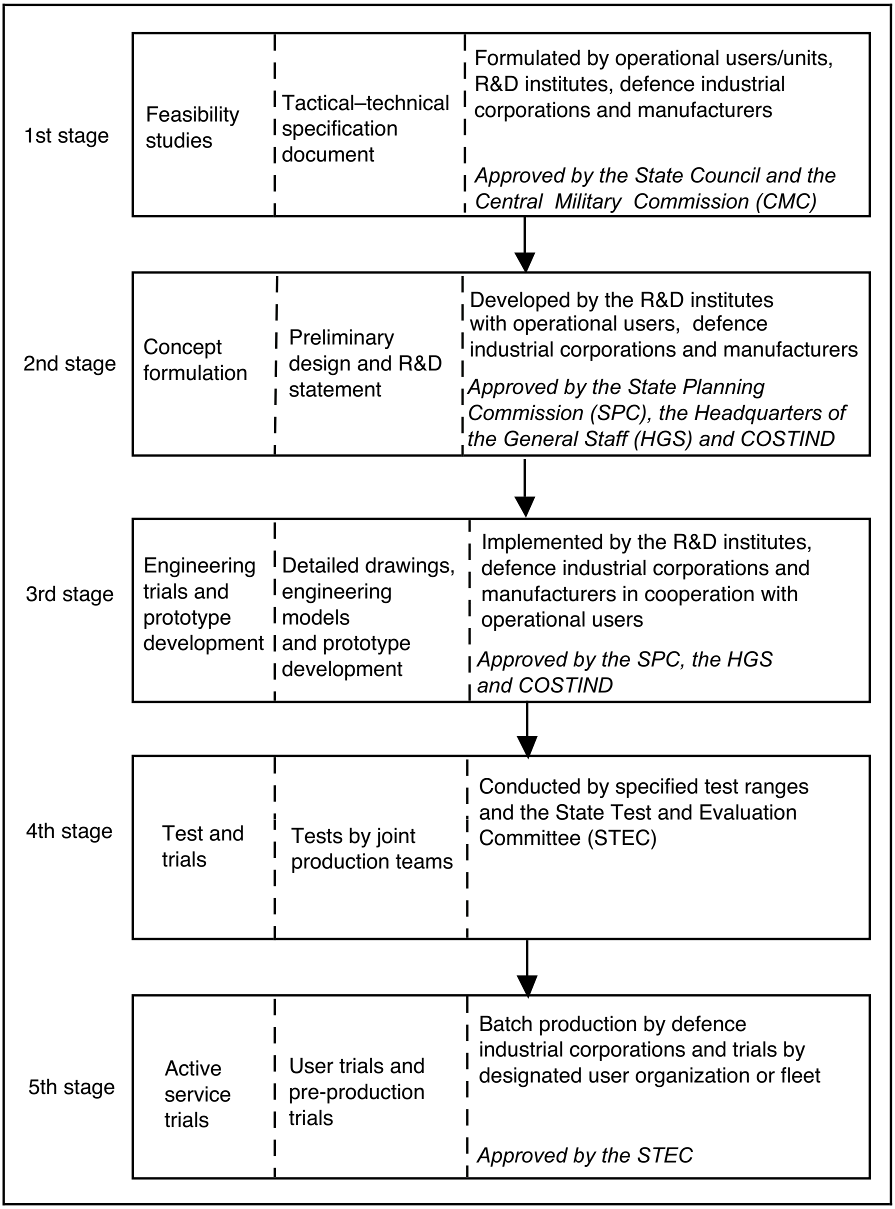

Figure 2.4. Stages in the Chinese military R&D process

Source: Adapted from Ling Ruyong, 'Procurement auditing of weapon systems', SIPRI Arms Procurement Decision Making Project, Working Paper no. 7 (1995), p. 10.

and operational requirements; (*c*) weapon system composition and preliminary requirements of main assemblies; and (*d*) indigenous R&D capabilities. The final feasibility study covers: (*a*) roles, functions and missions of the equipment in future operations and analysis of operational employment; (*b*) present status of weapon development trends and comparative analysis of weapons in the international market and the proposed indigenous development; (*c*) a tactical–technical performance assessment and feasibility analysis of indigenous development; (*d*) the R&D cycle and expected costs; (*e*) grouping of weapons and equipment; and (*f*) a proposal for design and engineering implementation.

2. *Concept formulation*. The approved TTSD is transformed into a preliminary design and R&D statement by R&D institutes together with the user services, under the auspices of industrial corporations and military headquarters. The R&D statement must provide: (*a*) the main tactical–technical performance requirements and operational requirements; (*b*) a proposed list of manufacturers; (*c*) schedules for all sub-phases in the R&D process; (*d*) estimation of R&D costs and production costs, size of trial production run, and so on; (*e*) arrangements for trial production and tests; and (*f*) the availability of R&D funds and the budget. As concept formulation is more comprehensive and detailed than the feasibility study, it is carried out jointly by the user services and the industrial authorities. If there are differences of opinion between the two parties, these are re-examined by the user services and finally decided on by the CMC.[32]

3. *Engineering*. This involves engineering trials and prototype development through coordination between R&D institutes, users and manufacturers.

4. *Test and trials*. This involves testing and evaluation by the State Test and Evaluation Committee (STEC), which is under the CMC. The STEC is responsible for issuing approvals for design, prototype development and manufacturing.

5. *Active service trial*. After approval by the STEC, industrial manufacturers organize batch production. The systems are tested by the designated user organization. The final products are tested and evaluated by the STEC again. If the project is not a major one, the test and evaluation are carried out by a secondary committee under the STEC, composed of members of the HGS, the military user service, the defence industries and certain ministries.

The standards for each stage are included in the contracts with the R&D enterprises, which are awarded through competitive bidding.[33] The entire process is coordinated by COSTIND. Appendix 2B presents a case study that describes the division of responsibility and stages involved in the development of a new weapon system.

In the case of projects for upgrading weapon systems or making improvements in the maintenance of weapon systems, joint research groups are formed to facilitate R&D work. These projects are led by the user service and focus on the improvement of weapons in service, the operation of weapons and the working conditions of the crews. A Chief Designer for technical systems and a

[32] Luo Fengbiao (note 12), pp. 11–12.

[33] Ling Ruyong, 'Procurement auditing of weapon systems', SIPRI Arms Procurement Decision Making Project, Working Paper no. 7 (1995), pp. 3–5.

Chief Administrative Director are appointed. The Chief Designer and Deputy Chief Designers of subsystems have technical responsibility and are in charge of the Design Department and the Chief Engineer's Office. The Chief Administrative Director organizes the work and is in charge of solving problems related to following schedules, improving support conditions and quality. To facilitate this work, an on-site Command Department is set up, with the participation of representatives from the armed forces and production and R&D units. To ensure that quality is high and that deadlines are kept, joint meetings and brainstorming sessions, joint inspections, joint installations and commissioning are organized, either in-house or on-site. These methods are also used in the case of private and joint venture enterprises.[34]

When weapons and related technology are imported a different procedure is followed. After approval by the State Council and the CMC, panels are formed by the HGS and industrial and R&D authorities to conduct feasibility studies, in which the technical performance specifications, quality, training and software of the various international offers are extensively compared. The domestic production facilities, technical capacity, and availability of materials and components are examined and financial analyses are conducted to assess whether the complete equipment or some components of the weapon system can be made indigenously. The requirements of time needed for local development, production of spare parts and components and the possibilities of substitution or other sources in the event of embargoes and sanctions are also studied carefully.

Each phase of the Chinese arms procurement decision-making process is managed by a different department, with different perspectives and priorities. Consequently, many problems arise in coordination between the departments. Since the Chinese arms procurement system is essentially hierarchical, horizontal coordination between different sectors is very difficult. There is a strong awareness in China regarding the importance of system management techniques in the defence industry; however, departmental alignments impede the full application of these techniques to defence R&D.[35]

Contracting

Arms procurement contracts are signed between the user services, the developers and the manufacturers. The contracts define the performance specifications of the equipment, time schedules, price or development budgets, risks, confidentiality provisions, responsibilities for developing or purchasing special equipment, and so on.[36]

Production of weapon systems through contracting is one of the reforms of the Chinese arms procurement decision-making process which were started in the mid-1980s. Military contracts are awarded through competitive bidding or through selection by way of comparisons and assessments of the industrial

[34] Luo Fengbiao (note 12), pp. 8–9.
[35] Chai Benliang (note 5), p. 16.
[36] Luo Fengbiao (note 12), p. 8.

entities concerned. Those awarded contracts are designated as prime contractors while other entities may serve as subcontractors.[37] Although state-owned non-military production enterprises, private enterprises and joint ventures are not the main contractors for military products, they nevertheless receive large military orders. After China adopted reforms and policies of opening up, many of these enterprises began to produce parts of weapon systems or even complete items of equipment.

