

# Chinese strategy to boost Scientific and Military Innovation through Civilian Military Integration, National R&D plans and Chinese DARPA

President Xi Jinping has urged the armed forces, “fully implement the innovation-driven development strategy, put combat capacity at the centre of its work, and step up theoretical and technological innovation.” At a key Communist Party meeting in October, Xi identified innovation as the most critical of five concepts for development, followed by coordination, “green” development, opening up and sharing. Xi called for better integration between the military and the civilian sector to boost innovation in both the army and the nation.

Xi – who also chairs the Central Military Commission – said in the documentary that scientists and weapons developers should aim to catch up to, and even surpass, the technology of other countries. “The importance of weaponry development has increased as military technologies continue to be upgraded in recent years,” Xi said. “It’s impossible to win a battle if there is a weaponry gap.”

Chinese leader Xi has repeatedly stressed the importance of “military-civilian integration” as a core component of the country’s military development strategy. China’s leaders believe this integration will help China continue its rapid defense modernization without creating too great a drag on its economy. “Through in-depth development of military-civilian

integration, military technologies are gradually applied in civilian fields, making high-tech equipment available to commercial markets. At the same time, we have also emphasized the importance of encouraging more civilian product suppliers to actively participate in the defense-building process," said Dai Hao, Director-General of China's Institute of Command and Control.

China will strengthen innovation by developing high-tech industries with military technologies to boost military-civil integration, a move that aims to cultivate new growth drivers and boost the economy, said a recent State Council guideline. This was one of the seven key tasks set by the guideline on deepening the military-civil integration in the defense technology industry, which was released by the State Council, China's Cabinet.

The guideline targets sharing technological innovation bases and facilities between military and civilian sectors while more efforts will be made to apply military technologies to non-military areas. The military integration will also focus on key areas such as space, cyberspace and maritime sciences, while private capital is encouraged to enter military industries, the document said. The guideline was the latest move by the central government to promote the military-civil integration to widen military contract orders to civilian sectors and apply high-end military technologies for civilian purposes as part of the supply-side structural reform.

## **China's Rapid Scientific and Military advances**

China is making rapid advancements in many technologies thus narrowing its gap with western world. Former US energy secretary Steven Chu has even observed that China is ahead of

America in areas ranging “from wind power to nuclear reactors to high-speed rail”. China is also catching up fast in artificial intelligence, genetic engineering, 5-G broadband technology and the “Internet of Things.” Some of its achievements include a gigantic 500m-aperture spherical telescope, the launch of the world’s first hacker-proof quantum satellite and the development of world’s fastest supercomputer – the new Sunway Tianhe-1A. China has also developing twin high-performance fifth-generation stealth fighters, , and large number of missiles including “Carrier killer” missile, anti-ship cruise missile, nuclear submarine and long-range intercontinental missile. Its homegrown aircraft carrier is nearing completion.

China is becoming formidable space power, it has sent 10 astronauts into orbit over the last 13 years, launched its first moon probe and two space stations (Tiangong 1 and 2). Most recently, China launched the Shenzhou XI manned spacecraft with two astronauts to the Tiangong II space lab for a 30-day manoeuvre. China is planning to send lunar probe Chang’e 5 to land on the moon and return with samples , in first such attempt, officials said. It will be the first time a Chinese probe would land on the moon, collect samples and return to Earth, and the third stage of China’s lunar exploration endeavour, according to the State Administration of Science, Technology and Industry for National Defence (SASTIND).

Out of total 86 space launches in 2015, China Aerospace Science and Technology Co. has launched a total of 43 satellites, followed by 29 in Russia and 17 in the U.S. China now has over 140 satellites in orbit with stable operation, second only to the U.S. in terms of satellite ownership, said a Chinese engineer from the national defense field at a

satellite exhibition.

China has become the world's largest source of new patents, industrial designs and trademarks. According to the World Intellectual Property Organisation, China in 2014 filed 34 per cent of the world's patents, compared with 22 per cent for the US and 12 per cent for Japan. China also filed 50 per cent of the world's new industrial designs, against 9 per cent for the US; and 76 per cent of new trademarks, compared with the US' 13 per cent.

However China is still accused of stealing western technologies. Now china is taking large number of measures to provide thrust to innovation including boosting civil military integration, Five-year plan, National R&D plan, National Medium to Long-term Plan (MLP), and establishing Chinese DARPA.

