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# A New Direction for China's Defense Industry

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## Summary

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Part of a larger RAND Project AIR FORCE study on Chinese military modernization, this study examines the current and future capabilities of China's defense industry. The goals of this study are to

1. Assess recent trends in China's 25-year-long effort to reform its defense-industrial operations
2. Analyze the individual strengths and weaknesses of four specific defense-industrial sectors: missile, military aircraft, shipbuilding, and information technology/defense electronics
3. Explain variations in performance among different defense-industry sectors, with a focus on differences in institutional arrangements, incentives, and exposure to market forces
4. Evaluate the prospects for China's defense industry and its ability to contribute to military modernization.

Over the past 25 years, a prominent and consistent conclusion of Western research on China's defense-industrial complex has been that it is rife with weaknesses and limitations. This study argues for an alternative approach. From the vantage point of 2005, it is time to shift the focus of research to the gradual improvements in and the future potential of China's defense-industrial complex, rather than concentrating on its past and persistent weaknesses. Certain Chinese defense-industrial enterprises are designing and producing a wide range of increasingly advanced weapons that, in the short term, will enhance China's military capabilities in a possible conflict over the

future of Taiwan and, in the long term, China's military position in Asia. More specifically, the following trends underscore the need to focus future research on the gradual improvements in China's defense-industrial capabilities:

- As measured by improvements in the quality of the output of China's defense enterprises, defense-industrial reform has not only taken hold but even accelerated in the past several years (since the late 1990s). These trends suggest a defense industry that is emerging from the doldrums of two and a half decades of systemic neglect, inefficiency, and corruption. The rates of modernization vary by sector, but a modicum of successful reform has been realized across key parts of the defense industry.
- The improvements in China's capabilities for defense research, development, and production have been mixed within sectors and uneven across them. While sweeping conclusions about the backwardness of the defense-industrial complex are no longer accurate, similar claims about systemic reform are equally unwarranted. This study argues that the current research and development (R&D) and production capabilities of China's defense industry must now be evaluated on a sector-by-sector basis.
- China's senior political, industrial, and military leaders have called the next 20 years the "critical stage" (*guanjian jieduan* 关键阶段) in China's modernization of its defense-industrial base. Thus defense-industry reform and renovation will be a gradual, deliberate, and consistent process. It is not likely part of a crash effort requiring a dramatic shift of national priorities from economic development to military modernization.

## **Explaining the Recent Progress in China's Defense Industry**

The recent progress in China's defense-industry modernization can be explained by four mutually reinforcing considerations.

First, the government has consistently devoted more funds to weapon acquisition. From 1990 to 2003, the official defense-budget allocation for military equipment (*zhuangbei* 装备) grew from 5 billion RMB to 64.8 billion RMB. These increases are about twice the rate of growth of the official defense budget. Also, the share of the budget devoted to equipment increased from 16.3 to 34 percent in this time period. For the period 1997–2003, according to official Chinese budget figures, the amount of funding for equipment grew 153 percent, more than for the other two categories in the official defense budget. Such defense spending is bound to positively affect output; these increases likely contributed to the pace at which new systems have come online in recent years. However, the benefits of such increased spending are limited unless defense enterprises actually improve their research, development, and production capabilities.

Second, the gradual development and commercialization of some defense enterprises during the transition in China's economy over the past 25 years have improved their research, development, and production capabilities. The robust and rational commercial business operations of select defense enterprises allowed the accumulation of "spin-on" benefits in some defense sectors. Defense enterprises with the greatest exposure to international markets have been especially effective at improving their R&D and production capabilities, through both partnerships and competition with foreign firms.

Third, the defense industry in the past decade has had consistent access to limited amounts of foreign military equipment and technical assistance, especially from Russia and Israel. This access has assisted the efforts of some defense sectors to copy-produce weapon systems, to integrate advanced technologies into China's production lines, and to raise the technical expertise of Chinese personnel involved in defense production.

Fourth, in past decades, Beijing largely avoided implementing the type of fundamental reforms, such as rationalization and consolidation, which were needed to revitalize the defense industry. However, beginning in spring 1998, China's leadership adopted a new series of policies to revamp the structure and operations of the

defense procurement system and to reform the operations of defense enterprises. At a minimum, these reforms importantly signaled recognition of the depth of the problems in China's defense-industrial system. More importantly, these policies initiated institutional changes in the management of China's defense industry in ways that outstripped past efforts in both scope and depth. Specifically, China's leaders aimed to inject into China's defense-industrial system the principles of "competition, evaluation, supervision and encouragement," known as the "Four Mechanisms" (*sige jizhi* 四个机制).