The new contracting system for military orders is still not perfect. Problems with pricing, scheduling, quality control, and so on have arisen to varying degrees. The regulations on pricing have yet to be properly reflected in contracts and in the awarding of contracts. A procurement system for defence science, technology and industry needs to be established so that the placing of orders, the provision of *matériel*, product delivery, economic compensation and penalties for default can be regulated and supported legally. The costs of arms development have become a contentious issue, especially when the prices of *matériel*, equipment and so on have increased and fluctuated.[38] However, as the market economy is just being established in China, there is still a long way to go before the price system can reflect the actual value of military products.[39]

Criteria for costing and pricing

A critical aspect of contracting is the pricing system. The Chinese economy has, to a great extent, opened up to market forces since 1978. Although the prices of about 90 per cent of civilian products are adjusted by the market, the prices of military products are still administered by the government. The current formula for setting the prices of military production is 'planned cost plus 5 per cent'. The planned costs include charges for raw materials, fuel and power, salaries and allowances, special-purpose tools, loss and waste, quality control, workshop management and enterprise management.

In July 1993 China adopted rules of business finance and business accounting norms, so as to conform to international statistical standards and to facilitate compatibility between the Chinese and international accounting systems. This new approach encouraged reforms in the calculation of costs and prices of military products. It also encouraged factories to compete for military orders, which they had previously been reluctant to do, since military products gave lower profit margins than comparable civilian products.

According to the new accounting system, the 'planned cost' of military products is to be replaced by the 'production cost'. However, this practice is still not widespread. For example, the PLAN has adopted a price formula similar to that of the US Navy, that is, a fixed price plus an incentive.[40] The new accounting system mainly covers four items—direct materials, direct salaries, other direct

[37] Luo Fengbiao (note 12), p. 8.
[38] Luo Fengbiao (note 12), p. 19.
[39] Ku Guisheng (note 25), p. 7.
[40] Luo Fengbiao (note 12), p. 19.

expenses and production expenses.[41] Management and sales overheads are not included in production costs but will be deducted from profits: this will include salaries and allowances for workshop administrators, expenses for administration, and depreciation and maintenance of buildings and installations used for workshop administration. Costs of technology transfer, R&D, design, testing and assessments will be put under production expenses. The depreciation rate for fixed assets has been raised from 3 to 7 per cent.[42] The production cost accounting system reflects the actual cost of military products more accurately than the planned cost system. However, it will take a relatively long time to implement the new accounting system in all the military production enterprises.

The implementation of price reforms for military products requires several steps. First, the scale and structure of military production need to be adjusted to balance supply and demand. At present, the domestic demand for military products is less than 10 per cent of the production capacities reserved for the military. Second, fixed expenditure must be apportioned for maintaining military lines of production: production capacities surpass peacetime demand, but have to be maintained to meet a surge in demand or unexpected wars. Third, the price reform system must be able to handle the sharp increase in the price of military products. Owing to the increase in the prices of raw materials, spare parts and other items, the producers of military products have asked for an 82 per cent increase in their prices.[43] If prices of military products increase to that extent, the defence budget will not be able to cover the development of new weapons. Fourth, profit margins on military products need to be adjusted in order to encourage the maintenance of military production lines.

There are two different opinions about the profit rate of military products. One view favours maintaining the current profit rate, that is, 5 per cent of the cost. Three reasons are given to support this view: (*a*) the fixed assets of military enterprises are invested by the state and the state also supplies them with operating funds; (*b*) there is less investment risk for military production because the production cost is reimbursed by the state; and (*c*) the limited budget allocated for arms procurement cannot accommodate a sharp rise in the prices of military products.

The other view contends that the profit rate of military products should be the same as, or somewhat higher than, the average profit rate for civilian goods. This suggestion is based on two arguments: (*a*) that military enterprises are responsible for their profits and losses so that they will seek a higher profit rate than the average; and (*b*) a lower profit rate will undermine their research and production efforts. Proponents of this view recommend that the price formula for military products should be:

[41] Liu Ping, 'Jungong Shengchan Hetong Guanli' [Management of military product contracts], *Junshi Jingji Yanjiu*, no. 3 (1994); and Ku Guisheng (note 25), p. 9.

[42] Ku Guisheng (note 25), pp. 9–10.

[43] Ku Guisheng, 'Junpin Jiage Bianhua' [Price changes of military goods], *Shichang Jingji Yanjiv*, no. 2 (1992).

$$Pr = (C+E)(1+Pt)$$

where *Pr* is the price of military products, *C* is the production cost, *E* is the allowance for management expenses (to include sales and finance expenses) and *Pt* is the average profit.[44]

Evaluation and auditing in weapon development

To ensure that quality requirements are met, tests should be done at each stage of the weapon development process. If rigorous testing in the form of design approval, type manufacturing approval and acceptance trials is carried out, the operational and technical standards of a product are assured. Auditing authorities within COSTIND carry out the auditing functions. However, arms procurement auditing should assess the financial burden of a weapon system through its entire service life. Experience shows that only by adopting a life-cycle method can the performance and cost requirements be met, demands for additional funding be avoided, quality be ensured, life cycles be prolonged and new products of high-quality performance for improving the next generation of equipment be proposed.

Prototype design approval—the technical model

Prototype design approval tests are divided into two categories: (*a*) 'proving' range tests designed to examine the product's technical performance; and (*b*) field force trials which examine the product's operational performance. The standards and requirements to be met for prototype design approval include the requirements of standardization and serial production, that product assemblies are complete, and that there are reliable supplies for all assemblies, spare parts, components and new materials needed for producing the equipment.

Type design approval—the engineering or demonstration model

In order to qualify for type design approval, the following requirements must be met: (*a*) all key technical problems of the product must have been solved and the solutions demonstrated through a process of necessary testing; (*b*) testing of the product's designed characteristics must have been done to show that technical performance and operational requirements have been met; and (*c*) all technical drawings and documents needed for type design approval tests must have been completed.

[44] Ku Guisheng (note 25), p. 14. Another perspective on this 2nd approach suggests that price estimates could include profit rates and contract amounts. These include allowances for the costs of raw materials, fuel and power, wages, overheads and special charges. Engineering costs are estimated by adding up the costs of each component that goes into the complete weapon system to obtain a total sum. R&D entities relevant to the proposed weapon system carry out costing under the leadership of COSTIND. Ling Ruyong (note 33), pp. 7, 14.

Product manufacturing approval—the pre-production model

The standards and requirements that must be satisfied for product manufacturing approval include: (*a*) that quality is stable, in the interests of large batch production; (*b*) that the requirements for type design approval have been met; (*c*) that operational requirements are satisfactorily demonstrated through testing by the user services and field forces; (*d*) that all technical documents that are needed for manufacturing and acceptance have been completed; and (*e*) that all assemblies, spare parts, components and new materials can be supplied on time. In order to apply for product manufacturing approval, the trials of a product and its production requirements are evaluated by the manufacturer under the supervision of a responsible body in accordance with the requirements for type manufacturing approval. Field trials and operational trials of the product are to be conducted by the user services according to their trials programme, and thereafter type manufacturing approval tests must be completed if necessary.[45]

Cost-effectiveness analysis

An analysis of cost-effectiveness should be conducted at each stage of the arms procurement decision-making process in order to ensure that actual expenditure does not exceed the funds budgeted.

Analysis of cost-effectiveness is likely to become a normative requirement in arms procurement decisions in China. It has been applied in linking the feasibility studies with acceptance trials and tests in some cases. However, the application of the analysis needs to be extended to all stages of procurement. The analysis of cost-effectiveness and life-cycle costs for weapon systems is generally conducted by the systems engineering institutes (centres or departments) established in the relevant PLA armed services and defence enterprises. As the weapon system can be assigned several different missions, it is not always feasible to synthesize the different effectiveness measures into a single effectiveness index.[46]

The cost-effectiveness evaluation is completed before the process of selecting the weapon system begins, and only one of the proposals is required to be submitted to the HGS, COSTIND and the SPC for their decision. The basic steps to be completed at this stage include: (*a*) determining the objectives of the cost-effectiveness analysis; (*b*) constructing and selecting alternatives; and (*c*) analysing the effectiveness of alternatives, including inherent capability, reliability, maintainability, durability, survivability, safety and human factors. An assessment of the quantitative relationship between total costs and the effectiveness index of the weapon system in terms of the probability of it being

[45] Ling Ruyong (note 33), pp. 5–6. The institutes or organizations responsible for the field tests and operational trials of a new product generally include specified test ranges or trial troops/fleets which provide test fields, suites or platforms, environmental support, such as safety measures, and engineering entities which prepare and operate their products, including providing test instruments and engineers.

[46] Ling Ruyong (note 33), pp. 5–8.

used for several different missions must also be undertaken. A decision is then made to continue to implement, revise or abandon the plan.

