CHINA'S DEFENCE INDUSTRY: ORGANISATIONAL REFORMS

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Alvin Toffler has described the Industrial Revolution as an integrated social system with its distinctive technologies; its own social institutions that ripped apart the underlying unity of society, creating a way of life filled with economic tension, social conflict and psychological malaise. He characterised this period as a divorce of production from consumption and the world for the first time witnessed a paradigm shift of production for purposes of consumption to production for purposes other than own consumption. Toffler has also mentioned that since the 1960s, most countries had been transiting from a Second Wave society (Industrial Revolution) to a Third Wave society (Post Industrial Revolution). The Chinese, however, had never witnessed the Second Wave but many of their leaders in the 1980s were immensely influenced by Alvin Toffler's writings and along with Deng's "Four Modernisation" reforms, laid the foundation for the future of their economy and their country.

As far as this technological revolution was concerned, it has been the biggest challenge for China since the 1980s; for China lacked the technological base, which was one of the greatest hindrances to its economic progress. The ability to adapt to new scientific findings and apply these in technological development was a bane of the Middle Kingdom in the

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China's ability to cope with the rapid Western technological innovation was indeed a threat as well as a challenge. It feared that in its quest to catch the 'wave' of high technology, it could be condemned to a state of deeper dependence on the advanced countries.

1980s. Unlike the technologies in the 1960s, the new technologies developed in the 1980s had a greater lineage towards electronics and software. China's ability to cope with the rapid Western technological innovation was indeed a threat as well as a challenge. It feared that in its quest to catch the 'wave' of high technology, it could be condemned to a state of deeper dependence on the advanced countries. The strategy for survival, thus, was to promote science and technology and be governed by the market mechanism; however, it was yet to come to terms with the divorce from the socialist system, and adoption of the market mechanism.

On the other hand, China's science and technology was well recognised in the field of basic research in mathematics, geology, dynamics and agricultural sciences, with scholars like Huo Luogeng,[1] Li Siguang[2] and Qian Xuesen[3], who had made outstanding contributions over the years. They had by this time made significant progress in engineering and advanced military technology like nuclear warheads, satellites, computers, missiles, which had taken the Western world by surprise.[4]

China's march towards attaining the status of a country having expertise and competence in the field of science and technology and its

1. Huo Luogeng, pioneer in mathematical research and has written more than 200 papers and monographs, http://en.wikipedia.org/wiki/Hua_Luogeng
2. Li_Siguang, founder of China's geomechanics, with outstanding contributions to changing the situation of oil deficiency, enabling large-scale development of oil fields, http://en.wikipedia.org/wiki/Li_Siguang
3. Qian_Xuesen, made important contributions to the missile and space programmes in the United States where he was known as H.S. Tsien, according to the NASA documents as well as in People's Republic of China. Qian was the founder of the Jet Propulsion Laboratory at the California Institute of Technology. He returned to his native country to lead the Chinese rocket programme, and became known as the "Father of Chinese Rocketry", http://en.wikipedia.org/wiki/Qian_Xuesen
4. Nobuo Maruyama, *Industrialisation and Technological Development in China (*Tokyo: Institute of Developing Economies, 1990), p.2.

overall effort in the development of industrial as well as military technology got hindered by the country's economic progress as well as the ten-year period of the Cultural Revolution from 1966-76. During this period, the institutional framework for promoting technology was driven into a state of complete disorder.[5] While China was in the midst of this social turmoil, the West was reaping the benefits of technological innovations resulting in high economic growth on a global scale. China, because of its internal social and economic contradictions, lost the opportunity to participate in this global technological progress; a loss of far greater significance than a mere decade would suggest.

Socialist countries have historically concentrated on heavy industrialisation, which in their belief was the fastest way to attain industrialisation.

TECHNOLOGICAL VACUUM

China adopted the '*Socialist Industrialisation Strategy*' which gave priority to development of the capital goods sector, and the quality of industrialisation was, therefore, measured by the share of the gross value of output by heavy industries in the gross value of industrial output.[6] Socialist countries have historically concentrated on heavy industrialisation, which in their belief was the fastest way to attain industrialisation as well as a choice necessitated by their individual defence requirements. This strategy emphasised on domestic production and import substitution of capital goods, which equipped China, unlike most other developing nations, with a full spectrum of basic industries. Also, the amount of resources allocated by China since the 1950s for the defence build-up was significant in assessing the trajectory of Chinese defence industries. China made significant progress in the manufacture of advance weaponry, including nuclear bombs, missiles, satellites, fighter aircraft and nuclear submarines,

5. David Shambaugh and Richard H. Yang, *China's Military in Transition*, Paper written by John Frankenstein and Bates Gill on Current and Future Challenges Facing Chinese Defence Industries (Clavedon Paperback, 1997), p.134.
6. Maruyama, n. 4, p. 14.

all manufactured domestically—indeed, an achievement, considering that as a country it never went through a process of industrialisation like many of the other advanced Western nations. China, in terms of innovation, was not anywhere close to being a trail blazer, hence, it depended on technical assistance from the advanced countries like Russia and Israel. The technological gap between China and the advanced countries in the fields of space, aviation, computers and nuclear technology can be analysed from Table 1. It is evident that in almost all aspects, China began developing advance weaponry roughly fifteen years after the advanced military powers. The catch-up by China in defence build-up could not have been possible, if it had not been for China's competence in Research and Development (R&D).

Table 1: Technological Gap Between China and Advanced Countries

Programme	USA	USSR	UK	France	Japan	China
Space						
First Satellite	1958	1957		1965	1970	1970
Aviation						
First Jet Plane	1942	1945	1941	1946		1958
Nuclear						
First Reactor	1942	1946	1947	1948		1956
First A-Bomb	1945	1949	1952	1960		1964
First H-Bomb	1952	1953	1957	1968		1967
Computer						
First Prototype	1946	1953	1949		1957	1958
First Transistor	1952	1956	1953		1954	1960
First Integrated Circuit	1958	1968	1957		1960	1969

Source: Nobuo Maruyama, *Industrialisation and Technological Development in China* (Tokyo: Institute of Developing Economies, 1990).

