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Introduction

The People's Republic of China (PRC) is nearing the end of the "Hundred-Year Marathon," a strategy of modernization efforts across all aspects of the Chinese society, economy, and military, lasting from 1949 through 2049.¹ Key to the PRC's strategy is advancing a comprehensive military modernization program that the PRC would consider complete by 2035 and transforming the People's Liberation Army (PLA) into a "world-class" military by 2049. Through imports, foreign direct investment, talent recruitment, research and development, and academic collaboration, the new PLA will integrate emerging technologies for military application.²

Integration of Technologies

The PRC is integrating numerous emerging technologies to reach its goal. These technology sectors and programs include:

- ◆ **Artificial Intelligence and Advanced Robotics:** The PLA's artificial intelligence and advanced robotics programs consist of enhanced data exploitation; decision support; manufacturing; unmanned systems; and command, control, communications, computers, intelligence, surveillance, and reconnaissance. Additionally, China's military and technology industries will push to dominate the third revolution in weaponry by advancing lethal autonomous weapon systems.
- ◆ **Semiconductors and Advanced Computing:** This advanced technology sector comprises enhanced cyber operations and weapons design, and shortened research and development cycles. China will speed up artificial intelligence and improve counter-jamming capabilities based on cutting-edge computing.
- ◆ **Quantum Technologies:** The goal of the PLA's quantum technology program is enabling secure global communications, enhanced computing and decryption capabilities, undersea target detection, and enhanced submarine navigation. China's quantum research budget is its largest national investment (estimates reveal spending of \$2.5 billion in 2017) and will dominate related computing patents.³ Current programs are in communications, but future ventures are unlimited.
- ◆ **Biotechnology:** The PLA's biotechnology program includes research and development in the fields of enhanced warfighter selection and performance and advanced human-machine teaming. The future of the Chinese soldier is "human enhancement" tied to cognitive, physical, and biochemical improvements.
- ◆ **Hypersonic and Directed Energy Weapons:** The focus of these programs entails developing global strike and defeating missile defense systems, antisatellite missiles, and unmanned aircraft system capabilities.
- ◆ **Advanced Materials and Alternative Energy:** This area includes improved military equipment and weapon systems.⁴ Lunar missions are China's approach to the creation of new metals for use in military applications by 2035.

Potential Fielding Challenges

The Chinese have integrated various technologies with PLA modernization planning, some of which have potential fielding challenges:

- ◆ **Biotechnology, Advanced Materials, and Computing.**
 - ◆ *Application:* Genetic alteration and human enhancement are integrated with advanced digital communications and materials producing the next generation Chinese soldier. Professional and elite soldiers will possess advanced body armor made of lightweight advanced material, enhancing performance and endurance with direct digital tactical and cyber secure communication.
 - ◆ *Challenge:* The concept and fielding of next generation Chinese soldier technologies is likely limited to professional and elite soldiers: airborne, marine, and special operations forces (SOF).
- ◆ **Advanced Artificial Intelligence Robotics with Advanced Materials.**
 - ◆ *Application:* Aggressive Chinese lunar exploration/mining and merger of artificial intelligence computing and robotics will create advances in tactically autonomous weapon systems—autonomous sentry and micro-avionic robotics. PLA fielding will expand beyond current lethal autonomous weapon system drones or unmanned aerial vehicles like the CH-4 Rainbow and GJ-2 Wing Loong II.⁵
 - ◆ *Challenge:* China will face scientific and political pressures concerning the application of artificial intelligence to weapons. This may be a catalyst for future conflict.⁶
- ◆ **Artificial Intelligence/Robotic Chemical and Biological Weapon Defense.**
 - ◆ *Application:* The advances in artificial intelligence integrated on vehicles are not limited to lethal actions. Autonomous robotic capabilities with advanced computing will enable China to deploy aerial and ground drones that detect explosives, chemicals, and biological threats.
 - ◆ *Challenge:* The challenge will be selecting and maintaining older systems, along with ensuring computing is up to date with the latest chemical and biological threats.
- ◆ **Autonomous Robotics with Global Access.**
 - ◆ *Application:* Advances in computing and robotics will give the PLA the needed autonomous logistical backbone to meet global requirements, first supporting civilian and then military ventures.
- ◆ *Challenge:* Learning how to secure and sustain logistics will require a decade or more for an actual autonomous logistics network.
- ◆ **Artificial Intelligence-Enabled Indirect Fire Systems.**
 - ◆ *Application:* The current detection, decision, shooter, and steel-on-target process can take anywhere from a few minutes to several minutes. The PLA desires to interdict an adversary's ability to fire or conduct counter-fire operations at all echelon levels.
 - ◆ *Challenge:* Heavy reliance on artificial intelligence acquisition and engagement may dismiss established indirect fire tactics. The PLA may reveal this capability near the Sino-Indian border.
- ◆ **Directed Energy.**
 - ◆ *Application:* Directed energy anti-air and missile technologies are not far from reality. The adoption of anti-air and naval directed energy weapons may produce capabilities for ground forces.
 - ◆ *Challenge:* The challenge of directed energy is the energy source required to integrate as a tactical maneuvering system.
- ◆ **Underground Facilities.**
 - ◆ *Application:* The construction of underground facilities ensures the survivability of the government and military. This requires a priority to ensure missile and strategic early warning and communication networks can operate in any contested environment.
 - ◆ *Challenge:* The construction of underground facilities is difficult to disguise, and Chinese strategists realize that any underground facilities within China and abroad are targets.