The estimates of the life-cycle costs are based on: (*a*) R&D, including costs paid for R&D as well as a part of supporting costs, namely, feasibility and concept formulation, design and trial production, and tests and evaluation; (*b*) purchase costs, including auxiliary equipment, installation, training and support, and so on; (*c*) operational costs, which are paid for operating and supporting the equipment during its commission in peacetime or wartime, including operating costs, maintenance costs, support costs and technical upgrading costs; and (*d*) the costs of decommissioning.[47]

III. The domestic context

This section examines the harmonization of the Chinese defence budget with the security situation and economic modernization. The principles guiding arms procurement decisions in peacetime are based on the availability of financial resources and the requirements of national security. Before the 1980s, there were five periods of dramatic increase in China's defence budget: 1951–53, 1959, 1962–66, 1969–71 and 1978–79.[48] During these five peak periods, China was involved in military conflicts with the USA, Taiwan, India, the Soviet Union and Viet Nam, respectively. Although the historical record indicates that China increases its arms procurement whenever it feels that its security interests are compromised, in this context a rise of nearly 90 per cent in Chinese military expenditure between 1990 and 1994 remains to be explained.[49]

Allocation of the defence budget

The level of transparency and accuracy of the official Chinese defence budget is often questioned on the assumption that there are hidden expenditures for military projects. Because the ways in which defence budgets are defined vary between countries, and because arms procurement expenditure is related to many sectors of civilian production, countries sometimes exclude various aspects of military-related projects from the defence budget. In the data released by the State Statistical Bureau on Chinese defence expenditure, items like the military's academic research and infrastructure projects are not included in the defence budget.[50]

Generally speaking, Chinese arms procurement takes up less than one-third of the defence budget. Before the 1970s, it accounted for less than 30 per cent, and since then it has increased to 30–32 per cent. For an overview of the Chinese

[47] Ling Ruyong (note 33), pp. 12–14. Another source claims that life-cycle costs (including expenditure on research, production, maintenance and demobilization) are in practice not yet being used in costing weapon production in China. Ku Guisheng (note 25), pp. 15–16.

[48] *Statistical Yearbook of China 1993* (Statistics Press: Beijing, 1993), p. 223.

[49] Ku Guisheng (note 25), p. 18.

[50] Ku Guisheng (note 25), p. 6–7.

Table 2.1. The Chinese defence budget, 1953–80
All figures are percentages.

	1953–57	1958–62	1963–65	1966–70	1971–75	1976–80
Personnel	38.77	41.40	36.67	33.66	27.81	23.48
Administration and public affairs	10.26	12.30	10.45	9.75	10.49	11.69
Maintenance	7.74	12.20	11.40	9.05	9.45	11.88
Arms procurement	28.22	15.53	21.79	24.39	31.28	30.75
Fuel	1.92	3.32	3.67	6.10	6.41	7.77
Construction	12.11	8.83	8.39	12.45	9.95	9.06
R&D	. .	. .	. .	0.67	2.22	1.10
War-readiness	. .	. .	1.31	3.00	1.46	0.96
Miscellaneous	1.25	4.99	5.56	0.96	0.93	3.31

Source: Zhang Zhenlong, *Jundui Jingjixue* [Military force economics] (China Price Press: Beijing, 1993), pp. 105–108.

defence budget between 1953 and 1980, see table 2.1. In 1994, China's expenditure on national defence totalled 55.071 billion yuan ($6.4 billion).[51] Of this amount, 34.09 per cent (18.774 billion yuan, or $2.2 billion) was spent on personnel, administration and public affairs; 34.22 per cent (18.845 billion yuan, or $2.2 billion) on maintenance of facilities, fuel, military construction and war-readiness; and 31.69 per cent (17.452 billion yuan, or $2 billion) on R&D, maintenance and weapons procurement. Thus, maintenance costs absorbed the largest share of military expenditure.[52]

Balancing military and economic modernization[53]

The foremost principle influencing Chinese arms procurement decision making is the balance between economic development and military modernization. It involves several important aspects.

First, China regards a strong and solid economy as the foundation for military modernization. At a talk organized by the CMC in 1984 Deng Xiaoping said: 'The air force, the navy and the Commission in charge of Science, Technology and Industry for National Defence (COSTIND) should divert some of their resources to foster the development of the economy'.[54] In a meeting of the CMC in 1985, Deng persuaded the military to be patient and tolerant in accepting a limited defence budget and to postpone the modernization plans. He said: 'The four modernizations should be achieved in order of priority. Only

[51] Based on the 1994 exchange rate (period average) of 8.6 yuan = $1. International Monetary Fund, *International Financial Statistics Yearbook 1997* (IMF: Washington, DC, 1997).

[52] 'China issues White Paper on arms', *China Daily*, 17 Nov. 1995. In addition to living costs and normal activities of the personnel, nearly 3.7 billion yuan ($429 million) is spent on social welfare.

[53] On military modernization, see section IV in this chapter.

[54] *Selected Works of Deng Xiaoping* (note 20), p. 105.

when we have a good economic foundation will it be possible for us to modernize the army's equipment'.[55]

Second, military modernization should not jeopardize the favourable international conditions for the country's economic development. Chinese leaders have reiterated that China's development needs a peaceful international environment, and any heightened tensions either in East Asia or in the Asia–Pacific region would undermine China's economic and political prospects. General Liu Huaqing, Vice-Chairman of the CMC, stressed this point again during his meeting with the visiting US–Pacific Commander on 27 April 1995.[56]

Some of the questions currently facing the military and civilian leadership concern: how the relationship between military modernization and economic development should be handled; how arms procurement should be balanced with economic investment; finding the ideal method of transferring military technology to civilian production so as to contribute to the national economy in a positive way; and how arms procurement can be commercialized in such a way as to strengthen China's military modernization rather than undermine it.

The Chinese leaders consider that the development of defence science and technology and weapon systems involves an analysis of factors influencing requirements, feasibility and the environment. The requirements depend on the strategies for national development, defence development, defence science and technology, and weapon systems development and are closely related to the accepted military strategy. Feasibility refers to the capabilities of the national economy and military technology. The environment refers to forecasts of future wars and emerging military technologies.[57]

For some time China tried to develop its own approach to arms procurement, seeking to balance a poor economy and heavy pressure from national security concerns. In July 1980, Marshal Nie Rongzhen, who was then in charge of the national defence industry, wrote to General Liu Huaqing, then Deputy Chief of the General Staff, about ways of approaching arms procurement decisions with regard to China's circumstances. He suggested that the approach to be taken should entail solving problems continuously as they appear with regard to China's unique conditions of geographical diversity and technological backwardness. This reality prevents China from acquiring modern military equipment in the same way as newly industrializing countries or entering the arms race like the developed nations. General Liu emphasized that China should be equipped with just enough military capability to deter aggression from powerful enemies while saving critical funds for improving the quality of weapons and equipment as quickly as possible.[58]

In order to modernize the PLA's equipment at low cost, China developed some basic principles of arms procurement. They are summarized as techno-

[55] *Selected Works of Deng Xiaoping* (note 20), p. 133. The 4 modernizations in agriculture, industry, science and technology and national defence were instituted by Deng Xiaoping in Dec. 1978.

[56] *Renmin Ribao* (overseas edn), 28 Apr. 1995.

[57] Luo Fengbiao (note 12), pp. 5–6.

[58] Han Huaizhi (ed.), *China Today: The Military Affairs of the Chinese Army*, vol. 2 (Chinese Social Science Press: Beijing, 1989), p. 121.

logical superiority, appropriate technology, efficient performance, low cost and ease of handling and maintenance.

Based on these principles, four basic elements of arms procurement policy can be discerned. The first is to reduce quantity and improve quality. In this regard, the PLA will gradually replace its obsolete arms with advanced systems. As the unit costs of advanced weaponry will be higher, the replacement programme will reduce the volume of weapon holdings. In terms of defence R&D, China is concentrating its limited resources on projects of new and high-technology research on a small scale. The second element is to concentrate on developing critical items such as electronic equipment and precision-guided weapons. The third is to deepen reform and improve management of arms procurement. The fourth element is to supplement domestic military production with arms procurement from abroad.[59]

Conversion

In order to maintain a balance between military and economic modernization, China has adopted a policy of combining military and civilian production which aims at preserving essential military industrial assets when they are used for civilian production and to support military products with earnings from civilian production.[60]

After 1978 China made economic development a top priority, which resulted in a sharp fall in military orders. In order to use the surplus capacity in defence production fully, military and civilian production were combined, resulting in the conversion of some defence industrial units to civilian production, on the one hand, and the awarding of military contracts to civilian industries, on the other. The general strategy is to use surplus capacities and manpower in military R&D and defence production enterprises for civilian products while keeping small units of the key technical workforce employed on defence products so that essential R&D projects and production for national defence do not come to a standstill.[61]

The Sixth Five-Year Plan (1981–85) proposed that the defence industry should produce 18 categories and 275 kinds of civilian product.[62] These were mainly machinery for the light industries and textile industries, domestic electrical appliances, motor cars and motorcycles, ships, offshore platforms, electric power machinery, aircraft and satellites for civilian use, automation instrumentation, machinery for the chemical industry, building materials and computers.