DEFENCE INDUSTRY

China's defence industry was a mirror reflection of the former Soviet Union's Military Industrial Complex (MIC); highly centralised in its design, it believed in excessive capacity, high consumption, incorrectly priced inputs,

poor management practices, inefficiency and low quality of production, resulting in China lagging behind the other countries. It, therefore, had to trade off high technology sectors due to its fragile economic base and was forced to concentrate only on priority projects, like developing the atom bomb, hydrogen bomb, satellites, nuclear-powered submarines and combat aircraft. Also, being a closed system, the developments in the field of defence could not percolate into other sectors due to secrecy and a hierarchical structure which discouraged horizontal knowledge flow, critical to technological progress. The civil industry could, therefore, not reap the benefits of progress made in the defence industry during this period in China.

The limitation of the defence production capabilities in the 1980s and 1990s cannot be simplistically attributed only to technological backwardness, long R&D and indeterminate production timelines.

China's defence industry in the early part of the 1980s was more or less stagnant. After the Chinese Communist Party's Third Plenary session of the Thirteenth Central Committee in September 1988, there were some signs of its revival, but it was still way behind the advanced Western countries. Since the late 1990s, the Chinese defence industry has progressed post defence reforms, resulting in greater productivity, improved R&D methodologies and, hence, improvement in the quality of defence output. Though these changes have been gradual, the Chinese are consolidating as their economy continues to grow year on year and we need to watch whether China has the ability to translate its growing economic resources into building a modern military which would also serve as an indicator of national technological progress.

The limitation of the defence production capabilities in the 1980s and 1990s cannot be simplistically attributed only to technological backwardness, long R&D and indeterminate production timelines. It would be only correct to apportion a part of the responsibility on the model of MIC, which was highly centralised, with excessive capacity coupled with poor management practices and a complex organisational structure which put China a decade

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behind many of the advanced countries, as can be seen from Table 1.

The turn of this century witnessed the Chinese defence industry transform itself from a defunct organisation of the 1960s and 1970s, to a more robust structure, having undergone a series of reforms in the organisational structure, policy and flow of international capital which, in fact, revealed a new paradigm shift on the part of the Chinese leadership. The reforms in the defence industry through the late 1990s can be recognised when viewed from the following perspective[7]:

- Greater funds for weapon acquisition.
- "Spin-on" benefits from the commercial economy.
- Integration into global research, development and the production chain which provides access to foreign technology and capital.
- Fundamental reforms in the sector.

Since the 1950s, the defence industry has undergone a number of organisational changes to meet the challenges posed by the advanced Western countries as well as to overcome its own shortcomings. Due to the lack of capabilities in producing weapons as well as shortage of resources, the Chinese preferred to acquire technologies and design which had already been developed in the more advanced countries like Russia and Israel. From a short-term perspective, it was prudent as well as cost-efficient for a cash starved nation to acquire technology from other nations rather than to reinvent it, but from a long-term perspective, the effect of this was visible in China's inability to keep pace with the more advanced countries. Hence, during the process of evolution, it was unable to meet global standards.[8]

7. James Mulvenon and Rebecca Samm Tyroler-Cooper, "China's Defence Industry on Path of Reform", Paper prepared for the US-China Economic and Security Review Commission, October 2009, p.5.
8. David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003), ch. 6, p.225.

The MIC in the 1950s was concentrated in the war-torn Manchuria and the coastal cities of Tianjin and Shanghai, which were developed with the technical and material support of the Russians in 45 factories producing ordnance, employing close to a 1,00,000 workers. Under the Soviets, the Chinese were also producing aircraft, naval vessels, and electronic equipment alongside a wide range of ordnance. Structurally, the defence industries were vertically integrated[9] like in the traditional Russian system.

On Mao's directive and as elucidated in his famous "*Ten Great Relationship Speech*" on April 25,1956,[10] the defence plants were built in cities displaced from the coastal areas like Taoyuan, Luoyang, Lanzhou, Chengdu, Chongqing, Kunming and Wuhan. In the 1960s, Mao decided to create a "Third Front" and moved factories to the interiors of Sichuan and Guangxi province to reduce vulnerability to attack by the Soviets or Americans. The programme continued until the late 1970s, creating 483 factories and 92 research institutes in China's remote mountainous and forested areas.[11] In retrospect, this policy, floated by Mao, from a national security perspective, not only lacked economy of scale but also squandered scarce resources, and, as a result, the Chinese defence industries paid a heavy price, the ripples of which are felt even today. In fact, David Shambaugh mentions that some of the most intractable and laggard enterprises of China's ossified state industrial system were the "Third Front" factories.

During the 1950s and 1960s, after the Korean War, the Soviets set up the defence industrial base to produce aircraft, tanks, armoured personnel carriers, ships and submarines for the Chinese. This development was interrupted from 1958 to 1962 by the "Great Leap Forward", which drained whatever capital and resources were available to other industrial initiatives, like the

9. Vertical integration is the process where each plant is composed of as many components as the whole manufacturing process requires.
10. Mao's speech at a meeting of the Political Bureau of the Central Committee of the Chinese Communist Party, "Bearing in mind lessons drawn from the Soviet Union, Mao summed up China's experience, dealt with 'Ten Great Relationships' in socialist revolution and socialist construction and set forth the ideas underlying general line of building socialism with greater, faster, better and more economical results, a line suited to the conditions of our country", Adapted from *Selected Works of Mao Tse-tung*, Vol. V (Peking: Foreign Languages Press, 1977) p.285.
11. John Wilson Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernisation in Nuclear Age* (Stanford University Press, 1994), p. 94.

Chinese planners, decided to short circuit the process and purchased only key systems from abroad with an aim to 'reverse engineer' the systems.

