The Center for Air and Space Power Strategic Studies
Symposium 2018:

Innovation in China

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1. Defense Technology Base and China

What measures should be taken to maintain the defense technology base? In my opinion, it is necessary to consider this from the viewpoint of fixed point observation, superiority/inferiority analysis of domestic and foreign abilities, industrial base and supply chain.

Fixed point observation means to clarify developmental policy with consideration given to the area and direction in which technology should be developed.

Superiority/inferiority analysis of domestic and foreign abilities means to choose whether to advance development domestically or to procure from foreign countries, based on the technical levels of other countries and the number of engineers in related fields.

An industrial base means the situation where we give consideration to maintaining domestic production capacity.

Supply chain means to ensure the stability of material procurement.

From the viewpoint of fixed point observation, China seems to recognize that they need to have “indigenous innovation.” From the perspective of superiority/inferiority analysis, it seems that in China the

civilian population is creating something new, but the military is lagging behind them, so civil-military integration is progressing. From the viewpoint of the industrial base and supply chain, existence of Made in China 2025[1] is pointed out.

As for China's innovation, there are several points to note. The first is the Thousand Talents Program. It is a human resource plan to recruit international high-level experts by offering a good compensation package and "import" the skills to China.

Civil-military integration includes information theft, imitation, cyber or physical reverse engineering. Made in China 2025 includes efforts to attract foreign companies to China.

2. History of Technological Development in China

Looking back on history, China's Program 863 was launched after the end of the Great Proletarian Cultural Revolution, aiming to acquire advanced technologies and achieve innovation. Program 863 was designed to include multinational joint research on dual-use goods and acquire technologies from the research.

Around 2006, the limitations of outsourcing were recognized and "indigenous innovation" was advocated. The Thousand Talents Plan was launched in 2008 and the Digital Silk Road was also launched in the framework of the Belt and Road Initiative in 2013, with the aim of building a cyberspace that China could control in the countries concerned. In the civil-military integration in 2015, the defense industry, which had been managed by the state until then, exported products in the same way as private companies and developed advanced technologies together with the private sector. Made in China 2025 has been talked about since around 2006 from the viewpoint of the modernization of China. There, importance was attached to the role of the network in battle.

Now, I would like to look back over the history of organizational systems. After the Chinese Communist Revolution in 1949, China initially had a strong relationship with the Soviet Union. The Chinese Academy of Science (CAS) was established, based on the model of the Soviet Academy of Science, as the supreme research institute for comprehensive high-tech research and natural sciences.

In the 1980s and early 1990s, large-scale projects were promoted in the eight fields of agriculture, energy, computers, lasers, space science, high-energy physics and general engineering under the leadership of the Commission for Science, Technology and Industry for National Defense (COSTIND).

From the 1990s to 2008, a shift from Soviet-style R&D to American-style R&D was accelerated, following the collapse of the Soviet Union. The style is almost entirely American today. In 2008, an organization called the Ministry of Industry and Information Technology (MIIT) was established in anticipation of the forthcoming computerization. This seems to be the organization that controls information. On the other hand, the State Administration for Science, Technology and Industry for National Defense (SASTIND) is an organization similar to the U.S.'s Defense Advanced Research Projects Agency (DARPA).

MIIT and SASTIND are sub-organizations of the State Council. And below these two is the state-owned defense industry called the Big Five. Further below it, in existence related to the civil-military integration, there is an organizational structure that copied the U.S. military-industrial complex. It includes universities. Universities under the control of SASTIND/COSTIND include Beijing University of Technology and other universities managed by the military. The defense industry under the control of COSTIND included 10 companies initially but now includes 9 companies. There are also so-called Big Five companies that are

responsible for land, sea, and air, respectively.

Looking at the size of defense-related companies in the world in fiscal 2016, seven Chinese companies including China South Industries Group Corporation (CSGC) are in the top 20. On the other hand, Mitsubishi Heavy Industries is ranked 43rd, which is the highest Japanese company.

3. Status of Research and Development in Recent China

The state of innovation in state-owned enterprises and state-managed university research institutions in China was analyzed around 2013, before the civil-military integration was advocated. There, the following were pointed out: (1) Weapon system requirements are poorly defined; (2) The scope of development of new technologies is too broad and ambiguous, so that the development guidelines are not well communicated; (3) System integration ability is low; (4) The level of awareness of creativity and innovation is low in the defense industry; and (5) Desire for creation and binding force to research and development is low because they do not face competition, although they are given a plentiful budget as is required for military research and development by the state.