[59] Based on Luo Fengbiao (note 12), p. 20; and Chai Benliang (note 5).

[60] Interviews by the volume editor with Chai Benliang and Ling Ruyong, Beijing, Dec. 1995.

[61] Luo Fengbiao (note 12), p. 14.

[62] Luo Fengbiao (note 12), pp. 14–15. E.g., the Wuxi Sonar Works diverted a sizeable portion of its technical force into the development of medical instruments and achieved success in both domestic and overseas markets, while continuing the development of new sonar equipment. The torpedo plant continued with its torpedo production in the older workshops while developing tobacco machinery in the newly built facilities.

Since the 1980s, COSTIND has organized defence 'sci-tech' industrial units to sign cooperation agreements with provincial and municipal enterprises and institutions on developing civilian products and transfer of technologies. In March 1986 the State Council approved China's first high-technology R&D Programme, which aimed at integrating military and civilian applications in dual-use technology areas such as biotechnology, information technology, space, automation, energy and advanced materials.[63]

In 1989 China established a Civilian Applications of Military Technology Liaison Group composed of representatives from the SPC, the State Scientific and Technological Commission and COSTIND. In this group COSTIND is represented by the China Association for the Peaceful Use of Military Industrial Technology (CAPUMIT). In provinces and municipalities with concentrations of defence enterprises, leading groups have been established to coordinate conversion from military to civilian production, facilitating such transfers in national, regional and industrial development plans. Some of the government departments formerly in charge of military production have already been changed into general corporations within their respective trades.[64]

During the Sixth (1981–85) and Seventh (1986–90) Five-Year Plans, China invested approximately 4 billion yuan ($1.2 billion)[65] in projects to convert defence industries to civilian production. During the Eighth Five-Year Plan (1991–95), an additional 10 billion yuan ($1.8 billion) were invested.[66] Defence industrial enterprises enjoy the same preferential policies that the state applies to other industries to encourage reform of enterprise management and use of the contract pricing system. As the contracts stipulate, enterprises are to pay a part of their profits to the government in addition to taxes. The remaining profits from civilian goods production will be used to expand production of such goods.[67] The China Industrial and Commercial Bank annually provides special credits for conversion of military technologies to civilian use.[68]

The process of conversion from military to civilian production has been facilitated by a number of initiatives such as: (*a*) changing the traditional concepts of information control to marketing of science and technology information; (*b*) opening up the technology market, with the China Defence Science and Technology Information Centre (CDSTIC) organizing trade fairs; (*c*) disseminating information on the commercialization of defence technologies through the weekly newspaper 'China defence industry' published (in Chinese) by the CDSTIC with the support of the Technological Base Bureau of COSTIND; (*d*) building up specialized networks in defence science and technology and

[63] Luo Fengbiao (note 12), p. 17.

[64] 'China issues White Paper on arms' (note 52). The Ministry of Machine Building and Industry and the Ministry of Electronics Industry still retain characteristics of government ownership; however, they have many commercially owned subsidiaries.

[65] The figure is based on the 1986 exchange rate (period average). *International Financial Statistics Yearbook 1997* (note 51).

[66] China issues White Paper on arms' (note 52). The figure is based on the 1991 exchange rate (period average). *International Financial Statistics Yearbook 1997* (note 51).

[67] 'China issues White Paper on arms' (note 52).

[68] Luo Fengbiao (note 12), p. 17.

industry; (*e*) building up databases to include information on defence factories and institutes, transferable technologies, civilian products and machinery; and (*f*) focusing on popularizing key technological achievements.[69] There has been significant funding and support for studies and research on conversion from the China National Natural Science Foundation, which was set up in 1982.[70]

As a result of the new national industrial policy, roughly 450 production lines are now operating in the defence industry producing civilian consumer goods. The output value of civilian products manufactured by the defence industry has been increasing at an annual average rate of 20 per cent, and in 1994 it represented approximately 80 per cent of the total output value of the defence industry as opposed to only 8 per cent in 1979.[71] The output of civilian goods and technologies from the China Aerospace Corporation accounts for 70 per cent of its gross industrial output.[72] Conversion initiatives have been most successful in the electronics industry. In 1979–85 the output value of civilian products increased by 42 times and in 1990 was estimated as 90 per cent.[73] Joint ventures between Chinese and foreign enterprises in dual-use technology are seen as an important approach to technology acquisition and upgrading. In 1984–92 the China North Industries Corporation (NORINCO) established 70 joint ventures with foreign companies, in which dual-use products accounted for 60 per cent of production.[74]

In December 1990 COSTIND drew up a national Critical Technologies Plan (1991–95), which was revised and published in 1993.[75] Technology-intensive defence industries have thus become the mainstay of the modernization of the national economy. Their advantages in human resources, technology, management and facilities obtained through R&D on military products have been useful in providing qualified staff, technology, equipment and products to other civilian industries in the state sector.[76]

In addition, new technologies imported or developed domestically for civilian products, such as gyro-compasses, computers, diesel engines, microprocessor control and monitoring systems and industrial robots, are transferred to military applications after modification. This contributes to the upgrading of research in both the civilian and the military sectors. For example, computers for civilian

[69] Shi Xianqing, 'Information on military conversion', and Wang Shouyun, 'Conversion, dual-use and transfer of technology', Papers presented to the Conference on Restructuring the Military Industry: Conversion for the Development of the Civilian Economy, jointly organized by the China Association for the Peaceful Use of Military Industrial Technology (CAPUMIT) and the United Nations Department of Development Support and Management Services (UNDDSMS), Hong Kong, 1993.

[70] Hu Jian, 'The role of the China National Natural Science Foundation in conversion', Conference on Restructuring the Military Industry (note 69).

[71] Luo Fengbiao (note 12), p. 17.

[72] Wang Maochang, Paper on 'Transfer of military industrial technology for civilian production', Conference on Restructuring the Military Industry (note 69).

[73] Shen Shuiyan, 'The conversion experience of the Chinese electronic industry', Conference on Restructuring the Military Industry (note 69).

[74] Gu Wei, 'Sino-foreign joint venture and cooperation: an important approach to military conversion', Conference on Restructuring the Military Industry (note 69).

[75] Wang Shouyun (note 69).

[76] Luo Fengbiao (note 12), p. 5.

use, after being adapted for use on board warships, have been upgraded significantly in precision and failure rates have been reduced.[77]

The defence conversion initiatives undertaken since the end of the 1970s have resulted in a remarkable increase in labour productivity in four defence industrial sectors—aeronautics, electronics, ordnance and shipbuilding.[78] However, notwithstanding the impressive social and economic benefits of conversion of defence enterprises, the transfer of China's R&D achievements to the civilian industrial sector remains unsatisfactory. The main reason for this is the inadequate infrastructure, such as technological information networks, technology transfer markets and sources of venture capital. The transfer of military technologies to civilian use requires the joint participation of military and civilian personnel. It is, therefore, more complex than technological innovation.

In the conceptual phases of new, high-technology defence development projects, the possibilities of developing dual-use technologies are examined.[79]

The balance between imports and domestic production

Two domestic factors determine Chinese military modernization: (*a*) China is reducing the numbers of its active troops from the former 3 million; and (*b*) with its growing economy and foreign exchange reserves, the possibilities of qualitatively improving domestic military production in technological terms can be realized in the foreseeable future. Nevertheless, as Chinese R&D and industrial capabilities cannot quickly produce sophisticated arms, China must continue to import foreign arms in order to accelerate the pace of military modernization and to meet emergent security requirements. For example, French SA-342 and US UH-60 helicopters have been imported to build up the Army Air Corps, whose units are mostly under the Chengdu Military Region responsible for the Sino-Indian border.[80]

Self-reliance is the first principle adopted by the Chinese Government to maintain a balance between imports of foreign arms and domestic military production. Dependence on foreign arms suppliers is considered a political handicap since, in the eventuality of a crisis, China could become subject to foreign political influence or embargo.

China has already experienced the insecurities of arms dependence with the Soviet Union in the late 1950s and with the USA in the 1990s. Its experience with the Soviet Union vividly illustrates the disadvantages of importing manufacturing capabilities without acquiring design and production technology domestically. After the Soviet Union began withdrawing its experts from China in 1958, the Chinese defence industry was severely undermined. China's experience with the USA also conveyed the unreliability of foreign military agree-

[77] Luo Fengbiao (note 12), p. 17.
[78] Chai Benliang (note 5), p. 16.
[79] Chai Benliang (note 5), p. 17.
[80] Fan Wei, 'Arms procurement and national development in P. R. China', SIPRI Arms Procurement Decision Making Project, Working Paper no. 6 (1995), p. 14.

ments. In the 1980s, China sent representatives of the PLAN and the China State Shipbuilding Corporation to the USA to purchase marine gas turbines and decided to import those produced by the General Electric Company. However, the political tensions between China and the USA after the 1989 Tiananmen Square incident disrupted this contract[81] as well as the agreement to upgrade Chinese aircraft. The USA's annulment of these contracts caused delays in the modernization of the PLAN and the PLAAF.