'backyard steel' production by communes that produced 'junk' in the name of steel. The same steel was used in the production of aircraft airframes, tanks and other military arsenal of poor quality, resulting in drop in productivity. The withdrawal of the Soviet assistance in the summer of 1960 with an estimate of over 60 percent heavy industrial projects remaining unfinished was another setback for the MIC as a majority of these unfinished projects belonged to the defence sector. During this period, the defence industrial base eroded literally into obsolescence. This was further escalated by the Cultural Revolution, when the aviation industry and conventional weapon industry were wasted and pushed back by many years.

In the 1980s, Deng demobilised close to a million soldiers and redefined security, as 'defence' was placed last in the priorities of the "Four Modernisations". The strategic understanding amongst the Chinese was that this was a period of prolonged peace and it was unlikely that China would face any confrontation from either the Soviets or the capitalists. They also recognised that the strength and influence of a country in the international system was guided by development of its national economy and its technological capability rather than just by its military capability, which, in fact, could only ride on its economic strength. Hence, during this period, meagre resources were allocated towards improving the defence industrial base due to limited foreign exchange, which proved to be a real constraint in the purchase of military equipment. To compensate, Chinese planners, being real juggernauts, decided to short circuit the process and purchased only key systems from abroad with an aim to 'reverse engineer' the systems. This policy boomeranged as none of the Western suppliers agreed to sell one or two prototypes and even if the Chinese did manage to lay their hands on any, by hook or by crook, the technologies proved too complex to be copied. As a result, the MIC continued to languish for a long time. Although the situation continued through the 1980s, there was a short period of respite, when America and China agreed to cooperate on joint

projects like "Peace Pearl" to upgrade avionics on the J-8-II. This too was for a brief period until the 'massacre at the Tiananmen' on June 4, 1989; thereafter, all Western nations suspended the technological assistance to China.

The spiralling Chinese economy, followed by the Gulf War and resurrection of relations between Moscow and Beijing in the 1990s, forced the Chinese to reassess their strategic and security needs. It was conclusive that a large and obsolete land-based force was inadequate to address the Chinese security concerns directed mainly towards the bombastic Americans and Japanese. Hence, the Chinese decided to urgently revive their moribund MIC to develop a new force structure in order to meet new challenges which would also be governed by the changing nature of warfare. The Gulf War had redefined modern warfare, and future wars were expected to be fought not only on land but also through the media of air, sea and space and, at the same time, also involve the gambit of electronic warfare. Chi Haotian, Defence Minister in 1994, had declared that along with promoting overall interest in economic construction, there must also be an endeavour to increase the national defence capacity.

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SHORT ARMS AND SLOW LEGS

"Short Arms-Slow Legs" was an idiom first used by a Chinese General to describe the People's Liberation Army (PLA) after he had analysed the Gulf War. It was then symbolic of the PLA's dilemma: that they did not have the transportation to get to a fight; and even if they got there, they could not hit anybody, unless their opponent had even shorter arms and slower legs than the PLA.[12] Hence, the major challenge for the MIC was to develop a level of confidence in the PLA by becoming capable of producing and developing

12. Russell. D. Howard, *The Chinese People's Liberation Army: Short Arms and Slow Legs* (Colorado: USAF Institute of National Security Studies), Occasional Paper 28, Regional Security Series, September 1999, p.28.

systems to enable the PLA to overcome its problem of "Short Arms-Slow Legs" and, thus, enable it to conduct limited wars under high-tech conditions.

MILITARY INDUSTRIAL COMPLEX

For a long time since its inception, the MIC had been languishing. Its limited access to foreign technology due to shortage of foreign exchange as well as the red tape bureaucracy prevalent in the defence organisational structure, along with lack of vision and obsession of the leaders for 'self-reliance' were reasons for the MIC to be withering during most of the 20th century. However, post Gulf War and a series of reforms in the organisational structure in the late 1990s, it appeared that the defence industries had come of age.

MIC (1950-1979)

After independence, in 1950, the Chinese MIC functioned under the State Council. The Military Industries Office, a subordinate of the Ministry of Heavy Industry managed the MIC. A year later, to have greater control, China's Communist Party Central Committee (CCPCC) established a Military Industry Bureau to manage the MIC. This was further reorganised in 1952, to create two Ministries of Machine Building (MMB), one of which looked at civilian production and the other one at military production (Fig1). This system held until the Sino-Soviet split in 1960, thereafter which the MMBs were expanded to seven. The Eighth MMB, which was given the responsibility for producing agricultural machinery was added in the mid-1960s and later merged with the First MMB in 1970 (Table 2). Thereafter, an entirely new Eighth MMB was incorporated in September, 1979 to look after the space programmes and production of tactical missiles (Table 3). All the MMBs were jointly controlled by the State Council and the Central Military Commission (CMC) through the Ministry of National Defence (MND). Under the PLA, the equipment department of the General Logistics Department (GLD) formulated the requirements for defence equipment, which were passed on to the respective ministries through the MND. The GLD, on the other hand, was also responsible for storage, maintenance and transportation of military material as well as managing a large number of PLA factories. The function

of the General Staff Department (GSD) was to coordinate the purchase of material for different arms of the PLA through the MND.