Chinese President Xi Jinping has tasked the new People's Liberation Army (PLA) Strategic Support Force (SSF) with pursuing "leapfrog development" and advancing military innovation. According to its commander, Gao Jin, the SSF will "protect the high frontiers and new frontiers of national security," while seeking to "seize the strategic commanding heights of future military competition." Through its integration of space, cyber, and electronic warfare capabilities, the SSF may be uniquely able to take advantage of cross-domain synergies resulting from the inherent interrelatedness and technological convergence of operations in these domains. The SSF has produced an "Innovation-Driven Development Strategy" that incorporates efforts to advance the construction of a cadre of innovative, talented personnel and to "cultivate the spirit of innovation."

China Aerospace Science and Technology Corp., the main contractor for the Chinese space program, has teamed up with a number of state-owned enterprises to establish a RMB150 billion (US\$21.78 billion) guidance fund to invest in innovative technologies. The vehicle will focus on clean energy, new energy vehicles, quantum teleportation, 3D printing, robotics, graphene, biomedicine, energy saving and environment protection sectors, with an aim to enhance the innovation capability of state-owned enterprises, assist develop emerging industries, as well as push for collaborative innovation between state-owned enterprises and other institutions.

## **Military Civil Integration to boost innovation**

China's leaders are continuing to promote "military-civilian integration" as a core component of the country's military development strategy. China's leaders believe this integration will help China continue its rapid defense modernization without creating too great a drag on its economy. Deeply-rooted barriers, redundancies, and incompatibilities between the military and civilian sectors have yet to be resolved before this integration can occur.

"It mainly means the military needs to take more advantage of civilian power in development of technology, from theory building to armour manufacturing," said Ni Lexiong, Shanghai-based naval expert. But one obstacle to integration was the handling of classified information, Ni said. The military would need to strike a balance to ensure sensitive information remained secure but contractors could still work efficiently.

The military civilian integration can also help in transferring military technology to civilian industries. For example, breakthrough technologies such as engines and aluminum alloy materials can help ease production overcapacity and transform China's economy, he said.

These new technologies can essentially boost economic growth and national defense, Jiang said. "For example, virtual reality headsets were first used in helmets for fighter jets and my company has developed six civilian industries such as virtual reality, drones, robotics and smart wearing," Lu said. The breakthrough technologies such as engines and aluminum alloy materials can help ease production overcapacity and transform China's economy, he said. These new technologies can essentially boost economic growth and national defense, Jiang said.

The military industry has the priority to apply cutting-edge technologies and also make breakthrough innovations, Lu Guangshan, chairman of the Avionics System Co under the Aviation Industry Corporation of China, was quoted by Shanghai Securities News as saying. Jiang said in October last year that China has about 290,000 national defense intellectual property rights not being used due to the previously separated military and civil industries.

The integration is a worldwide trend to fully improve the national defense capability, said Jiang Luming, a professor at the National Defense University of the People's Liberation Army. In countries such as the US, the United Kingdom and Germany, less than 15 percent of military technologies are

solely for military purposes and more than 80 percent are used for civilian purposes, Jiang said. Currently, 30 percent of products made by China's military companies are for military purposes and the other 70 percent for civilian purposes, he said.

In fact, many developed economies are highly reliant on military-civil integration. For example, the United States' airplane maker Boeing sells China civil aviation aircraft worth billions of dollars each year and is known for its high-end military aircraft. Many Japanese multinational companies such as Toshiba and Mitsubishi have a department to take military orders.

China's top science authorities published a five-year term plan to integrate innovative military and civilian technologies to explore cost-effective solutions in the science and technology sector. Jointly issued by China's Ministry of Science and Technology and the Science and Technology Commission of the Central Military Commission, the plan is to build new research units and think tanks on cutting-edge science projects, ranging from manned-space missions to navigation satellite systems to supercomputers, local media reports.

Integrating military and civilian technologies will lead to more innovations and applications that can benefit both the military and society, said Lieutenant General Xin Yi, the deputy director of the Science and Technology Commission (STC) of the Central Military Commission. "Integration of military and civilian technologies is crucial in improving national defense and building a modern military," Xin was quoted as saying by China Daily during a press conference Wednesday. "It

is also a powerful engine for facilitating scientific innovations and social economic development.”

A coordinated military-civilian innovation system for the sector should be put in place by 2020. It also identified a new round of key sci-tech projects in military-civilian integration towards 2030, such as an integrated information system, quantum communication/computing and brain science/brain-inspired intelligence.

China's military has offered \$870 million to private firms and institutes to fund 2,000 projects for research on equipment and weapons in a bid to boost military-civilian integration and upgrade military technologies. The Central Military Commission's (CMC) equipment development department released a guideline on its website, saying China plans to invest six billion yuan (\$870 million) this year for research in shared technology and other research, Zhuangbei Keji, a WeChat account affiliated with the People's Liberation Army (PLA) Daily, said. A million yuan has been allocated to project to study the temperature adaptability of solid propellants, state-run Global Times reported.