The Next 30 Years

Over the next 30 years, the overall measure of the Central Military Commission's success is the ability to increase readiness within the theater command structure, established in 2016 and divided into the Eastern, Southern, Western, Northern, and Central Theater Commands. Each theater has specific missions directed toward immediate regional security matters, with the exception of the Central Theater Command (headquartered in Beijing), which has the mission of capital security and the ability to support other theaters' response to non-war military activity.

The PLA is increasing the combined arms approach to operations. The Central Military Commission's Joint Operations Command Center is central to coordinating contingencies between the five theater commands. Over the next 30 years, the realism and size of these exercises will



The five theater commands of the People's Liberation Army

the airborne (7), marine (8), and re-structured SOF (15) brigades will be operational by 2049. The transition to a brigade of approximately 5,000 personnel and associated equipment ensures the PLAA can task organize forces to meet specific non-war military activities operations, or eventually to operate within a multi-domain contested action. New deployment concepts for the smaller, more adaptable brigades will improve the PLAA's ability to deploy, seize, and maintain areas abroad.

The modernization effort will replace existing armor (tanks and other combat vehicles), artillery, air defense, and aircraft in formations. The PLAA will field new advanced combat vehicles, armaments, munitions, and advanced communication devices based on

technology gained, and the development of new materials. Highlights of PLA force modernization initiatives include—

- ◆ **Autonomous Sentry Tanks.** The artificial intelligence modification to older equipment will enable the PLAA to employ an unmanned, likely autonomous security or defensive perimeter system. In November 2018, the Chinese already began testing artificial intelligence possibilities with the Type 59 tanks.⁸

grow. The 83rd Group Army's airfield seizure exercise is an example of combined training, with a growing complexity that will result in the demonstration of joint warfare capabilities. The 83rd Special Operations Brigade, 83rd Group Army, conducted a force-on-force exercise simulating a mission to seize an airfield in November 2020. Training consisted of reconnaissance, wet obstacle crossing, resupply of scouts by small unmanned aircraft systems (identified as hexacopter), and offensive phase, including heliborne insertion from the 161st Air Assault Brigade (not organic to the 83rd Group Army).⁷

People's Liberation Army Army (PLAA)

In the late 1990s, evidence of an Army reorganization revealed a restructuring from divisions and regiments to an operationally flexible force, including an emphasis on a brigade formation executing complex combined-arms and joint operations.

The PLAA restructured five "theater army commands" that comprised 13 group armies with a total of 78 combined-arms maneuver brigades—heavy, medium, and light—along with six additional brigades for artillery, air defense, aviation, SOF, engineer and chemical defense, and sustainment. There remain nonstandard independent divisions and brigades outside of the group armies with specific strategic missions in contested regions and Beijing proper.

