Testimony Before the U.S.-China Economic and Security Commission
Hearing on China's Pursuit of Defense Technologies: Implications for U.S. and Multilateral Export Control and Investment Screening Regimes
Panel I: China's Defense Modernization Objectives and R&D Ecosystem

Priorities, Policies, and Budgets for China's Defense Modernization

Tai Ming Cheung, University of California San Diego and University of California Institute on Global Conflict and Cooperation

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Explain how Chinese leaders' perceptions of threats they face in the international environment drive decisions about required future capabilities and military procurement programs.

The transmission belt of how threat perceptions of the external security environment held by China's governing leadership elite are turned into the development and procurement of military capabilities for the People's Liberation Army (PLA) runs through the formulation of the country's Military Strategic Guidelines (MSG), which constitutes the PLA's "programs and principles for planning and guiding the overall situation of war in a given period."[1]

The formulation of the MSG is overseen by the Central Military Commission (CMC) and carried out in coordination with numerous PLA units.[2] The MSG addresses a multiplicity of factors including external threat perceptions, likely contingencies, geostrategic assessments, and domestic concerns, and identifies tasks crucial for determining the likely nature of future wars.

Four factors are especially relevant to the examination of the relationship between threat perceptions and the development of war-fighting capabilities. The first is the identification of the Strategic Opponent (战略对手). This is based on an assessment of the international security environment and consideration of threats to China's national interests. The United States was the principal enemy between the 1950s and early 1960s, followed by the Soviet Union from the mid-late 1960s to the end of the 1970s. Chinese military authorities have not publicly identified their principal strategic opponent since the 1980s, but some internal PLA writings suggest that the United States became China's principal strategic opponent (not enemy) beginning in the 2000s.

A second concept is the Main Strategic Direction (MSD; 主要战略方向), which refers to the geographic focal point for potential conflict and provides the basis for the prioritization of resource allocations. The MSD is a contingency-based assessment that informs wartime

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[1] Taylor Fravel, ***Active Defense: China's Military Strategy Since 1949*** (Princeton: Princeton University Press, 2019), 28. See also David M. Finkelstein, "China's National Military Strategy: An Overview of the 'Military Strategic Guidelines'", Roy Kamphausen and Andrew Scobell (Eds), ***Right Sizing the People's Liberation Army: Exploring the Contours of China's Military,*** (Carlisle, P.A.: Army War College, 2007), 67–140.

[2] Zhang Wannian Writing Team (张万年传写作组), ***Biography of Zhang Wannian (张三并伀).*** (Beijing: Liberation Army Press (北京; 解放军出版社), 2011), 59−72.

operations and peacetime war planning for "worst case" scenarios to develop forces and capabilities and make deployment decisions. Only one MSD is permitted at any time, although multiple secondary strategic directions are allowed. The MSD has shifted extensively over the course of the history of the People's Republic of China, initially focused on threats from its east between the early 1950s and early 1960s in the direction of the United States and regional allies such as Japan and Taiwan. The MSD pivoted to China's north and northwest from the mid-1960s to the mid-1980s to face off against the Soviet Union. There was a lull between the mid-1980s and early 1990s when there was no major state-based threat, but Taiwan became the MSD from the early 1990s and has continued to occupy this position at the beginning of the 2020s, although the threat aperture has likely widened to include the role of the United States in any Taiwan contingency.

The third component is the "Basis of Preparations for Military Struggle" (军事斗争准备的基点), which is concerned with the nature and form of future war (total, local, conventional, or nuclear) that China will need to fight and the patterns of operations that will need to be conducted.

The fourth component is Army Construction and Development (军队建设发展) that is concerned with all aspects of the PLA's modernization, development, and reform efforts. The MSG guidance on construction and development provides the broad priorities and parameters for the detailed formulation of near-, medium-, and long-term implementation plans. One of the most important of these programs is the "Outline of the Five-Year Plan for PLA Construction and Development" (军队建设发展规划纲要), which comes out at the same time as the national five-year development plan. The Outline of the 13th Five-Year Plan for PLA Construction and Development was the first to be prepared and issued during Xi's rule in 2016 and reflects the priorities and goals of the MSG.[3] An extensive array of construction, development, and reform tasks are covered that include (1) ideological and political work; (2) force structure; (3) weapons and equipment; (4) logistics; (5) information infrastructure; (6) military training; (7) defense mobilization; (8) international military cooperation; (9) defense technological innovation; (10) military theory and regulations; (11) battlefield support; (12) and military civil fusion (MCF). The outline emphasizes that priority should be placed on military struggle preparations.

