

## A great leap forward

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**China is ramping up efforts to develop the industrial capabilities that can provide the People's Liberation Army with the edge it requires over regional rivals, as *Jon Grevatt* reports**

China's defence industry is at a critical juncture as Beijing looks to promote the development of technologies that will support its ambitious strategic intentions.

During China's 2016-20 13th Five Year Plan the government is pushing the industrial base - dominated by state-run organisations - to overcome lingering technological shortcomings that will propel the capability of the People's Liberation Army (PLA). This is turn is intended to enable China to meet its strategic objectives, including efforts to secure what it regards as its sovereign territory in the East and South China Seas and deter any resultant challenges from major regional powers such as Japan and the United States.

However, for that advancement to be achieved several major reform measures currently under way and in planning need to be successful: something that is far from assured. While China's defence-industrial base has expanded its capabilities rapidly over the past two decades - largely motivated by Western military sanctions imposed in the aftermath of the Tiananmen Square protests of 1989 - a major effort is now required to accomplish the next industrial leap: to bridge capability gaps and develop the modern technologies that will give the PLA the edge it requires over its rivals.



*Chinese President Xi Jinping meets military officers during an inspection of the PLA's Southern Theatre Command on 21 April 2017. President Xi has made innovation the watchword for China's defence-industrial base during the 13th Five Year Plan and beyond. (Xinhua/PA)*

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To overcome industrial weaknesses and continuing limitations President Xi Jinping has made "innovation" the watchword for the national defence-industrial base during the 13th Five Year Plan and beyond.

Reforms underpinning the effort towards innovation are, in terms of capability, intended to lead to the successful development of major systems - particularly in the aerospace domain - and a wide range of fourth- and fifth-generation defence technologies. China refers to many of these technologies as capabilities that will support so-called 'informationisation': a concept akin to the West's network-centric warfare strategies. Underscoring the significance of informationisation, all of China's defence White Papers in recent years have prioritised this drive.

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### **Structure and funding**

China's defence-industrial base is dominated by 10 state-owned corporations and their roughly 3,000 subsidiaries, which together employ an estimated 3.5 million workers. These groups comprise: the Aviation Industry Corporation of China (AVIC), China Aerospace Science and Technology Corporation (CASC), China Aerospace Science and Industry Corporation (CASIC), China North Industries Corporation (Norinco), China South Industries Group Corporation (CSGC), China Electronics Technology Group Corporation (CETC), China Shipbuilding Industry Corporation (CSIC), China State Shipbuilding Corporation (CSSC), China National Nuclear Corporation (CNNC), and China Nuclear Engineering Group (CNEC).

The state-owned groups are supported by a growing private sector of several thousand diversified companies, which have limited capacity and involvement in sensitive military programmes but do provide increasing support in defence manufacturing and services at Tier 2/3 levels.



*The Xian Y-20 large transport aircraft entered into service with the PLA Air Force in July 2016. (Xinhua)*

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The state-run corporations' position as the dominant sector is underpinned by several factors, not least their access to significant levels of funding through corporate revenues, state credit, and their increasing application of fiscal mechanisms such as selling shares, bonds, and securities.

Sales recorded by all state-run corporations have grown rapidly over the past 15 years but have generally slowed since 2013 in line with China's stuttering economy, a factor accentuated by Chinese defence companies' diversified activities in commercial sectors. In 2008 total profits reported by the 10 state-owned defence enterprises were about CNY45 billion (USD6.5 billion), while in 2016 this figure had grown to around CNY200 billion on approximate sales of CNY2.5 trillion.

Expansion activities have been further supported by the huge amount of funds that Chinese defence companies have secured from state banks to support development - including activities such as research and development, export promotion, mergers and acquisitions, and facility upgrades. Since 2007, when *Jane's* started tracking the value of announced loan deals, Chinese banks have provided the state defence sector with more than CNY600 billion (USD87 billion), with the majority of funds secured by aerospace enterprises, mainly AVIC.

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### **Technical strengths**

There is little doubt that this high level of funding - usually outside the national defence budget - has been an important factor in supporting the industrial base in making significant strides towards the objectives of developing the advanced military capabilities outlined in the defence White Papers. Other factors supporting advancement over the past 15 years include organisational changes in China's research, development, and procurement system (most notably the establishment of the State Administration for Science, Technology, and Industry for National Defense (SASTIND) in 2008); high levels of defence spending; a commitment to drive development from the highest levels of government; and a successful strategy of reverse engineering, particularly involving Russian systems.