To develop its indigenous capacity and approach its goal of self-reliance, China has tried to avoid purchasing many finished weapon systems and has focused instead on obtaining production technology through licensing agreements. Only a small number of weapon systems, their key components, test equipment and production know-how are imported. Related technologies are absorbed and upgraded to meet local requirements with the help of local R&D.

A second principle for maintaining a balance between arms imports and domestic production is to indigenize imported military technology. Consequently, China's arms import policies prioritize the import of production lines, combined with other measures: (*a*) importing complete weapon systems; (*b*) importing broken-down kits to be assembled; (*c*) importing parts that have been planned for production in China but are still not indigenized; (*d*) assembling weapons with indigenous parts; and (*e*) provisionally importing some parts for which it is not viable financially to construct new production lines.[82]

Requests for procurement of foreign arms or military technology are raised by the HGS. If the request to import a weapon system can be afforded within the budget, it is included in the proposals of the SPC and the Ministry of Foreign Trade and Economic Cooperation, and sent to the CMC and the State Council for approval. Thereafter, joint groups of experts from the PLA, manufacturing enterprises and R&D institutions are formed to study the technical performance, specifications, quality and ease of supply of the items to be imported, the training they would require and software needed.[83] These feasibility studies are guided by three principles:

[81] Luo Fengbiao (note 12), pp. 12–13.

[82] Luo Fengbiao (note 12), p. 12. In order to upgrade the propulsion system of 1 type of guided-missile destroyer by adopting the combined diesel engines or gas (CODOG) propulsion system, the whole system, including the gas turbines, diesel engines, 'reduction gears', shafts and controllable pitch propellers, was to be purchased from abroad and then indigenized in China step by step. Teams sent by the PLAN, the China State Shipbuilding Corporation and other authorities visited Germany, Sweden, the UK and the USA many times and finally decided on purchasing the naval gas turbines from the General Electric Company in the USA; the diesel engines and control and monitoring system from Motoren- und Turbinen-Union Friedrichshafen GmbH (MTU) of Germany; the gearboxes from Renk of Germany; and the controllable pitch propellers from KaMeWa of Sweden. MTU acted as prime contractor for the whole system. The working drawings for installation on board were done by the Ship Design Institute of the shipbuilding industry. The whole project was carried out through the concerted efforts of the end-user, builder, designer and foreign supplier. The China State Shipbuilding Corporation has since bought the production know-how of the controllable pitch propellers from KaMeWa and the diesel engines from MTU. However, the anticipated cooperation for the production of naval gas turbines with the US companies was disrupted for political reasons. Luo Fengbiao (note 12), pp. 12–13.

[83] Luo Fengbiao (note 12), pp. 11–13.

1. The production of arms under licence from foreign suppliers should include an element of domestic production in terms of technology, materials and components.

2. It should be possible to indigenize the parts or components of the imported equipment in a specified period of time. The possibility of indigenization is given special consideration since China cannot afford large amounts of military imports.

3. The technology of the imported weapons or equipment should be advanced but available at reasonable prices.

On the basis of these principles, the user services can either import the required technology or equipment through their own trading companies[84] or entrust the order to a trading company of the manufacturing industry under the State Council[85] or the Technology Import and Export Corporation and Machinery Technology Import and Export Corporation of the Ministry of Foreign Trade and Economic Cooperation.[86]

In addition to the import of foreign arms and equipment, China has tried to upgrade its arms through technological cooperation with foreign countries. According to incomplete statistics, China sent about 480 military delegations (or groups) to 55 countries for the purpose of learning about weapon and equipment technology or to establish cooperation on arms or military procurement during the period 1979–87.[87] Like other nations, China attaches great importance to attracting foreign investment. With an increased inflow of capital, facilities for R&D and production can be modernized, products upgraded and competitiveness improved quickly. This is also very important for defence enterprises, since they are now opening up to foreign cooperation in the civilian sectors. According to one report, joint ventures in the electronics industry hold a strategic position in the Chinese economic build-up, and nearly 500 joint ventures with foreign companies have used $4.6 billion up to 1994.[88] Although private and joint-venture enterprises still do not represent a large sector, they have boosted their position very fast since the introduction of economic reforms in China.[89]

[84] The Equipment Technical Department of the GSD or the HGS has a Bureau of Military Equipment and Technical Cooperation (BOMETEC) and a Military Trade Office. The trading companies are Polytechnologies Inc.; China Electronic Systems and Engineering Company (CESEC); Ping He Electronics (military technology trading); and China Zhihua Corporation (communications equipment, computers, image processing and navigation equipment). Holberton, S. and Walker, T., 'The generals' big business offensive', *Financial Times*, 28 Nov. 1994, p. 13.

[85] E.g., the North Industries Corporation (NORINCO), the China Shipbuilding Trading Company (CSTC) and the China Electronics Industry Corporation (CHINATRON).

[86] Luo Fengbiao (note 12), pp. 11–12.

[87] Han Huaizhi (note 58), p. 111.

[88] Luo Fengbiao (note 12), p. 18. Some joint ventures have become subcontractors for developing parts for military products, as in the case of bearings produced for military use.

[89] Luo Fengbiao (note 12), p. 9.

IV. Factors influencing arms procurement

Security issues

Sino-US relations

Generally speaking, China's security environment improved after the collapse of the Soviet Union, but there are grounds for long-term security concern. The USA is increasingly at odds with China over a host of security issues from arms sales to Taiwan to the proliferation of weapons of mass destruction. After the cold war the USA dramatically reduced its military presence in Europe while maintaining its military strength in the Pacific and East Asia regions.

Incidents such as the blocking of the Chinese cargo ship *Yinhe* (Galaxy) in the Persian Gulf for more than 20 days on suspicion of carrying chemical weapon precursors to Iran in 1992, the tracking of Chinese nuclear submarines in the Yellow Sea by the US aircraft-carrier *Kitty Hawk* in 1994, and the presence of US aircraft-carriers in the Taiwan Straits in March 1996 make the Chinese leadership wary and suspicious of US policy towards China, making it the foremost security issue influencing arms procurement by the PLA. Since it is difficult to predict whether the USA will shift its Chinese policy from one of engagement to confrontation, the Chinese believe that the US strategy could be to delay China's economic modernization by forcing China to divert its investment to the military production sector, as this strategy was assumed to be effective on the Soviet Union during the cold war.[90]

A US policy of confrontation towards China will drive it to strengthen its arms procurement from other military powers, such as Russia. During Prime Minister Li Peng's visit to Moscow in June 1995, China and Russia issued a joint communiqué on the development of military technology cooperation.[91] However, if the USA resumes a strategic relationship with China like that pursued in the 1980s, China may resume arms cooperation with the USA.

The Taiwan issue

After consolidating his power in Taiwan in the 1996 election, President Lee Teng-hui launched a diplomatic campaign to gain greater international recognition. As a consequence, separatism has gained momentum in Taiwan.[92] If Taiwan declares its independence, mainland China may resort to military force.

The initiatives of the Taiwanese leadership towards independence from the mainland are largely based on two assumptions—the expectation of US military involvement in a possible war in the Taiwan Straits and a continuation of the

[90] Yan Xuetong, 'China's security and military transparency', SIPRI Arms Procurement Decision Making Project, Working Paper no. 4 (1996), p. 2.

[91] 'Zhong E Lianhe Gongbao' [Sino-Russian joint communiqué], *Renmin Ribao*, 28 June 1995.

[92] In a survey by the Taiwan authorities in 1994, 12.4% of respondents were firm separatists, 32.1% favoured independence or permanent separation and 27.4% favoured reunification. Hu Zhiquiang, 'Ziang Taiwan shuo "Yes"' [To say 'yes' for Taiwan], *Zhongyiang Ribao* (international edn), 21 Sep. 1994.

large arms supplies from the USA and Western Europe. According to a Hong Kong newspaper, one of President Lee Teng-hui's advisers revealed the belief of Taiwanese leaders that the USA would take appropriate action against China if a war broke out in the Taiwan Straits.[93] After 1991, Taiwan increased its arms imports, mainly from the USA. By the end of this century, Taiwan aims to possess around 340 sophisticated fighter aircraft, including 150 F-16s, 60 Mirage 2000-5s and 130 Ching-kuo indigenous defence fighters. In contrast it should be noted that the mainstay aircraft of the PLA are the out-of-date J-7 and J-8.[94] The PLAAF will not be able to introduce the J-10, an advanced combat aircraft, by the end of this century. In the past few years, Taiwan has leased naval equipment from the USA, such as frigates, landing ships and mine-sweepers. It is also constructing seven improved Perry Class frigates and importing six Lafayette Class frigates.[95]

Faced with such a situation, the PLA needs to upgrade the arms and equipment of the PLAN and the PLAAF in order to prevent military conflicts in the Taiwan Straits. The only way to prevent Taiwan from becoming independent is to maintain mainland China's military advantage over Taiwan. During his inspection of a military manoeuvre in December 1995, Jiang Zemin, the Chairman of the CMC, observed that: '[w]e must emphasize naval building and speed up modernization of the navy in order to ensure our maritime security and push for national reunification'.[96]

Economic security

Since the end of the cold war, economic security has become a major aspect of Chinese security. Economic security differs from territorial security. It extends beyond a country's border and is more difficult to ensure. The emerging problems associated with economic security also have an impact on Chinese arms procurement. China must balance the competing demands of development strategies or requirements for national development with the development of national defence and military technology. These requirements are pursued by synthesizing the capabilities of national economic and technological power—a responsibility which is in the general domain of the State Council working through the State Planning, Economic, Science and Technology, and Education Commissions, as well as the Ministry for Foreign Affairs, the HGS and COSTIND. In this way the broader development of military strategy, technology and arms procurement is harmonized with national development strategy. This process requires the joint approval of the CMC and the State Council.[97]

[93] 'Taiwan Guji Ta Zaudau Jingong Shi Hui Tedao Zhichi' [Taiwan expecting support when it is attacked], *Dongfang Kuaixun*, 24 Aug. 1995.