While the MSG provides broad strategic principles and general guidelines on weapons requirements and acquisition issues, the detailed nuts and bolts of programmatic management, strategic design, planning, and implementation is the responsibility of the Weapons and Equipment Development Strategy (WEDS; 武器装备发展战略) and attendant Weapons and Equipment Construction Plans (WECPs). These planning documents represent the near-, medium-, and long-term visions and roadmap for implementation of the Chinese defense establishment's science and technology (S&T) development for its weapons and equipment capabilities, and have witnessed profound changes over the last several decades.

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[3] "Central Military Commission Issues 13th Five-Year Plan for Army Construction and Development", ***Xinhua News Age*ncy (新华社),** 12 May 2016, http://www.xinhuanet.com/mil/2016-05/12/c_1118855988.htm.

The WEDS and WECP are classified, and there are only occasional references to their role and importance in guiding the PLA's technological modernization. However, in an article marking the reorganization of the General Armament Department (GAD) into the CMC Equipment Development Department (EDD) as part of the restructuring of the PLA high command in 2016, *China Military Industry New*s, the GAD's official news mouthpiece, disclosed for the first time that one of its accomplishments was to establish "scientific planning of long-term defense science and technology and weapons and equipment development through a twenty-year development strategy, ten-year construction outline, and three five-year plans."[4]

The WEDS provides the overall strategic rationale for the country's armament development. It offers long-term planning stability and provides an integrated approach involving input from across the entire defense establishment. Moreover, it is a rigorous assessment that looks at regional and global strategic, military, and technological trends, and the nature of future war and compares these dynamics with China's national, military, economic, industrial, and technological capabilities to support armament research and development. As one PLA study noted, "in the formulation of military equipment development plans, it is necessary to use a military equipment development strategy as their foundation. Chiefly, this means considering the country's situation for a relatively long period of time in the future, and the country's military strategic policies, as well as analyzing and making predictions for the international strategic environment, the security environment on the country's periphery, and the military equipment needs of the country's troops in future military conflicts."[5]

The WEDS comes in two categories: a national-level version and service-level variants. The national-level WEDS is produced by the EDD and is a comprehensive and integrated strategy for the PLA and defense S&T establishment. The WEDS is described as "subordinate to and serves" the MSG and also takes into account the country's national development strategy and S&T plans.[6]

Identify the key people and organizations with China's Party-state and People's Liberation Army (PLA) that make decisions about the future capabilities China requires as well as how particular weapons systems or platforms enable those capabilities. If possible, illustrate this decision-making process with an example.

Chart 1 (at the end of this statement) identifies key Chinese state, party, and military institutions affiliated with the country's defense research, development, and acquisition system and are involved in providing inputs and/or making decisions about future armament capabilities:

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[4] "For Seventeen Years, We Walked Together", ***China Military Industry News (*** 31 December 2015, http://news.hit.edu.cn/zgjgb/list.htm

[5] Yu Gaoda and Zhao Lusheng (余高达,和赵潞生), ***The Study of Military Equipment (*** (Beijing: National Defense University Press (国防大学出版社), 2000), Chapter 9.

[6] Fu Guangming and Ji Hongtao (傅光明和吉洪涛), "Exploration of Hu Jintao's Strategic Thinking on Strengthening Military with Science and Technology", ***China Military Science (*** No. 5 (2011).

The most important of these organizations are:

- 995 Project Leading Small Group, which is responsible for overseeing the development of major, especially strategic deterrent, capabilities and was established in response to the U.S. bombing of the Chinese embassy in Belgrade in 1999.

- Central Military Commission (CMC) Science and Technology Commission: This organization's responsibilities include the strategic management of defense scientific research, promoting indigenous home-grown innovation, and promoting military-civil fusion. It has been compared to the U.S. Defense Advanced Research Projects Agency (DARPA).