Fig 1: MIC in 1950-1960

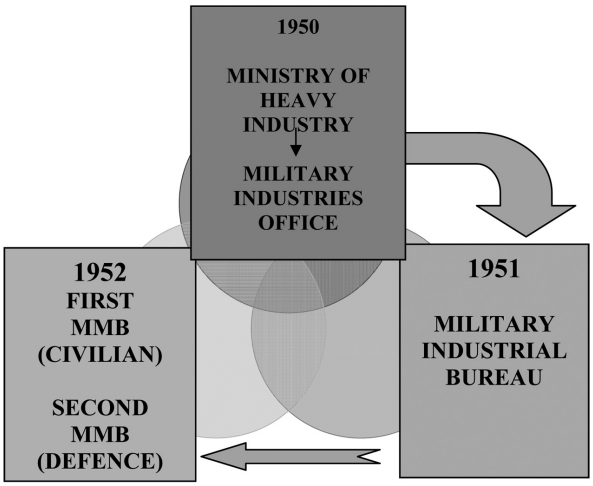

Table 2: Evolution of MIC After 1960

Ministry	Production Line
First MMB	Civilian
Second MMB	Atomic Energy & Nuclear Weapons
Third MMB	Aircraft and Non-Ballistic Missiles
Fourth MMB	Electronics and Telecommunications
Fifth MMB	Conventional Ordnance
Sixth MMB	Naval Equipment and Shipbuilding
Seventh MMB	Ballistic Missiles
Eighth MMB	Agricultural Machinery

Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

Table 3: Evolution of MIC After 1960

Ministry	Production Line
First MMB	Civilian Merged along with Agriculture
Second MMB	Atomic Energy & Nuclear Weapons
Third MMB	Aircraft and Non-Ballistic Missiles
Fourth MMB	Electronics and Telecommunications
Fifth MMB	Conventional Ordnance
Sixth MMB	Naval Equipment and Shipbuilding
Seventh MMB	Ballistic Missiles
Eighth MMB	Space Programme (Formed in 1979)

Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

MIC (1980-1990)

The numbered MMBs continued to function under the CMC and the State Council. The National Defence Industry Committee (NDIC) was responsible for all the policy matters concerning the MMBs and functioned under the CMC, while the National Defence Industry Organisation (NDIO) was under the State Council and coordinated the flow of products among the MMBs. It is evident that the military direction came from the CMC, while the MND functioned as a link between the State Council and the CMC.

In 1981-82, the MICs were once again reorganised by merging the ministries dealing with ballistic missiles and the space programme. The MMBs were reduced to seven and their names changed, however, their functions remained more or less the same (Table 4).

Table 4: Evolution of MIC After 1980

Ministry	Production Line
Ministry of Machine Building	Civilian Production
Ministry of Nuclear Energy	Atomic Energy & Nuclear Weapons
Ministry of Aviation Industry	Aircraft
Ministry of Electronics Industry	Electronics Systems
Ministry of Ordnance Industry	Munition and Conventional Arms
China State Shipping Corporation	Naval and Merchant Shipping
Ministry of Space Industry	Space System and Ballistic Missiles

Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

The ministries were once again reorganised and consolidated by shrinking them to four ministerial level organs in 1988. The aim was to reduce the overall number of ministerial level organs by combining related sectors like aviation and space; electronics, ordnance and machine building; nuclear, coal and electric power; merchant and military shipbuilding. On the contrary, this round of reforms in bureaucratic restructuring significantly decreased efficiency and economies of scale, as a number of ministries were combined, leading to replication of work, long production cycles, resulting in poor quality production of many systems. The 1988 reforms comprised a definitive step backwards towards invigorating the defence industry. The ministries continued to be funded through annual budgetary allocation and received minimal input from production enterprise. The combination of sectors resulted in excessive production capacity, surplus personnel, poor management practices and incorrectly priced inputs.

Table 5: Evolution of MIC in 1988

Ministry	Production Line
Ministry of Energy Resources	Nuclear, Coal and Electric Power
Ministry of Aerospace	Civil/Military Aviation, Space, Missiles
Ministry of Machine Building and Electronic Industry	Civilian and Military Machinery, Machinery, Electronics and Ordnance
China State Building Corporation	Merchant and Military Shipbuilding

Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

The government recognised the shortcoming of their MICs in the 1980s and made repeated efforts to reform and rehabilitate them. These ministries were further reorganised to induce greater efficiency in the system as China headed towards a market economy with a 'socialist character'. The focus was gradually changing from the rubric of social welfare to that governed by demand and supply and ultimately the efficiency of the end product, which was the key to any industry generating profits. The ministries also required systematic and institutional consolidation rather than merely cosmetically reorganising their names and shuffling responsibility. Hence, the defence

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industries post 1990 were governed by[13]:

- Market forces based on demand and supply.
- Threat perceptions to be the major factor deciding on production of equipment.
- Efficiency and the quality of the product.

Reorganisation of the MIC once again took place in 1993, like it had happened earlier in 1982 and 1988. However, this time, it was aimed at corporatising the MICs and carrying out administrative reforms to bring in greater efficiency by decentralising the system. The last organisational restructuring in 1988 had left the defence industries overcentralised and controlled, hence, the 1993 reforms were aimed at corporatisation, decentralising, reduction of subsidies, though the State Owned Enterprises (SOE) continued to be financed by the State Council, but out of the defence budget. The focus was on the quality of product and the entire mechanics was governed by market forces rather than social factors.

The 1993 format of reorganisation recreated six ministry equivalent bodies, which were corporations and governed primarily by market forces, the demand was guided by threat perceptions, and emphasis was laid on the satisfaction of the end user and quality of the product, with profit-making becoming an aim of the corporations. Modern management principles were incorporated by giving more prominence to managers than workers, as was done earlier. Pruning the organisation, cutting flab and making corporations independent and efficient became the *mantra* for the defence industries. The principles of Merger and Acquisition (M&A) became the buzzword for inefficient industries and corporations had no choice but to generate profit through innovations and produce impressive and high quality military systems. Although the goal was to reduce reliance on government

13. Discussion with Dr Srikanth Kondapalli on China's defence industry.

support, spur economic dynamism and encourage innovation, these corporations continued to be dependent on government support, as through this decade, most of the defence industry, barring the aviation sector, ran at a net loss.[14]

The ministries in 1993 were once again reorganised into corporations: thus, the Ministry of Energy Resources converted into China's National Nuclear Corporation; the Ministry of Aerospace split into Aviation Industry of China (AVIC) and China Aerospace Corporation; the Ministry of Machine Building and Electronics Industry was broken down into the Ministry of Machine Industry, Electronics Industry and Northern Chinese Industry Corporation (NORINCO); and the Ministry of Coal and Ministry of Electric Power Industry were also reestablished (Table 6). The Chinese defence industrial sector comprised six corporations, namely:[15]

- China National Nuclear Corporation (CNNC).
- Aviation Industry of China (AVIC).
- China Aerospace Corporation (CASC).
- Northern Chinese Industry Corporation (NORINCO).
- China Ordnance Industry Corporation (COIC).
- China State Shipbuilding Corporation (CSSC).