The new reforms were intended to alter both the structure and operation of China's defense industry. Reforms are occurring both at the central-government level and at the enterprise level. In general terms, the reforms aimed to centralize and standardize weapon-procurement decisions at the central-government level of operations while decentralizing defense-enterprise operations in order to increase incentives for efficiency, higher-quality production, and, eventually, innovation (see pages 22–24).

### **Central Government Reforms**

At the level of central government operations, Chinese leaders adopted two major reforms to significantly change the weapon-procurement process to make it more accountable to the military's needs. First, it abolished the military-controlled Commission on Science Technology and Industry for National Defense (COSTIND) and replaced it with a strictly civilian organ under the control of the State Council, but with the same name. Second, the government created a new military-run agency known as the General Armaments Department (GAD), which assumed the responsibilities for military procurement and the life-cycle management of the PLA's weapon systems (from R&D to retirement).

In addition to the "civilianization" of COSTIND and the creation of the GAD, which centralized China's military-procurement system, the 1998 reforms separated the builders (the manufacturers) from the buyers (the military). This separation further rationalized the procurement system to reduce conflicts of interest and corruption. GAD represents the PLA's interests, whereas COSTIND, as a

civilian agency, is now supposed to deal with industrial planning and the administrative affairs of defense firms.

To change the weapon-procurement process, the central government adopted policies that included issuing formal procurement regulations and provisions to standardize and unify the procurement process. The new regulations are also meant to accelerate the establishment of a competitive-bidding system for military contracts. Preliminary indications are that various bidding systems are beginning to be used and enforced (see pages 32–39).

### **Enterprise Reforms**

Chinese policymakers adopted several policies to make defense-enterprise operations more efficient and raise R&D and production capabilities. Their main goals were to separate the government administrative units from enterprise operations; make defense enterprises more sensitive to market forces by exposing them to competitive pressures; provide harder budget constraints; introduce new mechanisms for quality assurance and quality control; make enterprises less reliant on state subsidies; lessen the financial burdens on enterprises from the work-group social welfare system.

As part of this reform push, the Chinese government initiated a major enterprise reform in July 1999 to create incentives for competition and efficiency in defense-enterprise operations. The reform involved dividing each of China's five core defense companies into two defense-industrial enterprise groups (*jungong jituan gongsi* 军工集团公司). An eleventh enterprise group, for defense electronics, was established in late 2002. The main goal was to inject competition into defense-enterprise operations. The other goal of the formation of "group corporations" was to establish shareholder arrangements to further remove the government from firm operations, to distribute risk, and to increase enterprise accountability for profits and losses.

Beyond these broad structural reforms, Chinese policymakers have also implemented a variety of specific initiatives to revitalize defense-enterprise operations. These included downsizing and rationalization in certain sectors; a much greater emphasis on quality con-

trol; modernization of some production complexes and related facilities; the expansion of partnerships with civilian universities and research institutes to improve educational training relevant to military R&D; the promotion of R&D and production cooperation among defense enterprises located in various provinces and across defense sectors; and reform of the system of military representative offices (MRO) in defense factories (see pages 40–47).

## Constraints on Defense-Industry Reform

Beijing has a long and highly blemished history both of adopting weak reforms and of not implementing more radical policy changes. Thus, how quickly and effectively the post-1998 measures can overcome the deep problems that have plagued China's defense-industrial establishment for the last several decades is uncertain.

The government's success at fully implementing defense-industrial reforms will be broadly influenced by several tensions, or contradictions, that persist at both the central-government level and the enterprise level of operations—reform imperatives versus social stability, GAD versus the state COSTIND, and localization versus free-market practices:

- **Reform Imperatives Versus Social Stability:** Efforts to rationalize and downsize China's large, bloated, and inefficient defense enterprises raise concerns about social instability, especially the consequences of increasing unemployment, failing to fulfill pension commitments, and cutting off funding for enterprise-run social welfare programs. These consequences will hinder and, in some cases, halt the pace of enterprise reform, especially in poorer provinces, such as in northeastern and western China. Consideration of these consequences may also influence the government's distribution of large defense-production projects.
- **GAD Versus State COSTIND:** The civilianization of COSTIND and the creation of GAD in the late 1990s injected a variety of new political tensions into defense-industry opera-

tions. These new agencies often compete for influence in the defense-procurement process, and this tension may contribute to delays and inefficient decisionmaking on specific military projects.

- **Localization Versus Free-Market Practices:** Historically, China's defense-industrial enterprises have been highly vertically integrated and have relied on single-source suppliers within their own sector. These economic tendencies have been exacerbated by long-standing political ties within regions and provinces that influence business relations among firms in the same localities.

The success of China's newest round of defense-industry policy adjustments will be influenced by the ability of Chinese officials to balance these tensions in the coming years (see pages 47–49).