[94] 'Zhongguo Fazhan Xingxing Junyong Faiji' [China developing new military aircraft], *Renmin Ribao* (overseas edn), 2 Dec. 1988.

[95] Swaine, M. D., 'The modernization of the Chinese People's Liberation Army: prospects and implications for Northeast Asia', *NBR Analysis*, no. 3 (Oct. 1994), p. 15.

[96] 'Jiang Zhuxi Shicha Haijun Budui Guankan Haishang Yanxi' [Chairman Jiang inspects navy and watches manoeuvre], *Renmin Ribao*, 19 Oct. 1995.

[97] Luo Fengbiao (note 12), pp. 5, 6.

China's economy is becoming increasingly integrated into the world economy. Exports increased to 19.5 per cent of gross national product (GNP) in 1992, from 6 per cent in 1980[98] and the increasing globalization of the Chinese economy will further increase overseas trade. Because about 85 per cent of its foreign trade is transported by sea,[99] it is logical that China's maritime security concerns derive from the need to protect the sea lines of communication and offshore resources.

In 1992 China declared that its Law on its Territorial Waters and Contiguous Areas—its interpretation of the 'continental prolongation principle' of the 1982 UN Convention on the Law of the Sea—supports its claim to the Spratly/Nanshan Islands.[100] In the face of increasing demand and depleted oil reserves, pressure has increased for access to the oil believed to be in the South China Sea. China became a net oil importer in 1994, and its gross oil imports may approach 1 million barrels per day by the turn of the century. The quality of Chinese iron ore is low and its steel industry increasingly relies on imported iron ore from Australia and Latin America. To maintain durable high growth in the economy, China must secure its sources of energy supply and steel production; therefore, maritime routes are vital to the Chinese economy.[101]

Military modernization

Faced with such economic security concerns, China needs to modernize its military, especially the PLAN.

> . . . turning the PLA into a strong, modernized, revolutionary regular army and constantly increasing our defence capabilities, so as to provide powerful protection for the reform, the opening up and economic development . . . Thus it will be ready to perform even better the sacred mission of defending China's interests, its sovereignty over its territory, territorial waters and air space, and its maritime rights and of safeguarding the unity and security of the motherland.[102]

Chinese military equipment is far behind the systems of other major military establishments in terms of quality. By Western standards, the PLA remains a large, manpower-intensive force without sufficient transport, artillery and armour: thus it is not well prepared for large-scale mobile warfare.[103] In technology it lags behind the advanced countries' armies by 20–30 years.[104] It is at least 15 years behind Russia and 40 years behind the USA. Japan has a decisive

[98] *1993 Zhongguo Duiwai Jingji Maoyi Nianjian* [1993 China foreign economy and trade yearbook] (China Social Sciences Press: Beijing, 1993), p. 440.

[99] 'China adopts a new stance', *Jane's Defence Weekly*, 26 Feb. 1994, p. 19.

[100] Fan Wei (note 80), p. 7.

[101] Yan Xuetong (note 90), pp. 3, 5, 7.

[102] Report of the 14th National Party Congress, 1992, Jian Zemin, 'Accelerating reform and opening-up', *Beijing Review*, 26 Oct.–1 Nov. 1992, p. 26.

[103] Godwin, P. H. B., 'Military technology and doctrine in Chinese military planning: compensating for obsolescence', and Friedman, N., 'Chinese military capacity: industrial and operational weaknesses', ed. E. Arnett, SIPRI, *Military Capacity and the Risk of War: China, India, Pakistan and Iran* (Oxford University Press: Oxford, 1997).

[104] Yan Xuetong (note 90), p. 25.

edge over the PLA in terms of the quality of its naval weapons and supporting systems.[105] Without upgrading its military technological capabilities it will be difficult for China to win local wars in the future.

Emerging technologies are rapidly giving impetus to a revolution in weapons. This has widened the gap between the performances of different countries' weapons and the qualitative differences in military power. The concept of a high-technology arms race greatly influenced Chinese studies of imported arms after the Persian Gulf War of 1991. Faced with the prospect of such an arms race, China's priorities are to develop advanced weapons with the capability of medium- or long-range force projection. This involves developing capabilities in areas such as mobility and rapid reaction, and a technologically advanced and quality-driven defence industry. Arms are imported according to the need to build rapid-reaction forces capable of carrying out military operations in a high-technology local war. The PLA was previously trained to fight a major people's war against foreign invasion. The technological gap is expressed in the battlefield context in terms of gaps in information, space, time and precision.[106]

Since the end of the cold war, the view has been widely held in Chinese military circles that, in order to ensure the security of the country's economic achievements, the PLA must commit itself to keeping the enemy outside China's territory. This strategy is called *Jiji Fangyu* (active defence). The kind of conflicts China might expect to be involved in after the cold war are most probably local wars involving high-technology weapons and systems. The PLA must acquire the capability to win this type of war.[107]

The security rationale for modernizing and building up a blue-water navy goes back to the mid-1970s, when engagements between lighter Chinese naval vessels and larger South Vietnamese destroyers provided a new level of operational experience for the PLAN. In the mid-1980s Chinese security advisers suggested that the country's defence potential should be extended up to the 'First Island Chain' ranging from the Kurile Islands in the north to Taiwan, the Philippines and Indonesia in the south. Consequently, the PLAN Academic Guide Committee and the Naval Military Academic Institute recommended a three-stage naval development plan. The first stage (1996–2019) calls for the development of large surface combatant vessels and nuclear attack submarines. During the second (2020–39), plans call for the procurement of two or three light aircraft-carriers to become a major force in the western Pacific. By the third stage (from the mid-21st century onwards) the PLAN expects to be counted as a major sea power.[108]

[105] Morgan, J. R., 'Porpoises among the whales: small navies in Asia and the Pacific', *East–West Center Special Report*, no. 2 (Mar. 1994), p. 30.

[106] Chen Xiaogong, CIISS and Liu Xige, Foundation for International Strategy Research, *International Strategic Studies* (China Institute for International Strategic Studies: Beijing), no. 2 (June 1993), p. 4.

[107] Yan Xuetong, 'China's post-cold war security strategy', *Contemporary International Relations*, no. 5 (1995), p. 8.

[108] Jun Zhan, 'China goes to the blue waters: the navy, seapower mentality and the South China Sea', *Journal of Strategic Studies*, vol. 17, no. 3 (Sep. 1994), pp. 188–89.

China is likely to find it difficult to carry out broadly-based research in emerging high-technology weapons. A more realistic approach could be to invest steadily in basic and applied research projects in a few dual-use high-technology areas which would widen the spectrum of investment channels available not only from military and civilian enterprises but also from new high-technology enterprises, including foreign companies.[109] As demands for PLA modernization will be large, it is likely that high-technology weapon systems will be developed for select units and formations only until economic modernization catches up with military modernization.

Limited resources

Arms procurement is basically constrained by limited economic resources. The figures for gross domestic product (GDP) and GDP per capita bear witness to this.[110] By way of comparison, in 1994 China's military expenditure was only 2.2 per cent of that of the USA and 14 per cent of that of Japan.[111]

Although higher expenditure on defence R&D will improve the operational capability of the PLA, investments in economic development will generate better returns and indirect benefits for the defence industry. During the Seventh Five-Year Plan (1986–90), China invested 600 million yuan ($174 million)[112] to launch 11 civilian-purpose satellites, gaining a direct economic return of 4.3 billion yuan ($1.2 billion).[113] In contrast, in the military telecommunications area, an investment of several billion yuan is required to establish a telecommunications network linking the capitals of all the provinces and autonomous regions in China.

A key problem in releasing resources for arms procurement is already being addressed by reducing the manpower of the PLA.