- CMC Equipment Development Department: This is the military's principal organization for armaments research, development, testing, and procurement.

- State Administration for Science, Technology, and Industry for National Defense (SASTIND): This state entity manages the country's defense industrial apparatus and falls under the Ministry of Industry and Information Technology.

Key officials that hold influential decision-making authority include the heads of the 995 Project Leading Small Group, CMC Science and Technology Commission, CMC Equipment Development Department and its service arm counterparts, SASTIND, and the Executive Vice Chairman of the CMC.

Describe the policy framework that guides China's defense modernization efforts. What are the foundational policies, plans, and programs? Which agencies develop it and implement it? Are there any overlapping functions that cause friction, or any clear gaps in jurisdiction?

The primary policy framework that guides China's defense modernization efforts, especially over the medium to long-term, is the five-year planning cycle. These five year plans (FYP) are drawn up and implemented at the same time as counterpart plans in the civilian arena. Besides the PLA-wide Construction and Development FYP, the armament apparatus at the CMC and service and specialized arms levels, and defense science, technology, and industry systems all have their own FYPs. The PLA armament system has the five-year Medium-Term Weapons and Equipment Construction Plan, which is a core component of the PLA Construction and Development FYP. The defense industry has its five-year defense S&T development plan that has numerous specialized five-year sub-plans for specific sectors and technologies. The 995 Program also has a five-year planning cycle.

There is little open information on how the defense-related FYPs are drafted, but if the process resembles how civilian FYPs are drawn up, then special working groups are formed with broad representation from across the sector that the plan covers. For the PLA Construction and

Development Plan, the working group would likely be led by the CMC chairman, who will delegate detailed oversight to the Executive CMC Vice-Chairman. Members of the working group will also likely include senior representatives of relevant CMC departments, commissions, and offices such as the Joint Staff Department, Strategic Planning Office, Equipment Development Department, and CSTC, along with service and specialized arms, joint theater commands, SASTIND, key educational and policy think tanks such as the National Defense University and Academy of Military Sciences.

The current five year planning cycle began in 2021 with the launch of the 14th Five Year Plan. The national level FYP, officially called the 2021-2025 People's Republic of China 14th Five-Year Plan for National Economic and Social Development (中华人民共和国国民经济和社会发展第十四个五年规划), contains short descriptions of military, defense industrial, and dual-use military-civil fusion (MCF) objectives. The plan highlights the need to accelerate the pace and scale of defense modernization, especially with the goal of "improving the strategic ability to defend national sovereignty, national security, and development interests" by the 100th anniversary of the founding of the PLA in 2027.[7]

This centennial target was first disclosed at the 5th Plenum meeting of the 19th Party Congress Central Committee in November 2020, which reviewed an earlier draft of the 14th FYP and was the first time that such a target date had been publicly disclosed. Neither the 14th FYP nor the 5th Plenum communiqué provided any specific details of what is meant by the 2027 target date, however. The FYP emphasizes the need to "strengthen strategic forces and new combat forces in new domains as well as creating high-level strategic deterrence and joint combat systems."[8]

Several other military modernization objectives are detailed in the 14th FYP. One is accelerating the integration of mechanization, informatization, and intelligenization. Mechanization refers to industrial-age warfare that is predominantly fought by large-scale, low-tech, ground-based forces, which constitutes a large majority of PLA units. Informatization involves network-centric, highly mobile, and smaller-sized forces that are set up for information warfare. Intelligenization refers to future warfare in which emerging technologies such as AI, quantum information, big data, cloud computing, and the IoT will play a central role, which means a growing emphasis on autonomous and unmanned military capabilities.

The plan also calls for optimizing the layout of the defense industry. A top priority is promoting advanced high-end defense science, technology, and innovation along with high-quality defense production. Reforms are taking place to improve the structure and process of the defense innovation system and to reinvigorate the defense industrial base by allowing competition and addressing obstacles such as monopolies and corruption.

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[7] Xinhua News Agency, ***14th Five-Year Plan (2021-2025) and the Long-Range Objectives Through the Year 2035 for National Economic and Social Development,*** 12 May 2021, Section 16, Introduction.