## Sector-by-Sector Analysis

The changes in the structure, operation, and production capabilities of China's defense-industrial complex are most evident at the level of the individual defense-industrial sectors. This study includes four case-study chapters, which examine in detail the capabilities of China's missile, shipbuilding, military aviation, and information technology/defense electronics sectors. These sectors were chosen because they all contribute to the Chinese military's future power-projection capability.

As indicated in these case studies, reform of the defense industry has been uneven. We find that in each of these sectors the capabilities of manufacturers to design and produce key systems are improving, but weaknesses and limitations persist depending on the sector. Some have been more successful than others: Improvements in information technology and shipbuilding have been extensive, while those in aviation have lagged.

**Missile Sector**

Partly a legacy of its position as one of China's strategic weapon programs that received preferential treatment, China's missile sector has historically been one of the brightest stars in China's defense industry. While technological progress since the 1980s has been slow, it has accelerated since 2000. Missile-production enterprises continued to develop and produce new and increasingly advanced ballistic and cruise missiles—including serial production of some of these systems, such as the new variants of the DF-11 (CSS-7) and DF-15 (CSS-6) short-range ballistic missiles.

China may soon begin deploying land-attack cruise missiles, fast and highly accurate anti-ship cruise missiles, modern long-range surface-to-air missiles, and anti-radiation missiles. China's ability to produce and deploy increasingly high-quality systems in a timely manner will serve as an indicator of continued reform of the missile sector (see pages 51–108).

**Shipbuilding Sector**

China's shipbuilding industry has gradually modernized since Deng Xiaoping's reform and openness policies. It rapidly engaged international markets in the 1980s and, as a consequence, gained consistent access to foreign shipbuilding equipment, capital, and know-how. China is now the world's third-largest shipbuilder. As its commercial-shipbuilding business expanded, its naval-production capabilities benefited as well. China's shipbuilding industry now produces a wide range of increasingly sophisticated naval platforms using modern design methods, production techniques, and management practices. China's shipyards are now producing more-advanced naval vessels more quickly and efficiently than in the past. These improvements are best reflected in the serial output of several new classes of military ships in recent years. These innovations and heightened production rates are a first for China's shipbuilding sector and are likely to continue in the coming years (see pages 109–154).

**Military-Aviation Sector**

For years, China's aviation industry suffered under the weight of a large, bloated, technologically unsophisticated, and highly inefficient collection of R&D institutes and factories that failed to produce modern military aircraft in a timely manner. In the past five years, limited signs of increasing progress in this sector have begun to emerge. China's first indigenously designed and produced combat aircraft (JH-7/FBC-1) has recently entered service, and China is on the verge of producing a domestically developed, fourth-generation aircraft (known as the J-10/F-10), albeit with substantial foreign design assistance. It has also made significant progress toward producing turbofan engines for its newest fighters.

Important gaps in China's aviation design and production capabilities remain, however. China has not yet mastered serial production of such complex aviation platforms as fourth-generation fighters, nor is it able to produce heavy bombers or large transport aircraft. And it has yet to field an indigenously designed helicopter (see pages 155–204).

**Information-Technology Sector**

China's emerging IT sector is not an officially designated part of China's defense-industrial complex; however, it is probably the most organizationally innovative and economically dynamic producer of equipment for China's military. And it is at the forefront of China's improving defense-production capabilities. Although IT enterprises are primarily (exclusively, in most instances) oriented toward domestic and international commercial markets, the PLA has been able to effectively leverage certain IT products to improve the military's command, control, communications, computers, and intelligence (C4I) capabilities—a critical element of the PLA's modernization efforts (see pages 205–251).

## Future Prospects of China's Defense Industry

China's defense industry now has the *potential* to become more competitive with the defense industries of the world's advanced military powers in key sectors within a moderate (10–20 years) amount of time. Indeed, our analysis of their R&D and production capabilities suggests that several defense sectors are already overcoming long-standing weaknesses. To be sure, the prevailing data set related to defense-industrial capabilities is still limited, and current progress has been mixed within defense sectors and uneven across them.

Some of the current weaknesses of China's defense industry could be further ameliorated in the medium term (10–20 years), assuming China does not deviate from its present course of reform of the defense-industrial system and government investment in and, importantly, a continued political commitment to defense procurement. If the government continues to push for open contracting of defense projects and takes a tough line on cost overruns, efficiency gains, the quality of production capabilities, and the degree of innovation should continue to improve. In some sectors, this could occur fairly rapidly.

Even though such reforms are gathering speed, they will not happen overnight. Time is needed to train new employees into skilled defense-industry engineers and technicians. It will also take time to change management behavior and stimulate innovation, even after new management incentive systems are implemented. Such behaviors will be critical indicators of the pace of reform and the future direction of China's defense-industrial capabilities (see pages 253–259).