Transparency in arms procurement

In 1995 China for the first time issued a White Paper on its security policies.[114] This has encouraged scientists and experts to discuss the reforms in the defence industry, and some specialized newspapers and periodicals have published articles on the arms procurement debate.[115] The White Paper outlines the broad

[109] Chai Benliang (note 5), pp. 14–15.

[110] In 1995 China's GDP was $700 billion, while its GDP per capita was $570. These figures were 10% and 2%, respectively, of the GDP and GDP per capita of the USA. *International Financial Statistics Yearbook 1997* (note 51).

[111] 'Shishi Shengyu Xiongbian' [Facts beat eloquence], *Renmin Ribao*, 28 July 1995.

[112] The US$ figures are based on the 1986 period average exchange rate. *International Financial Statistics Yearbook 1997* (note 51).

[113] Lu Fengxian, 'On values of development of space technology from successful launch of Australian satellite', *China Space*, no. 6 (1993), pp. 3–6.

[114] *China: Arms Control and Disarmament* (Information Office of the State Council of the People's Republic of China: Beijing, Nov. 1995) (in English).

[115] These periodicals include *Zhongguo Jungong Bao* [China military industry news], *Jungong Kancha* [Review of military industry] and *Binggong Xuebao* [Arms industry magazine].

features of Chinese security policy. These include reductions in its military manpower, defence spending, conversion, technology export controls and arms control commitments.

Arms procurement-related information is currently available in a variety of domestic publications including newspapers and periodicals, 'business news' issued by the various defence industrial enterprises and special publications about military developments.[116] These publications provide basic information from various forums to the society as a whole.

The question of transparency in arms procurement has been addressed through Chinese participation in the debate on the development of the UN Register of Conventional Arms and its reports to the UN Register on its exports and imports of conventional arms. China supports the enactment of appropriate and practicable transparency measures as they foster international trust, guard against conflict and serve to ease international tensions. As far as transfers of high technology with military applications are concerned, the Chinese view is that there is a need to abolish the biased and discriminatory technology export controls set up by a minority of the leading developed countries, and to guarantee developing countries their legitimate right to exploit high technology for economic development and for the maintenance of defence capability.[117]

V. Conclusions

The pace of modernization of the PLA's arms will be greatly determined by the economic development and the security situation of the country. Weapons and equipment will be modernized while China pursues economic development, but economic priorities may constrain modernization. Arms procurement will be maintained at current levels if the Taiwanese leaders restrain their efforts for independence. However, should Taiwan attempt independence, the PLA could be driven to accelerate its arms procurement plans. In 1995, not long after Lee Teng-hui's visit to the USA, Jiang Zemin told senior Chinese veterans: 'We need to strengthen our defence construction and military building, concerning the complex international environment, the maintenance of national unity and the protection of economic construction . . . we must improve the weapons and equipment of our troops, enhance military quality and increase defence operational capability'.[118]

[116] These include *Jiefangun Bao* [Liberation Army daily]; *Zhongguo Bao* [Defence industries weekly]; and *Junzhuanming Bao* [Defence conversion news]. Business news is carried by various defence industry periodicals such as *Junshi Jingji Yanjiu* [Military economic studies monthly] published by the Military Economic Academy in Wuhan; *Xiandai wugi* [Modern armaments]; editions on military developments in *Dangdai Zhongguo Congshu* [Series of *China Today*] *Zhongguo Junshi Baikequanshu* [Chinese military encyclopedia]; and *Zhongguo Junshi Nianjian* [Chinese military yearbook] published by the Academy of Military Science Press and National Military Standards.

[117] Sha Zukang, 'China and transparency in armaments', *Disarmament: A Periodic Review by the United Nations*, vol. 17 (1994), p. 139.

[118] 'Jiang Zemin Tongzhi de Jianghua' [Comrade Jiang Zemin's speech], *Renmin Ribao*, 26 Aug. 1995.

Chinese arms procurement policies will continue to emphasize improvement of domestic military production, especially high-technology weapon development. During a visit to Hubei Province in 1994, Vice-Chairman of the CPC Liu Huaqing observed that:

> to push up our defence science, technology and industry with high technology and gear up our military modernization . . . the defence industry must closely follow the rapid development of the state-of-the-art technology in the world and effectively combine domestic and imported technology and equipment, continuously improving our defence industry to provide better service to the strategic guideline of 'active defence'.[119]

The military part of China's defence industry will shrink through conversion to civilian production, but some initiatives to improve defence science, technology and industry, especially through R&D, will be stepped up. It is evident that closer cooperation between China's and Russia's defence industries will play a significant role in improving the capability of China's military production, especially in terms of advanced military technology. As regards arms imports, China will continue to prioritize sophisticated weapon technology.

It is important to remember China's unique characteristics. In terms of population, GNP and military power, it is far ahead of other developing countries. It is expected that the economic development priorities will be maintained for at least another 15 years with China keeping to its current guidelines concerning arms procurement priorities. Thus, China is likely to increase its arms procurement from abroad steadily but not dramatically, and will fundamentally rely on the improvement of the domestic defence industry.

According to the late Deng Xiaoping, a world war is not likely to occur in the foreseeable future—a judgement without which China cannot devote itself wholeheartedly to the four modernizations, let alone the reforms and policies necessary to build up the PLA. It was this thinking that shaped the changes in the mid-1980s in China's national defence build-up and the plans for qualitative enhancement of the military that were formulated in 1992.[120]

[119] 'Yikao Gaoxin Jishu Jiakuai Guofang Xiandaihua' [Speeding up defence modernization with high technology], *Xinhua Meiri Dianxun*, 21 May 1994.

[120] Chen Xiaogong and Liu Xige (note 106), pp. 2–3.

Appendix 2A. China's military R&D, manufacturing and trading*

Central Military Commission (CMC)

PLA Headquarters of the General Staff (HGS)
Bureau of Military Equipment and Technology Cooperation (BOMETEC)
Huitong Corporation (Group)
China Electronic Systems Engineering Company (CESEC)—*communications and electronics technology and equipment*
Pinghe Electronics Company Limited—*military technology*
China Zhihua Corporation Limited—*communications equipment, computers, image processing equipment and navigation equipment*

PLA General Political Department (GDP)
Kaili Corporation or Carrie Enterprises—*communications equipment and publications*
Tiancheng Corporation (Group)

PLA General Logistics Department (GLD)
China Xinxing Corporation (Group)—*food, clothing, construction materials, fuels, vehicles and boats*
San Jiu or 999 Enterprise Group—*pharmaceuticals*

PLA Air Force (PLAAF)
Lantian (Blue Sky) Industrial Corporation
Tianma Enterprises
China United Airlines
China Anda Aviation

PLA Navy
Songhai Corporation

Strategic Rocket Forces or 2nd Artillery
Shanhaidan Enterprises Group

People's Armed Police (PAP)
(For day-to-day functions, the PAP comes under the Ministry of Public Security)
Jingan Equipment Import–Export Corporation—*small arms and riot-control, security and fire-fighting equipment*
China Anhua Development Corporation

* This appendix is based on: US Defense Intelligence Agency, 'China's defense–industrial trading organisations', Defense Intelligence Reference Document PC-1921-57-95 (1995); Deng Liqun, Ma Hong and Wu Heng (eds), *China Today: Defence Science and Technology*, vol. 1 (National Defence Industry Press: Beijing, 1993), pp. 46–47; Holberton, S. and Walker, T., 'The generals' big business offensive', *Financial Times*, 28 Nov. 1994, p. 13; *China Directory 1997* (Radiopress: Tokyo, 1996), pp. 80–81 (in English); Deng Liqun, Ma Hong and Wu Heng (eds), *China Today: Defence Science and Technology*, vol. 1 (National Defence Industry Press: Beijing, 1993), pp. 34–39; and Foreign Broadcast Information Service, *Daily Report–China (FBIS-CHI)*.