Table 6: Evolution of MIC 1993

Ministry	Production Line
China National Nuclear Corp (CNNC)	Nuclear Power and Nuclear Weapons
Aviation Industry of China (AVIC)	Civilian/Military Aircraft
China Aerospace Corp (CASC)	Space Launch Vehicles, Satellites, Missiles and Related Equipment
China North Industries Corp (NORINCO)	Conventional Weapons and Ordnance
Ordnance Industry Corp (COIC)	Ordnance
China State Shipbuilding Corp (CSSC)	Commercial and Naval Shipping

Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

14. Evan S. Medeiros, Roger Cliff, Keith Crane, James C. Mulvenon, *A New Direction for China's Defence Industry* (RAND Corporation, 2005), ch.1, p.8.
15. Ibid., ch.1, p.16.

MIC (1998)

The Chinese planners recognised that sustainable progress in defence modernisation had to go hand in hand with upgrading the structure, management and operations of the defence industry, which had to survive on its own by cutting cost, improving efficiency, and innovation, without any assistance from the State Council. Quality control had become a 'catchword' and mechanics were being developed to monitor the production at the factories by the end user or the consumer. Since there was a paradigm shift from the natural process of "production for the purpose of consumption to production for purposes other than own consumption," as had been lucidly articulated by Alvin Toffler, a mechanism had to be formulated to ensure efficiency and quality.

The path-breaking changes took place in the organisation of the defence industry in 1998, where in addition to creating a new super body as in the General Armament Division (GAD) under the party's CMC, the function of the Commission of Science, Technology and Industry for National Defence (COSTIND) was redesigned and the five corporations were expanded to ten new corporate bodies. In the early 1980s, the Chinese, under Deng adopted a duopolistic arrangement of 'statisation' to cater for redundancy. This was conspicuous in structures like the CMC, which had a Party CMC as well as a State CMC[16]. In the same manner, the State Council established two companies in the MIC to break the monopoly and promote competition.[17] The five state-owned defence corporations were split into ten as given below and as enumerated in Table 7.

- AVIC
  - China First Aviation Corporation
  - China Second Aviation Corporation
- CASC
  - China Aerospace Science Technology Corporation
  - China Aerospace Machinery Electronics Corporation

16. n. 13.
17. Timothy Hu, "A Morning Star Shines", *Jane's Defence Weekly*, July 30, 2008.

- NORINCO
  - China North Industry Group Corporation
  - China South Industry Group Corporation
- CSSC
  - China State Shipbuilding Corporation (Northern Shipyard in (Dalian)
  - China State Shipbuilding Corporation (Southern Shipyard in Shanghai and Wuhan)
- CNNC
  - China National Nuclear Corporation
  - China National Nuclear Energy and Construction Corporation

Table 7: MIC in 1998

Ministry	Production Line
1. China First Aviation Corporation	Fighter, Bomber, Transport, ADV Training Jets, Airliner
2. China Second Aviation Corporation	Helicopters, Light Trainers, UAV
3. China Aerospace Science Technology	Space Launch Vehicles, Satellites
4. China Aerospace Machinery Electronics Corporation	Missiles, Electronics, Other Ballistics
5. China North Industry Corporation	Tanks, Armoured Vehicles, Artillery, Ordnance
6. China South Industry Corporation	Misc Ordnance, Trucks, Automobiles, Motorcycles
7. China State Shipping Corporation (Northern Shipyard in Dalian)	Destroyers, Submarines, Large Containers, Commercial Vessels
8. China State Shipping Corporation (Southern Shipyard in Shanghai and Wuhan)	Frigates and Smaller Surface Combatants, Submarines and Merchant Ships
9. China National Nuclear Corporation	Nuclear Fuel, Energy and Weapons

10. China Nuclear Engineering and Construction Corporation	Nuclear Power Plants

Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

The frequent reorganisation of the defence industries in the past was an admission of China's search for greater efficiency and rationality and, at the same time, it was also a tacit admission of the failure of the previous structures. Through the process of introspection, Beijing was continuously trying to improve the technological capabilities of its defence industry. It was aware that a total technological revolution in its defence industries would be almost impossible, hence, it decided to follow the path of selective modernisation by looking at its core strength like aerospace, missiles and electronics. China also realised that dependence on foreign technology was essential to enable China to achieve its broader goal of independence in defence production. Also, looking at the Western models, it realised that civil-military integration was essential to accelerate its march towards attaining independence in defence production. Hence, through civil-military integration, China's defence manufacturers could aspire to take advantage of dual use equipment that could be used in the production of weapon systems.

FOUR MECHANISMS

The reform of the defence industry in the new millennium was channelised through the "Four Mechanisms" of:

- Competition.
- Evaluation.
- Supervision.
- Encouragement.

This became the guideline to refurbish the ailing ineffective, inefficient and corrupt defence industry and its procurement system, through a decentralised system with better market practices and management systems. The aim was to provide the corporations or enterprises with

greater autonomy and make them responsible for their own bottom lines. This would incentivise running of corporations and guard them from becoming bankrupt. The financial accountability would improve the health of the corporations; infuse better management skills and efficiency by not only vertical integration but also horizontal integration within and outside the defence sector. Hence, in the new millennium, efficiency and better management practices became the *mantra* for the defence industries.