The PLAA brigade transformation comprises heavy, medium, and light, along with mountain missions. Additionally,



Video footage showing a Type 59 medium tank with a PLA soldier possibly controlling via a remote computer terminal.

- ◆ **Autonomous Fires.** The integration of artificial intelligence into computing detection-to-fires will transform PLAA battlefield capabilities. Munition distance and accuracy will run parallel to experimentation in the detection of targets with the ability to assign fires autonomously while emphasizing speed and deception in order to increase system survivability.

- ◆ **Airborne and Marine Troops.** The PLA will emphasize combined arms training and mobility of the airborne and naval marine brigades. The priority through 2035 is an increase in aerial and amphibious lift capacity at greater distances than currently exist in the PLA.
- ◆ **SOF Capabilities.** Scalable, lighter, and advanced weapons tactics for initial entry to secure ports and critical infrastructure will be essential.

PLA Air Force and PLA Navy Aviation

The PLA Air Force and PLA Navy Aviation is the third largest global aviation combat force but will continue to increase in numbers and advanced avionics. Future emphasis is on airborne command and control, logistics and in-flight refueling, strategic reconnaissance, and paratroop operations.

Unmanned Aerial Vehicle. Future development of the unmanned aerial vehicle by the Chinese civilian and military employment strategies will enable new tactics and doctrine in PLA warfare. Stealth and miniaturization with advanced avionics, engines, and lift capacities will further a wide range of unmanned aerial vehicle technology. Swarming drones tied into autonomous guidance, target acquisition, and attack execution will accompany the growth in artificial intelligence-enabled autonomous unmanned technologies.

Integrated Air Defense System. The integrated air defense system is a significant antiaccess and area denial challenge for United States forces in the regional limits of China. Artificial intelligence will again improve autonomous operations to include kinetic-kill vehicle technology of a mid-course interceptor at the upper layer of the PLA's multi-tiered missile defense system.⁹

PLA Rocket Force

The PLA will continue to focus on a capable and robust ballistic missile global force. The focus for the PLA Rocket Force is "enhancing its credible and reliable capabilities of nuclear deterrence and counterattack, strengthening intermediate and long-range precision strike forces, and enhancing stra-

tegic counter-balance capability, so as to build a strong and modernized rocket force."¹⁰

Conclusion

By 2035, the PLA will have transformed from an army capable of defending China's internal and immediate regional security concerns to a "world class" military that is extremely visible on the global security stage. Global powers will recognize the PLA's transformation into small, multi-role, scalable brigades and SOF capable of responding to multi-domain contingencies. This transformation includes cyberspace operations, a physical presence in space (likely the Moon), and a global response beyond humanitarian and disaster relief events. 🌸

Endnotes

1. Michael Pillsbury, *The Hundred-Year Marathon: China's Secret Strategy to Replace America as the Global Superpower* (New York: Henry Holt and Company, 2015).
2. Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2020* (21 August 2020), 175.
3. Phillip C. Sanders, "Beyond Borders: PLA Command and Control of Overseas Operations," *Strategic Forum* no. 306 (July 2020), <https://ndupress.ndu.edu/Portals/68/Documents/stratforum/SF-306.pdf>.
4. Office of the Secretary of Defense, *Annual Report to Congress*, 148.
5. Elsa B. Kania, "'AI Weapons' in China's Military Innovation," *Global China* (April 2020), https://www.brookings.edu/wp-content/uploads/2020/04/FP_20200427_ai_weapons_kania_v2.pdf.
6. Elsa B. Kania, "Chinese Military Innovation in the AI Revolution," *RUSI Journal* 164, no. 5–6 (29 November 2019): 26–34.
7. Department of the Army, *U.S. Army Asia Studies Detachment Report ASD21C03023* (November 4, 2020); and Department of the Army, *U.S. Army Asia Studies Detachment Report ASD21C03025* (November 6, 2020).
8. Office of the Secretary of Defense, *Annual Report to Congress*, 144.
9. *Ibid.*, 52.
10. *Ibid.*, 55.