State Council

Ministry of Machine Building (former 1st Ministry of Machine Building and Industry, MMBI)
(Only some sections of this ministry are defence-related)
Military Production Department
Automobile Industry Department

China National Nuclear Corporation (CNNC) (former 2nd MMBI)
China Nuclear Energy Industry Corporation (CNEIC)—*nuclear technology*
China ZhongYuan Engineering Corporation (CZEC)—*international cooperation of the Chinese nuclear industry*
China Nuclear Instrumentation and Equipment Corporation (CNIEC)—*fire control systems and precision instruments*
China Nuclear Equipment and Materials Corporation (CNEMC)
China Rainbow Development Corporation—*nuclear power development*
China Isotope Corporation

Aviation Industries Corporation of China (AVIC) (former 3rd MMBI)
China National Aero-Technology Import and Export Corporation (CATIC)—*aircraft and remotely piloted vehicles*
China National Aero-Engine Corporation
China National Aero-Equipment Corporation
Xian Aircraft Company (XAC)—*aero-engines*
Nanchang Aircraft Manufacturing Company (NAMC)—*cruise missiles*
China Helicopter Company
Harbin Aircraft Manufacturing Company—*helicopters, light aircraft*
Northwest Industry University—*miniature turbojet engine for use in cruise missiles and pilotless aircraft*
Shaanxi Aircraft Company
Chendu Aircraft Industrial Corporation—*fighter aircraft*

Ministry of Electronics Industry (MEI) (former 4th MMBI)
China Electronics Industries Corporation (CEIC)
China National Electronic Import-Export Corporation (CEIEC)—*cryptographic systems, radars, mine-detection equipment, fibre and laser optics and communications technology*

China North Industries Corporation (NORINCO) (former 5th MMBI)
—*armoured vehicles, artillery, infantry weapons, small arms, ammunition and radars (also motorcycles, mini-vans, mini-cars, heavy trucks, engineering machinery, chemicals, telescopes, electronic goods)*
China General Industrial Materials and Equipment Corporation—*armoured vehicles and trucks*
China Yanxing National Corporation
China North Optics and Equipment Corporation
China Ordnance Industry Corporation

China State Shipbuilding Corporation (former 6th MMBI)
China Shipbuilding Trading Company Limited—*naval ships and craft*
Nuclear Submarine Building Plant (NSBP)
Dalian Shipyard
Qingdao Shipyard
Guangzhou Shipyard

China Aerospace Corporation (CASC) (former 7th MMBI)

China Academy of Launch Vehicle Technology (CALT) or the former 1st Academy or the Beijing Wanyuan Industry Corporation (BWYIC)—*space launch vehicles, mission analysis and interface coordination*

China Chang Feng Mechanics and Electronics Technology Academy or the former 2nd Academy—*spacecraft and components*

Hai Ying (Sea Eagle) Electro-Mechanical Technology Academy of China or the former 3rd Academy

Hexi Chemical Corporation or the former 4th Academy

Chinese Academy of Space Technology (CAST) or the former 5th Academy—*satellites and recoverable payloads*

China Space Civil and Building Engineering Design and Research Institute (CSCBI) or the former 7th Academy

Shanghai Academy of Spaceflight Technology or the Shanghai Bureau of Astronautics (SHBOA) or the former 8th Academy—*first and second stages of space launch vehicles and altitude control, guidance and stabilization systems*

China Academy of Basic Technology for Space Electronics or the former 9th Academy

Xichang Satellite Launch Centre

China Great Wall Industry Corporation (CGWIC)—*space launch services, Long March launchers, space technology and equipment and prime contractor for space services*

China National Precision Machinery Import and Export Corporation (CPMIEC)—*missiles, rocket engines, radars, precision machinery, optical instruments, medical equipment, household electrical appliances, tools and fixtures*

China Jiangnan Space Industries Group Company

Sichuan Aerospace Industry Corporation

China Sanjian Space Group

Shaanxi Linganan Machinery Company

Yunnan Space Industry Corporation

China Astronautics Industrial Supply and Marketing Corporation

Feihuan Corporation

Beijing Tongha Measuring Instruments Corporation

Commission of Science, Technology and Industry for National Defence (COSTIND)

Xinshidai (New Era) Development Corporation—*scientific cooperation and exchanges, exhibitions and advanced technology tactical missiles*

Yuanwang (Group) Corporation

Galaxy New Technology Corporation—*super computers*

China Defence Science and Technology Information Center (CDSTIC)

China Association for the Peaceful Use of Military Industrial Technology (CAPUMIT)

Xiaofeng Technology and Equipment Corporation—*computers, test equipment, robotics and advanced technology*

Appendix 2B. The development of coastal minesweepers by the PLAN in the 1980s*

In 1976, the PLAN anti-mine equipment programme was approved to develop a new generation of coastal minesweepers, substituting for two existing types. The tactical–technical performance requirements for the new type were set through a feasibility study conducted by a special research team consisting of representatives from operational fleets, the Shipbuilding Corporation and the Navy Material Commands. On the basis of manufacturing and peacetime operational experience with the two existing types and for combat effectiveness, the minesweeper should be able to: (*a*) operate generally in offshore and harbour areas in high seas with good seaworthiness; (*b*) manoeuvre while performing minesweeping; and (*c*) use various physical principles—acoustic, magnetic, mechanic, and so on.

Next, the concept formulation stage was initiated with the establishment of an R&D Engineering Team of professional engineers from the Shanghai Naval Architecture Institute, the Shipboard Auxiliary Machinery Institute and the Hubei Underwater Weapon R&D Center, among others. After several years of effort, some key technology objectives were formulated concerning, for example, magnetic signature reduction, the use of composite alloys and materials for ship hulls, and the power generation and propulsor systems.

These technical objectives were realized through prototype testing that ensured type design approval. The vessel was constructed in 1984–87. After commissioning, it completed a full minesweeping test in 1988 and training exercises.

No further vessels were built.

Between May 1989 and May 1990 a comprehensive Review and Improvement Study was conducted, which resulted in several reports and documents on technical innovation for the construction of future vessels.

The military representatives deployed by the Navy's Materials Department, which functions under the Logistics Department, had carried out auditing at all major stages of procurement, together with officers sent by the China State Shipbuilding Corporation.

Figure 2B.1 shows the working relationships and the division of responsibility among various organizations involved in development of a warship.

* This appendix is based on: US Defense Intelligence Agency, 'China's defense–industrial trading organisations', Defense Intelligence Reference Document PC-1921-57-95 (1995); Deng Liqun, Ma Hong and Wu Heng (eds), *China Today: Defence Science and Technology*, vol. 1 (National Defence Industry Press: Beijing, 1993), pp. 46–47; Holberton, S. and Walker, T., 'The generals' big business offensive', *Financial Times*, 28 Nov. 1994, p. 13; *China Directory 1997* (Radiopress: Tokyo, 1996), pp. 80–81 (in English); Deng Liqun, Ma Hong and Wu Heng (eds), *China Today: Defence Science and Technology*, vol. 1 (National Defence Industry Press: Beijing, 1993), pp. 34–39; and Foreign Broadcast Information Service, *Daily Report–China (FBIS-CHI)*.

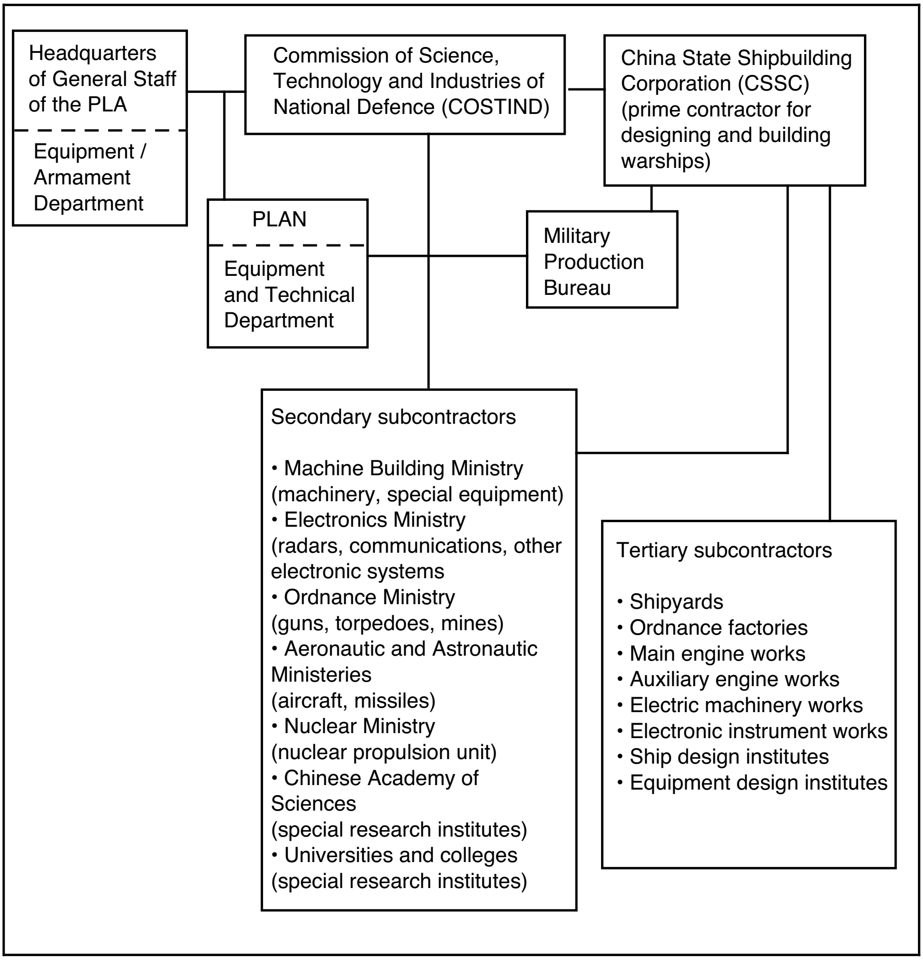

Figure 2B.1. Organizations involved in the development of a warship

Notes: PLA = People's Liberation Army; PLAN = People's Liberation Army Navy.

Source: Compiled by the authors.