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WTO

China had officially applied to the General Agreement on Tariff and Trade (GATT), the predecessor of the World Trade Organisation (WTO), in July 1986 to resume its status as an original contracting party. Finally, China became a member of the WTO on December 11, 2001, an event which acknowledged its entry to the world just as the economic reforms propagated by Deng had opened up China to the world! What this meant was that the Chinese economy was now heading towards a market driven system, which was non-discriminatory, without tariffs and subsidies. The concept of market economy with a socialistic character became a challenge, as competition in China's domestic as well as international market became intense with the proliferation of new and more market-oriented companies in various sectors. Competition from foreign producers became a key, now that China had entered the WTO. Interestingly, a few defence firms were able to use defence conversion gainfully to access modern production technologies to produce better military goods, one of the many rationales for bringing in defence conversion. A few sectors, such as shipbuilding and electronics, successfully transformed themselves into efficient productive firms. The import and export of electronic products showed a year on year rise of 42 percent and exports in this sector alone

reached a whopping $262 billion, where computers accounted for $99 billion and communication devices and home appliances accounted for almost $82 billion in 2010.[18] The Chinese shipbuilding also became the number one shipbuilding industry, overtaking South Korea, according to Clarkson Research Services Limited.[19] Hence, the benefits China derived from its entry into the WTO were profound as it led to speedier economic reforms and long-term growth was based on efficiency and innovation. At the same time, it also gave the foreign investors an opportunity to use China both as an export platform as well as a gateway to develop China's domestic market. Regardless, it brought in a large amount of Foreign Direct Investment (FDI) as well as new management technology, global production and distribution networks that would link China more tightly to the other economies.

COSTIND

In August, 1982, COSTIND was set up by merging the Defence Science and Technology Commission (DSTC), National Defence Industry Office (NDIO) and Science and Technology Equipment Commission (STEC). The working of COSTIND was fuzzy as it functioned conjointly under the CMC and the State Council.[20] In 1986, COSTIND was made the nodal agency for trade of all military products in the defence industry and, along with the State Council, took over control of the Aviation, Nuclear, Ordnance and Space Ministries of the MICs. COSTIND also had extensive responsibility over all of China's testing and evaluation bases such as the Lop Nur nuclear testing site. Hence, in the reorganisation process of the defence establishment, the function of COSTIND was to coordinate development, production and general acquisition of advanced weapons.

COSTIND was, in fact, designed to break barriers between civilian and military R&D and the industry; to bring in 'spin-on' and 'spin-off'

18. "Trade In Electronic Products Up 41.8 % in H1", *China Daily*, Xinhua, July 27, 2010.
19. "China Overtakes Korea Shipbuilding Deliveries", *JoongAng Daily* online, July 19, 2010, Published in FBIS.
20. Article published on the website of Federation of American Scientist on Commission on Science, Technology and National Defence Industry, http://www.fas.org/nuke/guide/china/agency/costind.htm

benefits. The defence industry was privileged with resources and technology not available to the civilian industry. The creation of COSTIND was one measure by which Chinese leaders hoped to facilitate the transfer of technology between the military and civilian sectors. COSTIND was also responsible for procuring foreign technology for the military through the China Xinshidai Corporation, which was its trading arm. COSTIND also controlled procurement funding, reviewed proposals for weapons requirements funnelled through the General Staff Department's Equipment Sub-department, and coordinated with defence industries to produce the needed equipment. In 1987, China adopted a new contractual system for weapons R&D and production. Under the new system, the state divided defence R&D funds into three categories: military equipment research, basic and applied sciences research, and unidentified technological services.

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- The first type of appropriation went to military arms and Services, which signed contracts with research institutes or enterprises to develop and manufacture the required weapons. The contract system involved the PLA, which had been removed to a large extent from such activities in the development and manufacture of the weapons it would use.
- The second category of funds was devoted to basic research and applied science to help modernise the defence industry.
- The third category went to technological services necessary for research programmes.

This reform was another measure designed to integrate the military and civilian industry by placing the military production of defence industries within the framework of the planned-commodity economy. The new system further sought to provide the military with better equipment at less cost; upgrade weapon designs and improve

production; improve the management of weapons R&D; promote cooperation between research institutes and factories; and enhance the decision-making powers of the enterprises.

In March 1998, COSTIND once again underwent a makeover to become a ministry level agency under the control of the State Council. What it implied was that from a fuzzy dual control under the CMC as well as the State Council, its control was entirely transferred to the State Council and COSTIND was 'civilianised' at the Ninth National People's Congress (NPC). This resulted in COSTIND relinquishing all its earlier military responsibilities, which were transferred to a new PLA department under the CMC called the General Armaments Department (GAD). After this reorganisation, COSTIND's functions were curtailed further and it no longer controlled any of the prime military facilities like the testing and evaluation bases in China, such as the Lop Nur and Xichang satellite launch centres. The aim of reorganising COSTIND was to bring in reforms in the management, improve efficiency and induce competition in the defence industries so that a more rationale procurement system could be developed to cater for the requirements of the PLA through the GAD.

GAD

The GAD was established on April 3, 1998, under the CMC with an initiative to reorganise the structure and production of the defence industry. The formation of the GAD was simultaneously accompanied by the reorganisation of COSTIND, which was administratively placed under the State Council and renamed as State COSTIND (SCOSTIND). The system was designed on the French model, by centralising the management, research and production of weapons and the GAD was made the superagency. This was done with the intention to overcome obsolescence and distortions in the production costs, which historically had been the bane of the defence industry in China. Although the GAD under the CMC was all powerful when it came to taking decisions for the defence industry, it was still fuzzy when it came to establishing parameters of its administrative purview and

