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A Model for Analysis of China's Defense Life Cycle Management System

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Over the last decades, the Chinese military has made a concerted effort to improve its military power projection capabilities through the modernization of its research, development and acquisition (RDA) process. The civil-military players in the RDA process include the General Armament Department (GAD), the State Administration for Science, Technology, and Industry for National Defense (SASTIND), relevant defense committees, as well as the services, particularly the air force, navy, and strategic rocket forces, among others, to create a complex and unwieldy defense RDA network. This brief introduces key players in defense development and provides a seven-step defense life cycle management model for “cradle to grave” analysis of Chinese military modernization programs and projects, beginning with identification of requirements during the pre-program phase, through production, and concluding with the sustainment and disposal phase. The model provides a systemic approach to examine key players at each step of the process, and to assess systemic challenges and strengths of the RDA process that is driving China's military modernization.

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A key finding of this study is GAD's inability to effectively oversee the development of military weapons and equipment leads to persistent problems in quality control and a mismatch between defense production and military user requirements. These shortcomings help slow production and weaken military sustainment, resulting in early obsolescence of weapons and equipment.

THE DEFENSE LIFE CYCLE MANAGEMENT MODEL

The defense life cycle management model is derived from primary sources on China's defense RDA and life cycle management systems. This model may be applied to case studies of weapons and equipment platforms, and systems within one of China's armed forces (army, navy, air force or strategic rocket forces) or jointly, such as a force-wide communications network. It can help analyze indigenous innovation in China, as well as the introduction of foreign technologies into the defense life cycle process. It provides a framework to systematically examine how effectively China's defense funding is applied to the modernization of the Chinese military to develop power projection capabilities. The defense life cycle approach also integrates critical areas of enquiry that are often overlooked, such as how well China fields and sustains its weapons and equipment after production.

KEY PLAYERS AND LINKS

Before examining the seven steps of the life cycle model in detail, we introduce some key players and links within the defense system that interact throughout this process.

Military weapons and equipment are developed in China through a complex interplay between the Chinese Communist Party, government, military, and industry (public and, to some degree, private). This

is facilitated (and sometimes possibly subverted) by links between the players within the process that act as power nodes to move projects from inception to deployment, or to delay or kill a project. Although some information on China's defense life cycle process (e.g., how it is organized, key personnel, regulations, duties and responsibilities, etc.) is openly available in publications and on multiple websites, there is still a high degree of opacity aggravated by ad hoc variations. Further, while GAD exercises oversight over the development of weapons and equipment for China's armed forces, variability between the army, navy, air force, and strategic rocket forces (a subcomponent of the army) in the development process leads to a high degree of independence and autonomous, internal oversight limiting the standardization role GAD could play in general. Even for the ground forces, which GAD is supposed to directly control, the General Staff Department (GSD), for example, can bypass GAD in the life cycle management of communications equipment.

China's civil-military interplay in weapons and equipment life cycle management is an arcane story of bureaucratic infighting extending over decades, which continues to generate complexity and inefficiencies in China's defense modernization despite multiple, including ongoing, reforms. In this process, GAD largely serves as the military end-user's representative, particularly for the ground forces, while SASTIND is responsible for managing and prioritizing activities within China's civilian-led defense industrial complex. Each of these civil-military organizations has strong vested interests, based on its areas of responsibility.

GAD was established in 1998. Its life cycle management responsibilities include weapons and equipment research, development, acquisition, and maintenance; operation of China's test, evaluation, and training bases; a

network of military representative bureaus and offices; and guidance of the direction of modernization of the People's Liberation Army (PLA) through its Science and Technology Committee.

The GAD is also responsible for some low-level oversight for each of the services' weapons and equipment life cycle management. For the ground forces, GAD serves as the chief actor on behalf of the PLA at every step of the process. But for the other services, it loosely coordinates the process. For a new aircraft for the air force or navy air force, for example, oversight would largely fall on the respective service procuring the equipment.

SASTIND is not restricted to any particular area of China's defense industry. It is responsible for oversight and management of the entire defense industry, including state-owned enterprises and a limited number of new private companies that have been allowed to enter the system. Although it has been more than five years since its creation, there are still major pieces of information missing on this organization in official publications. Even though SASTIND personnel do a considerable amount of research, few of its findings are openly published. In contrast, the military publishes widely on defense life cycle issues. SASTIND's opacity also extends to management of seven academic institutions directly under the Ministry of Information Industry Technology (MIIT). Previously, these schools were understood to be controlled by SASTIND's predecessor, the Commission on Science, Technology, and Industry for National Defense (COSTIND), however, no information has been found yet officially linking SASTIND to these institutions, despite numerous exchanges between SASTIND officials and officials from these universities.