[8] 14th Five-Year Plan, Chapter 56.

The 14th FYP also discusses the pursuit of the convergence between the civilian and defense economies, although the MCF term is no longer employed.[9] The general objective outlined in the plan is to build an overarching integrated strategic system in which the civilian, defense, and national security sectors are closely aligned and coordinated. An extensive list of goals includes the following:

- Expand efforts to share resources, which means allowing the defense industrial sector to increase its access to the financial markets.
- Encourage the coordinated civil-military development of key regions. A top priority of the 14th FYP is regional and infrastructure development, especially the construction of high-speed transportation networks and the building of major urban clusters around the country. Military requirements will feature prominently in these projects.
- Deepen civil-military R&D collaboration. The civilian S&T R&D system will be increasingly leveraged for defense requirements.[10]
- Strengthen military-civil joint development (军民统筹发展) in maritime, space, cyber, biotechnology, new energy, AI, and quantum technology.
- Promote spin-on (civilian to military) and spin-off (military to civilian) applications in research, development, and production activities.
- Improve the development of the national defense mobilization system to ensure that the national economy can be rapidly and effectively repurposed for defense and national security uses in crisis and wartime conditions. The coronavirus pandemic in 2020 is a prime example of activating the defense mobilization system to deal with a health crisis.
- Guarantee the national security of critical economic capabilities and beef up of early warning, risk prevention, and control mechanisms of the economy. Sectors explicitly pointed out in the plan include the grain, food, infrastructure, energy, and financial industries.[11]

In parallel, the state defense industrial bureaucracy formulates the Defense Science, Technology, and Industry Five-Year Plan (DSTI FYP 国防科技工业五年规划). There is no information so far as to the contents of the 14th DSTI FYP, but its predecessor 13th FYP had a number of key objectives. First was the task of achieving "leapfrog" development in weapons and military equipment. Second was the enhancement of innovation capabilities in turnkey areas. Third was the optimization of the structure of the defense industry and the vigorous promotion of MCF. Fourth was the stepping up of weapons exports efforts.[12]

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[9] 14th Five-Year Plan, Section 16, Chapter 57.

[10] Liu, Xiaobing (刘小兵), "Promote the Simultaneous Improvement of National Defense Strength and Economic Strength" (促进国防实力和经济实力同步提升), ***Guangming Daily,*** 14 March 2021, https://news.gmw.cn/2021-03/14/content_34683946.htm.

[11] 14th Five-Year Plan, Chapter 53. See also Dong, Yu (董煜), "The Correct Way to Open the 'Outline' of the 14th Five-Year Plan" ("十四五"规划"纲要"的正确打开方式), ***Diyi Caijing (笫乛贤绑),*** 15 March 2021, https://www.yicai.com/news/100986328.html.

[12] "2016 National Defense Science, Technology and Industry Work Conference was held in Beijing", ***SASTIND (圄阴枝巧层),*** 9 January 2016, http://www.gov.cn/xinwen/2016-01/09/content_5031770.htm.

As FYPs are a key policy instrument for securing financial resources and commitments for extended periods of time, there is almost certainly intensive bureaucratic rivalry among competing constituencies to get their priorities funded.

What information is available about the budget for research and development of new weapons technology? Where do the monies in this budget come from? How often is funding authorized or appropriated, and by what bodies within the Chinese party-state? Is the budget for R&D distinct from the PLA's own budget?

The Chinese government do not publish any openly available information on official budgetary allocations for defense research and development. While military authorities do provide a high-level breakdown of the official defense budget that is divided into three categories (personnel, training and maintenance, and equipment), most research and development-related funding allocations are excluded. Defense R&D expenditures, which are officially termed defense scientific research and experiment funds (国防科研试验经费), are assigned to other parts of the government budget that goes to SASTIND, dedicated S&T development plans such as the 995 program, and subsidies for defense industrial firms.