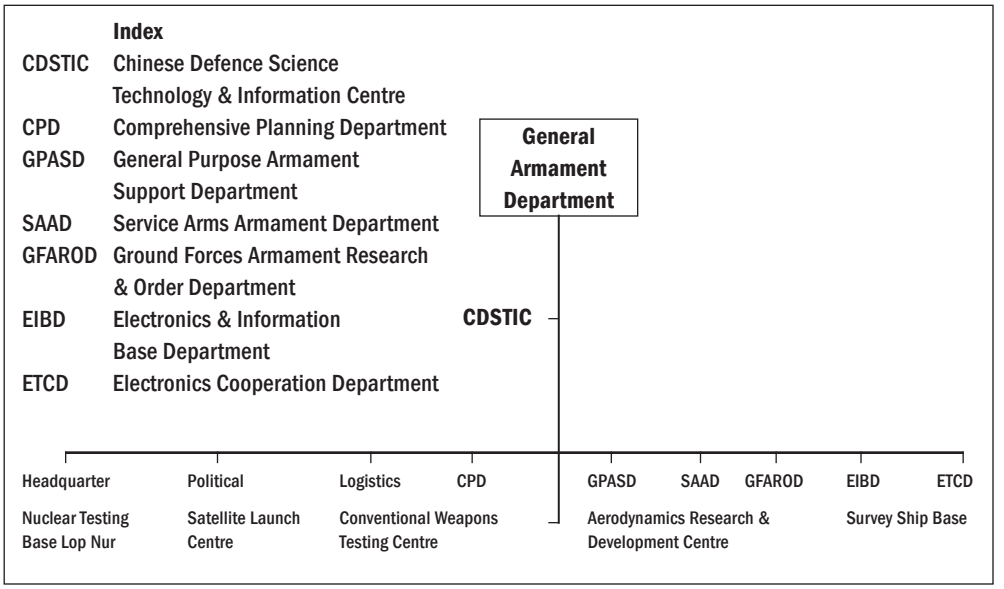
the defence industrial installation that it controlled.[21] The GAD consisted of nine first level departments, consisting of:

- Headquarters.
- Political.
- Logistics.
- Comprehensive Planning consisting of the Finance and Budget Section.
- General Purpose Armament Support.
- Service Arms Armament for Air Force, Army and Navy.
- Ground Forces Armament Research and Order.
- Electronic and Information Base.
- Equipment Technology Department.

The headquarters, Political and Logistics Department were the GSD, GPD and GLD representative organs in the GAD and carried out their respective staff functions. The Comprehensive Planning Department was responsible for budgetary affairs; the General Purpose Armament Support Department was nominated to provide technical support for equipment used throughout the PLA. The core of the GAD was the Service Arms Armament Department, formed by combining the Special Arms Department and Equipment Department of the GSD, and Ordnance and Military Supplies Production Department of GLD. It supervised the development of specialised weaponry and equipment for the Services. The Ground Forces Armaments Research and Order Department oversaw the equipment research and production for the army as well as played a key role in arranging purchases from abroad. The organisation chart of the GAD is shown in Fig 2.

21. Shambaugh, n. 8, ch.4, p.143.

Fig 2: General Armament Department



Source: David Shambaugh, *Modernising China's Military Progress, Problems and Prospects* (Regents of the University of California, 2003).

Under the GAD, there were a number of factories along with nuclear and conventional weapon test facility, missile launch centre and research institutes. The GAD also absorbed in its structure the China Defence Science and Technology Information Centre (CDSTIC) from the former COSTIND. It had more or less taken over control of a number of functions from COSTIND and literally stayed on top of the MICs in almost all aspects.

By removing the acquisition function from COSTIND and creating the GAD, China created within the PLA an advocate for the PLA's interests in the development and procurement of weapon systems for the defence industry, which earlier in a way was divorced from the interest of the PLA; the production chain was governed more by the interest of the industries than by the interest of the PLA or its threat perceptions. Both the GAD and COSTIND remained embedded in China's larger government bureaucracy and SCOSTIND was now meant to function as the administrative and regulatory agency for the defence industries.

The GAD, on the other hand, assumed the responsibility of military procurement, which was guided by the PLA's very own requirements. This reorganisation centralised China's military procurement system, making the CMC and GAD all powerful.

The significance of the "civilianisation" of COSTIND and the creation of the GAD is two-fold. First, these policy changes centralised China's military procurement system which was earlier the responsibility of various civilian and military organisations, each with distinct and conflicting interests. Second, the 1998 reforms separated the builders from the buyers. This organisational change further rationalised the procurement system which aimed to reduce conflicts of interest, and corruption. Hence, the GAD represented the PLA interests whereas COSTIND as a civilian agency handled industrial planning and the administrative affairs of the defence industries.

MINISTRY OF INDUSTRY AND INFORMATISATION (MIIT)

In 2007, the State Council approved the policy document "Some Opinions on Deepening the Reform of the Investment System of Science, Technology and Industry for National Defence," which proposed a new investment system featuring effective government regulation and control, participation of social capital, standardised intermediary services, vigorous supervision and management, and positive military-civilian interaction.[22]

The plan for restructuring was passed at the First Session of the Eleventh National People's Congress in 2008, which established the State Administration for Science, Technology and Industry for National Defence (SASTIND) under the Ministry of Industry and Information Technology (MIIT). This was, in fact, a commitment from the government to inject the "Four Mechanisms" into the structure by the creation of MIIT and elevation of the GAD. The state owned defence enterprises displayed their enthusiasm in incorporating the "Four Mechanisms" in the system and simultaneously utilised the opportunity to leverage the spin-on benefits of the commercial economy to integrate it with China's defence industry.

22. Article published on the net on SASTIND, updated December 2009, http://www.nti.org/db/costind.htm

China had set up five super ministries on March 11, 2008, as part of the institutional reforms at the first session of Eleventh NPC.[23] These were:

- MIIT.
- Ministry of Human Resource and Social Security.
- Ministry of Environment Protection.
- Ministry of Housing and Urban-Rural Construction.
- Ministry of Transport.