A further information gap in understanding SASTIND's role in the life cycle management system is that it does not have direct financial con-

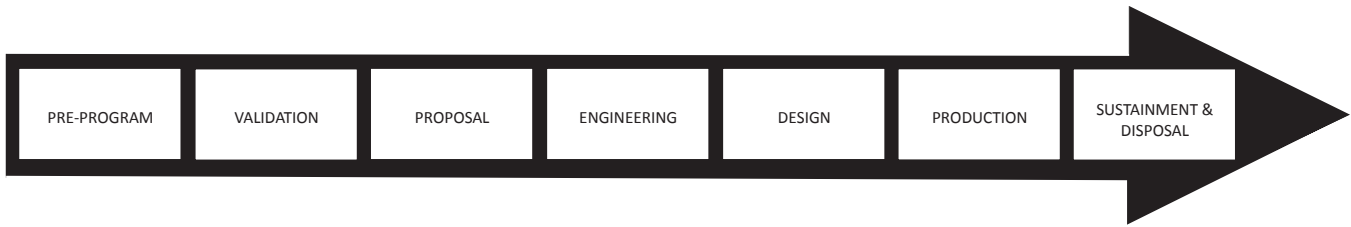


Figure 1. The defense life cycle management model

control over the defense industry at the national level. It does have significant oversight at the local level through the State Council's State-Owned Assets Supervision and Administration Commission (SASAC), however, which technically oversees all budgets, including defense. Additionally, despite hints of major corruption within SASTIND, it is unclear to what degree corruption may debilitate China's defense modernization. President Xi Jinping has sought to clean up corruption within the Chinese Communist Party (CCP) by limiting entertainment and other wasteful activities, as evidenced by recent policy guidelines to curb the proliferation of slush funds (*xiaojinku*) across industry sectors under SASTIND's control. This seems to indicate a systematic problem that will be difficult to curb. But the scale of corruption goes far beyond entertainment. For example, profitability over the last ten years seems to have encouraged local research institutes and factories to retain a greater share of their profits than their state-owned overseers permit.

During each step of China's RDA process, numerous defense committees are officially tasked with decision-making. However, it is difficult to identify when committees contain representatives from both GAD and SASTIND and how their internal power dynamic unfolds. Furthermore, it is even more difficult to assess whether durable changes are occurring organizationally through the work of the committees. Among the important committees in the defense life cycle management system are GAD Science and Technology committees, and GAD Design and Manufacturing

Finalization committees. Considering the vast number of steps and approvals that take place within committees that affect the defense RDA process, this report is far from exhaustive, but highlights some of the key interactions between military and civilian entities during the RDA process.

PRE-PROGRAM PHASE

Activities of the pre-program phase (which can also be called the pre-validation phase or pre-research phase) include forecast planning, which is developed based on threat and other projections, defense priorities, project advocacy, and bureaucratic jockeying between departments and services for resource allocations. Several specific factors were identified that influence this phase, including military strategy principles; forecasts of strategic environment and regional security; military analysis of trends and future needs; forecasts of domestic economy, scientific level, and trends; forecast of equipment funding; current status of weapon systems; forecast of research, manufacture, production, and technology safeguard capabilities. Identification and selection of military modernization projects priorities remains obscured by internal politics between the CCP, special committees, and military and civilian production. Additionally, the research shows that some of these activities blend into the validation phase.

VALIDATION PHASE

The links between the factors influencing the choices of weapons proj-

ects and selection are the five-year weapons construction program plan (*wuqi zhuangbei jianshe guihua jihua*) and the weapons support system (*wuqi zhuangbei tizhi*). Only weapons proposals listed in these can enter into the validation phase and begin the formal research and manufacturing process. During the validation phase programs undergo high-level evaluation and approval. The preliminary stages are believed to be most critical to injecting science and technology and innovation into weapons development. During this phase military needs, research and manufacturing requirements, operational functions, and life cycle costs are assessed according to the requirements of "full system construction" (*cheng tixi jianshe*) and the "complimentary systems" (*tixi peitao*). After the assessment, a report of findings and the application, which outline some of the key elements of the RDA for a particular project, is developed, approving the proof of concept.