The EU Council on Foreign Relations reports that, “Since the Cultural Revolution, the People's Liberation Army (PLA) has acquired civilian industries, which it has helped to protect in stormy times, and which have become a source of profits for the military.” “Dual use development has provided an indirect way to acquire foreign technologies, which could eventually be transferred to weapons production.” Technologies such as information technology, microelectronics, aerospace, and other commercial technologies are dual use that can be adopted for military purposes.



Noting that China continues to modernise its military by incorporating Western (mostly US) dual-use technologies, which have also assisted its overall indigenous industrial, military industrial, and high-technology sector development, the report said one of China's stated national security objectives is to leverage legally and illegally acquired dual-use and military-related technologies to its advantage.

## **China Military and Civilian Integration Expo in Beijing**

The second China Military and Civilian Integration Expo was held in Beijing's National Convention Center. The three-day event provided an open platform for the exchange and integration of military and civilian technology."Through in-depth development of military-civilian integration, military technologies are gradually applied in civilian fields, making high-tech equipment available to commercial markets. At the same time, we have also emphasized the importance of encouraging more civilian product suppliers to actively participate in the defense-building process," said Dai Hao, Director-General of China's Institute of Command and Control.

Sophisticated technologies were displayed during the Expo: These include command information system, armored vehicles for transportation, the virtual combat training system, cyber security, anti-terrorism robots, drones, unmanned patrol boat, vehicle-mounted sonic weapons, emergency rescue system, as well as border monitoring and control system. "We have the virtual combat training system here on display. Using a virtual reality technology and simulation system, 3D training scenarios could be built. With V-R facilities, soldiers could feel as if they are in a real battlefield and practice

tactical combat skills,” said Zhang Ke, Vice General Manager of Beijing Huaru Technology.

“This is an autonomous boat. It can be used for hydrology research, scientific exploration, hydrographic surveys, emergency search and rescues, security patrols and other work on the seas. It can also carry unmanned underwater vehicles for performing a variety of tasks,” said Zhang Yunfei, Chairman of Yunzhou-Tech. Innovation is crucial to the competitiveness of the armed forces. Officers and researchers have been working together to enhance the efficiency of national defense systems and turn cutting-edge military technology into real combat capacity.

By now, more than 1,000 Chinese private companies have received permission to develop and produce weapons or other defense equipment, accounting for nearly 40 percent of defense equipment contractors in China, according to the State Administration of Science, Technology and Industry for National Defense.

## **China's DARPA**

Innovation in the military should be part of the overall national approach, Xi said. A new national defence innovation mechanism should be explored to advance the deepening development of military-civilian integration, Xi said. In response to Chinese President Xi Jinping's call, the People's Liberation Army (PLA) has formed a new science and technology committee to manage defense R&D. According to a spokesperson for China's Ministry of Defense, the committee, known in Chinese as junweikejiwei, is designed to meet the needs of China's ongoing military modernization. The committee will

strengthen management of defense science and technology, promote indigenous innovation in national defense, and coordinate integrated development of military and civilian technologies, the spokesperson says.

The new steering committee and the CMC Science and Technology Commission will spearhead scientific and technological innovation, according to the CCTV documentary. Song Zhongping, a Hong Kong-based military commentator with Phoenix Television, said the committee should include scientists and leading engineers who were familiar with cutting-edge technologies. "The steering committee will play a consultative role to help the CMC to decide on projects at an early stage," Song said. "Funding, resources and the detailed implementation of these projects will be overseen by some of the 15 functional departments under the CMC."

## **China makes impressive military modernization, however accused of stolen designs**

China has made impressive advancements in military technology: China has advanced space technologies, out of 86 space launches in 2015, China has launched 43 satellites. It is also believed to have amassed counterspace technologies. It is set to provide Beidou global navigation service similar to GPS by launching 35 satellites by 2020.

Chinese is now second nation to have two fifth generation stealth designs J-20 and J-31 aircrafts. China is developing conceptual and experimental hypersonic flight vehicle technologies such as hypersonic cruise vehicles (HCV) capable

of maneuvering at Mach 5 speeds (6,150+ km/h), and flying in near-space altitudes.

China is building modern and regionally powerful navy, it has commissioned large number of long range land attack and antiship cruise missiles, warships, aircraft carrier and advanced type 094 Jin class nuclear powered ballistic submarines. China is set to launch first Quantum communications satellite this year, it has also plans to complete, longest fiber optics based quantum Network.

However China is also criticized of carrying out massive cyber espionage and stealing plans for advanced military jets, ships, and lasers. US has often accused china of using a number of methods to obtain US technology, including espionage, exploitation of commercial entities and a network of scientific, business and academic contacts. It also lacks West in many critical defense technologies like Aircraft engines.

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