An analysis by academics Sun Yutao and Cong Cao of Chinese S&T financial data from 71 central government agencies for 2011 show they accounted for 44 percent of central government S&T expenditures.[13] The study also found that eight national security-related agencies (SASTIND, China Atomic Energy Agency, National Nuclear Security Administration, National Space Administration, Ministry of State Security, Ministry of National Defense (proxy for PLA), National Administration for Protection of State Secrets, and State Encryption Administration) did not disclose their S&T expenditures, which suggests they accounted for the remaining 56% of central S&T outlays, or around Renminbi (Rmb) 110 billion ($17 billion) in 2011. The PLA and SASTIND would account for most of the non-disclosed central S&T expenditures. As China's defense budget in 2011 totaled Rmb 601 billion ($91 billion), the non-disclosed central S&T expenditures would be equivalent to 18 percent of the defense outlays. This rough calculation would suggest that Chinese state allocations for defense-related R&D activities would be around the mid-10s as a percentage of the official defense budget, which would be a little higher than what the U.S. Defense Department allocates for its R&D enterprise.

It should also be pointed out that Chinese defense industrial firms have been able to tap into investment assets from China's capital markets since the early 2010s through government guidance funds, asset securitization deals, bond issues, and bank loans. This has provided a significant financial boost to China's investment in defense and dual use-related research, development, and production.

What constraints or trade-offs do Chinese leaders and defense contractors face when deciding how much of their budget to allocate to R&D for weapons technology?

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[13] Sun Yutao and Cong Cao, "Demystifying Central Government R&D Spending in China", ***Science,*** Vol. 345, Issue 1006, 29 August 2014, https://www.science.org/doi/10.1126/science.1253479

One of the biggest fundamental issues for Chinese policy-makers and the defense R&D community when it comes to determining R&D allocations is the balance between basic research and applied research and development. China and the Chinese defense community more specifically have benefited greatly from an absorption-based approach to S&T development, which is to absorb foreign technology and research know-how and convert this into output. This has meant that the overwhelming allocation of research and development funding has been in the development category. Chinese basic research spending is well below the level invested by advanced industrial economies.

In recent years, and especially since the beginning of the 2020s as detailed in the 14th FYP and other long-term S&T planning efforts, the focus is shifting to emphasizing original innovation that means greater emphasis and nurturing of basic research capabilities. The 14th FYP, for example, calls for a significant boost in basic national research spending from around 6 percent at the end of the 13th FYP to 8 percent by 2025. This is still around half of what advanced economies such as the United States (17 percent in 2017), France (21 percent in 2016), and Japan (13 percent in 2017) spends on basic research,[14] but in absolute terms could see a doubling in the size of Chinese basic research outlays by the mid-2020s. Moreover, the plan calls for increasing annual R&D expenditures by 7 percent.

The defense R&D enterprise has likely been investing more heavily in basic research and focusing on original innovation much earlier than the civilian sector because it has been subject to Western sanctions and export control measures since the end of the 1980s. But the shift of the national innovation system from absorption-oriented to original innovation-based development will help to significantly bolster the expansion of the basic research capabilities of the defense R&D system. This will require defense policy makers and defense contractors to make trade-offs between how much should be allocated between basic research vs. applied research and development.

The Commission is mandated to make policy recommendations to Congress based on its hearings and other research. What are your recommendations for Congressional action related to the topic of your testimony?

One observation is that the U.S. defense community as well as the broader U.S. S&T community has very little expertise on the issues covered in my testimony. Chinese defense-related research, development, and industrial affairs is poorly researched and covered by both the policy and scholarly communities. Much more effort needs to be invested in this area given that technology-security competition is at the heart of U.S.-China great power competition.

One recommendation is that while the U.S. service arms have set up China-dedicated research entities such as the Center for the Study of Chinese Military Affairs at National Defense University, China Maritime Studies Center at the U.S. Naval War College for the U.S. Navy, and

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[14] National Science Board, ***Research and Development: U.S. Trends and International Comparisons (Science and Engineering Indicators 2020),*** (Arlington: National Science Foundation, January 2020), 32, https://ncses.nsf.gov/pubs/nsb20203/.

the China Airpower Studies Institute for the U.S. Air Force, there should be a similar research entity situated in the Pentagon, specifically within the research and engineering portfolio.

Chart 1: Organization Chart of the Chinese Defense Research and Development System