PROPOSAL PHASE

Following the proof of concept, the Chinese literature describes a period of planning known as the proposal phase. GAD researchers characterize this as GAD's most important opportunity to influence the development of weapons and equipment. During this phase GAD develops guidelines for the program. Concurrently, researchers and manufacturers overseen by SASTIND demonstrate the feasibility or readiness of key technologies to be applied to platforms.

Military training manuals for GAD military representatives characterize

this period as one of intense scrutiny over the concept proposed, as the military representatives are tasked with overseeing an extensive list of requirements to ensure reliability, pricing, standardization, software integration, and interoperability. Through its military representatives, GAD oversees researchers and manufacturing during the planning and approval of two guiding documents that set the course for the rest of the RDA cycle, the “General Requirements for Equipment Development” (*zhuangbei yanzhi zhongyaoqiu*) and the “Integrated Demonstration Plan” (*yanzhi zhongyaoqiu zonghe lunzheng baogao*). These documents establish GAD’s expectations of the researchers managed by SASTIND. Following their approval, a contract is signed to pursue the engineering of the piece of equipment, and the process of developing the weapon’s components begins.

GAD’s dependence on the military representative system reveals a weakness in military oversight of weapons and equipment development because the state-owned enterprises, where the military representatives are assigned, pay their military pay and allowances and provide housing, which seriously undermines their impartiality. Additionally, the military representatives are often insufficient in number and lack the necessary qualifications to carry out their extensive oversight duties.

ENGINEERING PHASE

The engineering phase is when “the design drawings are realized and the technology documents turn into products.” According to educational materials published by the Hunan Science and Industry Polytechnical College, 60 to 80 percent of the project funds are spent during this stage, which is the longest in the process.

During this phase, existing and innovative technologies are tested and integrated. Sub-components are

individually tested, and emphasis is placed on systems integration and interoperability with existing and future weapons platforms. For military end-users it is also the most risky period since weapons and equipment may be developed that fail to satisfy military requirements, particularly since the system depends upon military representatives who often do not have sufficient authority to strictly oversee this civilian-led effort and ensure that it conforms to the military’s requirements. Consequently, the end-users’ requirements do not appear to be sufficiently guaranteed during this phase, which ends with development of a prototype or demonstration weapons.

DESIGN PHASE

Following development of a prototype, more than half of the total RDA time is spent on testing the design, much of which occurs during this phase. It appears that during this stage, the testing of prototypes is primarily undertaken by the factory itself and is not under the control of the military. Military representatives are present, but do not appear to actually control the testing. This puts tremendous strain on military representatives who may be pressured not to identify flaws they observe during these initial tests.

PRODUCTION PHASE

This stage of China’s system allows the end-user to provide a final test of a small number (or batch) of the weapons or equipment before it goes into larger production. This phase allows for the closest cooperation between military units (which may actually be professional test units) and the engineers who researched, designed, and manufactured the equipment. Testing is conducted in accordance with the requirements outlined in the general requirements adopted during the proposal phase. This reconciliation

ensures that the small batch production is reliable and that the research and manufacturing organizations have fulfilled their requirements laid out earlier in the general requirements.

SUSTAINMENT AND DISPOSAL

China’s military life cycle management system for weapons and equipment does not end with the completion of production and fielding to units. It continues throughout their life until retirement and/or disposal. To sustain weapons and equipment, even ammunition, a system of effective preventive maintenance, repair, and periodic overhaul must be in place to maximize the serviceability and reliability of weapons and equipment during military operations, whether on land, sea, or air. This aspect of China’s defense life cycle management has often been overlooked in research, but it is essential to accurately assessing PLA capabilities and to assess how well the PLA might perform during peacetime operations and war.

Within the Chinese military there is some recognition of the importance of sustainment of equipment to promote the life of weapons and equipment, and also how this plays an important role throughout the entire life cycle management. Researchers Li Ximin and Jiang Xiaofeng, for example, have linked early obsolescence of weapons and equipment to multifaceted issues throughout the entire life cycle management system, such as poor quality management and excessive production times that produce outdated weapons and equipment.

CONCLUSIONS

Application of the defense life cycle management system model provides a comprehensive way to assess China’s military modernization and its ability to develop projection capabilities by incorporating a “cradle to grave”

framework for analysis. Applying the model to weapon systems analysis can identify gaps and problems as well as potential strengths within the life cycle system.

The initial findings of this analysis collectively raise questions about China's ability to indigenously research, develop, manufacture, and maintain advanced weapons that meet the needs of future military operations. China's ability to overcome these limitations will determine the

combat effectiveness of its military modernization and its ability to project military power onto future battlefields.

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