However, industry is still some way short of being able to develop and produce the kinds of advanced materiel that is available in much of the West, which is the yardstick by which Beijing continues to measure industrial capability.

China's indigenous programmes generally demonstrate the capability to produce military equipment imitating foreign designs but a continuing shortfall in some areas of innovative design and development. As a result China remains reliant on foreign designs and underlying technologies to fill its capability gaps. Over the coming decade this dependency is likely to decline but not end, as the gap between China's capabilities and those in major industrialised nations gradually narrows.

In terms of military hardware Chinese industry's advancement can be exemplified by the numerous new military platforms that have been developed, manufactured, and inducted into service in the past decade or so. In the aerospace sector such new and high-profile platforms include the Chengdu J-20 fighter aircraft, 10 prototypes of which are now believed to be flying; the Shenyang FC-31 fighter, of which, as of early 2017, there are believed to be two flying prototypes; and the Xian Y-20 large transport aircraft, which entered service with the PLA Air Force (PLAAF) in July 2016.

Other Chinese-produced hardware to enter service in recent years include new Type 052D ('Luyang III')-class destroyers and Type 054A ('Jiangkai II')-class frigates; new variants of the Type 093 ('Shang')-class nuclear-powered attack submarine and Type 094 9 ('Jin')-class nuclear-powered ballistic missile submarine; and new variants of the Type 96 (ZTZ-96) main battle tank and a new light tank, the designation of which is not yet known and which first came to light in December 2016.



*On 26 April China launched its first domestically built aircraft carrier, known as the Type 001A, in a ceremony held at CSIC's Dalian shipyard. (PA)*

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Further underscoring gains in the naval domain, Chinese shipbuilders are now reportedly building the PLA Navy's (PLAN's) third aircraft carrier. The second, which is also China's first indigenously built aircraft carrier, the Type 001A, was launched at CSIC's Dalian shipyard in the country's northeastern Liaoning Province on 26 April.

In addition, China has made inroads in developing missiles and related systems. The most notable advances are evident in capabilities including short-, medium-, and intermediate-range ballistic missiles; air defence systems; and long-range land-attack and anti-ship cruise missiles.

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### **Technical shortcomings**

Given that its industrial development can largely be linked to its heavy reliance on Russian designs and technologies, many of which are now dated, it could be argued that China's development to date has been relatively straightforward.

However, this presents a problem for China when - as now - the focus is on achieving breakthroughs in some of the most sophisticated fourth- and fifth-generation technologies that support the country's strategic ambitions. Wary of China's reverse-engineering tendencies, Russia has become less willing to transfer technologies and advanced systems to the Chinese, although there is some evidence to suggest that this partnership is gradually growing stronger again.

Despite this, Moscow is still highly unlikely to allow China the same access to its technologies as once was the case.

China's inability to design, develop, and manufacture innovative niche technologies is indicated most clearly by its continuing use of foreign systems on board indigenous or Russian platforms. For instance, the PLAN operates combat management systems developed from Western products such as France's Tavitac and IPN-10 systems alongside Russian systems supplied with the PLAN's Sovremenny-class destroyers. Tactical datalinks in use include the Link W system supplied by France and the Mineral ME3 supplied by Russia and indigenous products imitating the US Link 16 system.



*At least 10 prototypes of China's Chengdu J-20 fighter are now believed to be flying. (Source unknown)*

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## **Reforms**

During the 13th Five Year Plan President Xi has put emphasis on a number of initiatives collectively aimed at supporting the evolution of innovation and positioning the industrial base for future capability development. These initiatives are broadly geared towards optimising industrial and associated defence structures and procedures, promoting competition, and leveraging gains in commercial sectors. The most high-profile and important initiative is the latter: civil-military integration (CMI).

**CMI:** The principle of CMI is the integration of commercial and defence industrial capabilities to promote dual-use technologies and production processes and the use of personnel and facilities that can, to a degree, undertake both disciplines. A feature of CMI is the acquisition of commercial technologies, production know-how, and research methods that can benefit Chinese military programmes and vice versa. The programme is supported by China's expansive commercial industry links with foreign companies, particularly in aerospace, which have been strengthened in the past few years by a series of Chinese international acquisitions.