The MIIT assumed authority over the functions of several government departments like the industry and trade part of the National Development Reform Commission (NDRC), SASTIND, the former Ministry of Information Industries and the State Council Informatisation office. In its position of consolidated authority, the MIIT not only represented an overall streamlining process, but also helped facilitate the exchange between civil and military resources. The super-ministry had a broad range of functions, including managing the telecommunications industry and safeguarding information security. The spin-on benefits from the commercial telecom and Information Technology (IT) sectors have played an important role in the Chinese military's operational and communications security.

A key office within the MIIT is the Civil-Military Integration Department. Its mission is to write policy and set standards pertaining to the "promotion of military-civilian dual use technology transfer and to implement an integrated system of standards." For example, this office manages the licensing for civilian space launches. This kind of partnership plays a critical role in helping the defence sector leverage spin-on benefits from the commercial economy and integrate into the global R&D and production chain.

SASTIND

SASTIND was established to function under MIIT, one of the five super ministries established in 2008. Its role in managing the defence industry

23. "China to Set Up Five New 'Super Ministry'," *China Daily*, March 11, 2008, http://www.chinadaily.com.cn/china/2008npc/2008-03/11/content_6527183.htm

had been reduced as compared to the earlier COSTIND, since most of its functions had either been taken over by the MIIT or GAD. Under the new structure, SASTIND's role was to concentrate on industrial planning and regulatory aspects of the defence industries, while the role of the GAD was to consolidate R&D processes within the military. Another notable change in the function of SASTIND compared to the former COSTIND was that it was no longer responsible for the management of nuclear power which had been transferred to the National Energy Administration and separately administered under the National Development and Reform Commission (NDRC). The six university level schools, formerly under COSTIND had also been transferred under MIIT.[24] These were:

- Beijing Engineering University.
- Harbin Institute of Technology.
- Harbin Engineering University.
- Nanjing University of Aeronautics and Astronautics.
- Nanjing Engineering University.
- Northwest Polytechnic University.

The role of SASTIND was, therefore, to coordinate with the GAD and supply the military equipment required by the PLA. It was responsible for military R&D and production and, therefore, only had a broad authority over China's ten military industrial corporations. Hence, it was more or less clear that the GAD was the 'super agency' that called the final shots as far as the PLA and its requirements were concerned. The functions of SASTIND can be articulately framed as follows:

- R&D and draft guidelines, policies, laws and regulations related to science, technology and industry for national defence.
- Formulate plans for the development of science, technology and industry for national defence.
- Organisation and management of all international cooperation and exchanges.

24. Mulvenon and Tyroler-Cooper, n. 7.

The vibrancy of the defence sector is also reflected in the production of relatively more capable weapons which are being produced or under advanced development .

- Foreign technologies and foreign trade that involve national defence science, technology and industry.
- Oversee matters related to bilateral and multilateral international cooperation.

ROAD AHEAD.....

The proactive reforms, coupled with sustained increase in procurement funding of weapon systems since the turn of the century, have resulted in an evolved and more capable defence industry compared to what the Chinese had inherited. In 2002, for the first time, the defence industry was able to break even, in contrast to the early 1990s when the industry ran an annual deficit in excess of RMB 3-5 billion.[25] Since the early 1990s or more precisely after the Gulf War, the government started allocating more funds for the acquisition of weapon systems. From 1990 to 2003, the official defence budget allocation for weapons procurement grew from RMB 5 billion to RMB 64.8 billion.[26] The share of the budget devoted to weapons procurement increased from 16.3 percent to 33.8 percent during this period. This kind of defence allocation is bound to have a positive impact on acquisitions, which to some extent is visible in the present Chinese arsenal.

The success of these reforms is also reflected in the success of the financial performance of the defence sector. The earnings of the ten defence industries totalled $6.3 billion in 2007, an 80 percent jump over the previous year. However, it still remains unclear as to what percentage of this increase came from defence and non-defence. The vibrancy of the defence sector is also reflected in the production of relatively more capable weapons which are being produced or under advanced development like the J-10, WS-10 turbo fan engines, Luyang and Luzhou class destroyers, Song class

25. "Chinese Defence Industry, Chinese Puzzle", *Jane's Defence Review*, January 21, 2004.
26. Ibid.

submarines and missile systems.[27] However, China's major challenge in the defence sector continues to be in the field of propulsion system and electronics.

China's defence industry in the future will play a pivotal role in defining the military competence of the PLA, which would also become a vital factor in its attempt to reorganise and rationalise the force structure.

China has been working concertedly on the weapons requirements of the PLA and simultaneously on the political aspirations of long-term transformational requirements. The short-term requirements call for an impetus to the combined development of mechanisation and informatisation to lay a foundation by 2010 for the country's military posture, as articulated in the 2006 Defence White Paper, by replacing the existing arsenal with new generation naval, aviation and missile hardware. The long-term goal would be to look at a comprehensive blueprint for undertaking ambitious technological leapfrogging efforts by 2020.[28]

Though the quality of output of China's defence industry has improved manifold, it is still way behind many advanced Western countries in terms of weapon capabilities. The strategic significance of its robust defence production capabilities is huge, but as the US defence industry continues to advance, China's capabilities in terms of weapons production has been dwarfed by America's technological dominance.[29] On the other hand, on critically examining China's present capability, one finds that as the third largest economy and a progressive military, it is yet to develop a stealth fighter or a dedicated attack helicopter; its technology in terms of precision guided munitions is also way behind most of the advanced nations; and it is yet to develop a propulsion system for its fighter aircraft, for which it has to depend on the Russians.

China's defence industry in the future will play a pivotal role in defining the military competence of the PLA, which would also become a vital factor

27. Hu , n. 17.
28. Ibid.
29. Roger Cliff, *Advances Underway in China's Defence Industries* (RAND, March 2006).

in its attempt to reorganise and rationalise the force structure. As a part of this rubric, it is essential to also follow the aviation, missile and shipbuilding industries, which would be an important factor for consideration while evaluating the PLA's modernisation process.