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Chinese Expectations for Biotechnology And Cognitive Enhancement in Future Warfare



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Proper Nouns Translation Reference

<i>Academy of Military Science</i>	军事科学院
<i>Baishan Press</i>	白山出版社
China's Future Warfare	<i>中国未来战争</i>
<i>Du Chao</i>	杜超
<i>PLA National Defense University</i>	中国人民解放军国防大学
The New High Ground for War	<i>战争新高地</i>
The Science of Military Strategy	<i>战略学</i>
<i>Shiro Ishii</i>	石井 四郎
<i>Xiao Tianliang</i>	肖天亮
<i>Zhang Shibo</i>	张仕波

Concepts and Phrases Translation Reference

<i>Artificial intelligence</i>	人工智能
<i>Biological realm</i>	生物领域
<i>Biological warfare</i>	生物战/生物作战
<i>Deal with unexpected situations</i>	不会处置突发情况
<i>Developing a genetically modified bedbug</i>	研制基因臭虫
<i>Especially since the United States adopted a series of measures to occupy the commanding heights of military conflict in the biological field</i>	尤其是美国为占领生物领域军事斗争的制高点
<i>Emerging form of strategic power</i>	新兴战略力量
<i>Five Incapables</i>	五个不会
<i>Inability to judge the battlefield situation</i>	不会判断战场形势
<i>Inability to understand the intent of senior leaders</i>	不会理解上级意图
<i>Inability to make operational decisions</i>	不会定下作战决心
<i>Inability to organize and arrange troops</i>	不会摆兵不阵
<i>Inability to deal with unexpected situations</i>	不会处置突发情况
<i>Intelligentization</i>	智能化
<i>Scientifically grasp the connotation and essential characteristics of biological warfare</i>	科学把握生物战争内涵与本质特征
<i>The most effective are genetically engineered weapons designed to attack people of a specific racial or ethnic background</i>	最具希伤效果的是种族基因武器
<i>The “spear” and “shield” of national biosecurity defense</i>	国防生物安全的“矛”与“盾”
<i>To ensure people of specific races fall ill</i>	特定种族患病
<i>Two bombs and one satellite</i>	两弹一星

Introduction

This monograph examines attitudes within the Chinese People’s Liberation Army (PLA) attitudes toward biological warfare and what it calls “the ‘intelligentization’ of military operations.”¹ In the twenty-first century, Chinese military strategy tends to study biological warfare alongside technological advances in artificial intelligence (AI) and biomechanics. All are part of the same problem-set and are treated as means to degrade enemy soldier performance or provide its own soldiers with advantages during military operations. For example, Zhang Shibo—the former commander of the critical Nanjing Military region and a former president of the PLA National Defense University—discusses the potential for advances in both biotechnology and intelligent systems in warfare to affect human capacity in his book, *The New High Ground for War*, where he suggests that these systems can reinforce each through genetic engineering or human-machine interface to enhance soldier performance.² The title’s reference to the military advantage of holding high ground clearly indicates the author’s belief in the importance of these innovations for future war.

While the Chinese Communist Party (CCP) and the PLA often permit eminent military leaders like Zhang to publish books about their experience and the future of China and the PLA, *The New High Ground of War* was a particularly influential statement. Not only was it published by an authoritative institution of higher military education, but it also directly preceded publication of the 2017 edition of *The Science of Military Strategy (SOMS)*, which was assigned reading at Beijing’s National Defense University. *SOMS* is the most authoritative explanation of China’s approach to military strategy available and is both a foundational document and a teaching tool. *SOMS* represents Chinese military thought from the Academy of Military Science (AMS) or, depending on the edition, the National Defense University (NDU)—leading Chinese military

¹ Zeng Haiqing, “The Era of Intelligentization Calls for the Transformation of Training to ‘Intelligence,’” *China Military Network*, July 21, 2022; Ye Zheng, *A Discussion of Informatized Operations* (Beijing: Military Science Publishing House, 2007) 463-471; Wang Guoliang, et. al., eds., *Test and Evaluation of Information Network Security and Critique* (Beijing: National Defense Industry Press, 2015), 14-21. The PLA uses “intelligentization” to mean what English speakers would consider an awkward translation of the concept of using information systems to analyze and automate military operations and warfare.