Although CMI has been in place for many years, its emphasis has become more important to China as a means to access foreign technologies in the face of restrictions imposed by Western military sanctions. Technologies that China is believed to have acquired through CMI range from

production techniques in shipbuilding and aerospace to avionics systems, night-vision devices, information and communications technologies, and cyber capabilities.

CMI's significance to China's military modernisation efforts was highlighted by the 2015 White Paper. This document stated that with "stronger [CMI] policy support" China would establish key technological areas and explore ways to develop weapons and equipment. It also called for a range of enhancements to the way in which CMI is managed, supported, and resourced. This, in turn, led to the establishment in 2017 of the Central Commission for Integrated Military and Civilian Development, which is chaired by President Xi.

The fact that the CMI initiative is seen in need of major reform, with the country's president overseeing development, can perhaps be regarded as an acknowledgment by Beijing that the effectiveness of the strategy as a tool for driving development has been questionable. While some gains can be attributed to the strategy in terms of lower-value technologies, it is unlikely whether CMI will support meaningful industrial gains in the advanced military technologies China desires such as stealth, fighter jet engines, and advanced C4ISR systems.

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*The Shenyang Aircraft Corporation J-11, a Chinese version of Russia's Sukhoi Su-27 'Flanker' fighter series, is regarded as a prime example of Chinese reverse engineering. (Source unknown) 1647627*

**Industrial restructuring:** The objective of restructuring is to expose defence enterprises to market forces in a bid to spur accountability and self-sufficiency, boost innovation, improve competitiveness, and ultimately enhance industrial capability.

On its introduction in around 2007 Beijing said the restructuring was intended to render defence enterprises as self-sufficient and boost financial capital through divestments. Other goals were to eradicate duplication through consolidation, improve industrial efficiencies, and prompt the emergence of large conglomerates that could compete in global markets against major Western corporations. The first major restructuring move was announced in 2008 and saw AVIC re-merged following a decade of operating as two enterprises: AVIC I and AVIC II.

However, China's industrial restructuring effort was hindered by the global economic crisis of 2008, which prompted caution across the defence industry, with nearly all enterprises integrated into now-unstable commercial markets through the CMI strategy. Industrial restructuring was reprioritised in the 2011-15 12th Five Year Plan and the push has continued in the 13th Five Year Plan.

The most recent restructuring push has prompted a number of activities. To date most industrial reorganising has taken place in the aerospace and ordnance sectors. In 2016 AVIC consolidated its military jet engine and precision engineering sectors, while some similar efforts to merge activities have been evident in CASC and CASIC.

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**Administrative restructuring:** The restructuring evident in industry has been replicated to some degree in overhauls in the administrative systems that support research, development, production, and procurement. Announced in 2016, a major overhaul within the powerful Central Military Commission (CMC) was focused on promoting jointedness and enhanced effectiveness across the PLA and related structures - including the national defence industry.

The restructuring was focused on replacing the CMC's four previous agencies (armament, logistics, staff headquarters, and politics) with 15 new departments. In terms of procurement and development, the PLA's General Armament Department was replaced by the newly created Equipment Development Department (EDD), although unlike the former entity the new one is focused on supporting the three service arms of the PLA, not solely the army.

**Private sector:** One of the focuses of the new EDD is promoting the development of the private sector in a bid to promote competition with the dominant state-owned enterprises. This is another strategy that has been in place for several years but has been re-emphasised by President Xi.

The private sector has been allowed to be involved in defence-industrial activities since 2001, but the bureaucratic certification process and restrictions on what sensitive programmes the private sector can be exposed to have meant that its participation has been limited to manufacturing components and auxiliary products. Since 2014, however, there has been a clear shift towards accelerating private-sector involvement through the government's implementation of a range of policies. These have included:

- Easing administrative barriers for private companies looking to enter the defence sector;
- Reducing the number of military items that require production licences;
- Promoting involvement by increasing transparency in procurement programmes (including the launch of a new procurement website);
- Widening the areas of defence manufacturing that are open to bidding from the private sector; and
- Introducing financial incentives for the private sector.