Though I must turn the clock back, here I would like to touch upon the State High-Tech Development Plan called “Program 863” proposed on March 3, 1986. Behind Program 863 was the U.S.’s Strategic Defense Initiative (SDI). COSTIND and the State Science and Technology Commission (SSTC) worked together to carry out research on dual-use goods in 17 major projects. In particular, the military-related COSTIND supervised the laser and space fields. This plan is said to have been advocated by 44 scientists who have developed nuclear weapons, optical weapons, rockets, guided weapons and satellites.

The term “dual use” often tends to be understood as conversion of defense technology to civilian use. When viewed from abroad, however,

dual-use technology in the private sector is seen as defense technology. In Program 863, the ratio of dual-use projects was almost 100%.

In 2006, the Science and Technology Development Guidelines were established. It is advocated to improve the business environment of high-tech companies in order to promote indigenous innovation.

Regarding intellectual property strategies, there were newspaper reports recently that Huawei had held the largest number of patents in the world for the second consecutive year. Looking at the ratio of R&D[2] expenditures against GDP, China has been on the rise. The number of patents surpassed the United States and the number of inventions is also increasing.

4. Reverse Engineering by China

How is China gaining advanced technology information? The following are pointed out in an analysis made by the U.S.:

The first method is to physically thieve information. The second is to conclude a contract in a way that is beneficial to China; for example, when a company is invited from abroad, a Chinese national must be employed by the company. The third is to restrict access to raw materials through export restrictions as a part of intellectual property strategies. The fourth is to obtain such information through international students.

I would like to introduce specific cases. Looking at robots developed in China, there are some examples that are almost the same as, but are slightly inferior to, those developed by U.S.'s DARPA.

There are also some products that are suspected to have been produced using reverse engineering. As mentioned in the keynote speech earlier, J-31 is quite similar to the fifth-generation fighter F-35, and it is one of the grounds for the suspicion that the F-35 data was stolen. Furthermore, the Y-20, which is almost identical to the C-17 of the United States, was

officially adopted in 2016. Information is stolen in a form similar to reverse engineering. Some say that it is similar to Ilyushin of Russia, but its shape is similar to the U.S.'s C-17.

In dual-use product development, a commercial aircraft called the C-919 is under joint development participated in by multiple countries. Regarding this joint development, some pointed out the possibility that China is ignoring confidentiality agreements regarding know-how, etc. concluded between Chinese and European/American companies, and is leaking information to People's Liberation Army-related companies. As a result, it is said that some technologies were stolen and used in J-20 fighters.

Europe and other countries are subject to the U.S. export regulation on weapons called "ITAR." The matter of concern is that there is a concept of "ITAR-free" in opposition to this.

Huawei and ZTE are now able to access the very deep part of U.S. advanced technology through international joint development.

In a recent case, the Hong-20 bomber, which appears to be capable of carrying and operating a nuclear weapon, is currently under development. China is also considering the development of stealth bombers to add its nuclear capability.

5. Possibility of Advancement by Civil-military Integration

As mentioned above, the Thousand Talents Plan is aimed at recruiting human resources. Experts are welcomed with a good compensation package, including a bonus of about 14 million yen per year from the state.

Recently, 5G is promoted in the process of civil-military integration, and the People's Liberation Army is also using this technology. It is said that by shifting the focus from information to intelligence, it is possible to change the way of fighting.

Under these circumstances, ZTE, China Unicom and others jointly

established the 5G Technology Civil-Military Integration Industrial Association in November 2018.

Civil-military integration is evolving year by year. Each region has its own special project plan, which is implemented as a derivation from the Scientific Technology Civil-Military Integration Project.

Acceleration of innovation is directed under Made in China 2025. Its programs are being implemented in ten specified fields, including ICT industry, improvement of manufacturing industry capability such as NC machine tools, aviation and space, high-tech shipping, advanced transportation equipment.

In terms of manufacturing ability, the United States is at the top, followed by Japan. However, Japan has almost leveled off. China is still at the lower level but making very rapid progress.

What is said here is that digital transformation, which was also mentioned in the keynote speech, can change the manufacturing process.

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[1] It is a 10-year plan to promote the manufacturing industry in China and was issued by the national government in 2015. This development plan for the Chinese manufacturing industry for the years until 2049 is set in three phases. The goal of the first phase is to become one of the world's manufacturing powers by 2025 and this phase is named Made in China 2025. The goal in the second phase is to reach an intermediate level among the powers by 2035 and the third is to climb to the top of the powers by 2045.

* There is the same footnote in Mr. Funabashi's keynote speech. When publishing "Air Power Studies," it is necessary to simplify or delete one of them.

[2] Abbreviation of Research and Development.