While these reforms have resulted in greater private-sector involvement in downstream manufacturing, they are unlikely to result in private-sector companies challenging the dominance of the state-owned companies any time soon. Continuing barriers facing the private sector include continuing procedural restrictions and guidelines, a general lack of modern capabilities, the government's lack of trust of the private sector (despite rhetoric to the contrary), and most importantly the significant influence that China's state-owned corporations continue to wield.

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## **Impediments**

Despite the reforms under way to spur further advancement in China's defence industry there exist several major obstacles to development, including those related to a lack of competition, antiquated administrative processes, fragmentation, and corruption. Over the coming few years China's government has indicated that it is committed to addressing these hurdles, but the ingrained nature of some of the problems it faces suggests that this will be far from straightforward.

**Competition:** The influence of China's behemoth defence corporations is extensive as a direct result of their long-held government links and their position as defence manufacturers over several decades. However, this industrial landscape has led to the development of monopolies that face little competition. With China's private sector restricted by continuing (but gradually easing) rules governing participation, the competition required to spur rapid modernisation is unlikely to materialise, at least in the near and medium term. It can be argued, perhaps, that the reforms that China has introduced to spur this competition have not been deep enough.

The influence of the state-owned corporations is accentuated by China's procurement process, through which the government continues to prefer sole-source contracts. The process encompasses negotiation between the armed forces' procurement agencies and specific military contractors, who are identified in a PLA suppliers' database (which is not published), followed by a contract award.



*China's expanding capability in land systems is reflected in the new variants of the Type 96 (ZTZ-96) main battle tank that have emerged in recent years. (C F Foss)*

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**Administration:** For decades China's administrative and procurement systems have been plagued by a range of institutional and administrative problems linked to top-down Soviet-style



strategies and central planning legacies, which have meant in the past that military equipment sometimes did not match the requirements of the Chinese armed forces.

Other related problems have been disjointedness in the procurement system, which has hindered the evolution of a cost-effective acquisition system. Over the past decade or so the procurement system has been undergoing reform, leading to the creation of the EDD, although changes have yet to prove very effective mainly because of China's inability to free itself from a legacy of central-planning policies combined with an absence of modern project management techniques and contracting methods that can spur efficiencies and competitiveness.

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**Fragmentation:** The government is slowly making inroads at consolidating the industrial landscape but the fragmentation - and resultant inefficiencies - that exists today are unlikely to be eradicated in the near term.



*Chinese industry is now understood to be building a fifth Type 094 'Jin'-class nuclear-powered ballistic missile submarine. The boat is regarded as significant in advancing China's strategic objectives. (Chinese internet)*

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Consolidation to date has been somewhat piecemeal and only in elements of business sectors (aero-engines, for example) as opposed to wider segments. There are still wide areas of production and development that remain disjointed and are undertaken by many of the subsidiaries of the major corporations. CASIC, for instance, operates more than 600 academies, research institutes, and production companies across China focused mainly on space and aerospace. There are also similar opportunities for consolidation in shipbuilding, in which CSSC and CSIC together operate more than 130 subsidiaries.

In military research and development (R&D) the landscape is similarly fragmented. All of the state corporations operate R&D institutes and laboratories and although the creation of the EDD is intended to provide some policy guidance, China still does not operate a domestic version of the US Defense Advanced Research Projects Agency that can provide national leadership and cohesion in R&D.

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**Corruption:** All aspects related to nationally sensitive defence procurement in China remain secretive. Procurement and budgetary issues are tightly controlled by the state and there is no apparent civilian control, no measures to encourage accountability, and very little scrutiny by the country's compliant media. The problem is made worse by the armed forces' near autonomy, which means they operate without significant accountability or oversight, and the continued preference of sole-source military contracts: a system that not only discourages corporate competition but is also prone to corruption through bribery.

Additionally, while corruption scandals in China routinely involve the military there has been, up until recently, very little open-source or reported information about alleged corruption cases in defence procurement. However, over the past two years there have been several pointers indicating concerns in Beijing about the requirement for greater accountability in military acquisitions and an awareness that corruption affects industrial efficiencies, value for money and, ultimately, the quality of defence products.

In October 2015, for instance, AVIC agreed to tighten its internal procedures after the country's anti-corruption watchdog, the Central Commission for Discipline Inspection (CCDI), said it found evidence of bribery and misuse of public funds in AVIC's business dealings. The CCDI said that some officials from state-owned AVIC had used company funds to play golf, take holidays abroad, and pay for other personal expenses.

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