² Zhang Shibo, *The New High Ground of War* (Beijing: PLA National Defense University Press, 2017), 281-287. Note that the PLA translates this as “*The New Highland of War*”, a literal translation that misses the point of high ground in military parlance.

research institutes that advise the Central Military Commission (CMC) and educating Chinese flag and general officers.³ The PLA AMS is primarily a research and policy analysis institution, while NDU is a high-level professional military education (PME) institution, although it has research and analysis sections. *SOMS* is regarded the PLA's major strategy document on the concepts of war and strategy and is based on Chinese understandings of the laws of war, strategy, history, and "Marxist scientific concepts of the laws of war."⁴ In terms of purpose and substance, the closest equivalent among US military publications might be *Joint Doctrine Note 2-19: Strategy*.⁵ Both *SOMS* and *The New High Ground for War* were widely available and frequently assigned as readings in PLA PME schools.⁶ The authors of *SOMS*, Zhang, and other leading PLA thinkers espouse views on the importance of these military innovations that are similar to those revealed in many PLA official publications and doctrinal statements.

This monograph analyzes recent writing from leading Chinese military thinkers and two of the PLA's most authoritative institutions: the AMS and the NDU. The AMS writes for what is now the CMC Joint Staff Department—previously, the General Staff Department—while the NDU educates high-level PLA officers and serves as a finishing course or capstone for PLA general and flag officers. Of particular interest are the Chinese language version of the 2017 *SOMS*, edited by Xiao Tianliang and published by Beijing's National Defense University Press, and the 2020 edition, which was translated into English by the Air University's China Aerospace Studies Institute.⁷ This monograph depends on both the 2013 and the 2017 versions. The author has compared the 2017 edition to the 2020 version, finding no substantive differences on the issues discussed in this paper.

³ Bates Gill and James Mulvenon, "Chinese Military-Related Think Tanks and Institutions," *The China Quarterly*, no. 171 (September 2002): 617-624.

⁴ Peng Guangqian and Yao Youshi, eds., *The Science of Military Strategy* (Beijing: Military Science Publishing House, 2005), 503.

⁵ Joint Chiefs of Staff, *Joint Doctrine Note 2-19* (Washington, DC: Joint Chiefs of Staff, 2019).

⁶ During a 2018 visit, this author observed that Zhang's book was grouped alongside course readings in both the AMS and NDU bookstores.

⁷ Xiao Tianliang, ed., *The Science of Military Strategy 2017* (Beijing: National Defense University Press, 2017), 165-172, and 173-179. For the English translation, see *In Their Own Words: Science of Military Strategy 2020* (Montgomery, AL: China Aerospace Studies Institute, January 2022). There is no substantial difference between these versions, though for a critical comparison see Marcus Clay and Roderick Lee, *Unmasking the Devil in the Chinese Details: A Study Note on the Science of Military Strategy 2020* (Montgomery, AL: China Aerospace Studies Institute, 2022).

In general, there is a convergence of official PLA and private views on biotechnology, AI, and cognitive enhancement. While this does not necessarily demonstrate that one is influencing the other, it indicates certain shared beliefs about the future of warfare and how China should prepare for conflict. For example, Zhang's argument that new technology necessarily influences the development of weapons, defense industry, and future war echoes Xi Jinping's ideas on military-civil fusion, where civilian organizations are paired with the PLA to advance research.⁸ Meanwhile, in the 2017 version (and the 2020 version), *SOMS* states that "the biological field has become a brand-new territory for the expansion of national security. For example, the use of new biological weapons, bioterrorism, large-scale epidemic infections, specific ethnic genetic attacks, and purposeful genetic modification of the ecological environment, food and industrial products...can not only bring biological damage to specific targets and people, but also bring large-scale spreading effects and deterrent effects."⁹ In sum, the PLA expects the combination of developments in the "biological realm" and "intelligitization" to transform future war.¹⁰

Historical Influence on PLA Attitudes

Concern about bio-warfare in China is heavily influenced by the historical experience of the Japanese invasion and subsequent occupation of China between 1932 and 1945.¹¹ Japan used biological warfare during its occupation of China, conducting experiments involving Surgeon General Shiro Ishii and his Unit 731. Unit 731 conducted experiments on humans, including various testing biological agents in places like Changde, Hunan province, and Ningbo, Zhejiang province, where bubonic plague killed more than 10,000 people.¹² In 1946, Ishii was granted immunity by the US government in exchange for information on Japanese biological-warfare

⁸ Zhang, *The New High Ground of War*, 1-3; On Xi, see Lorand Laskai, "Civil-Military Fusion and the PLA's Pursuit of Dominance in Emerging Technologies," *China Brief* 18, iss. 6 (April 2018).

⁹ Xiao, *The Science of Military Strategy 2017*, 165.

¹⁰ Zhang, *The New High Ground of War*, 245-265.

¹¹ Manuela Oliveira, Gabriella Mason-Buck, et. al., "Biowarfare, Bioterrorism and Biocrime: A Historical Overview on Microbial Harmful Applications," *Forensic Science International* 314, (September 2020). In particular, see table 1 and paragraph 1.1.2.

¹² See Robert Harris and Jeremy Paxman, *A Higher Form of Killing: The Secret History of Chemical and Biological Warfare* (New York: Random House, 2002). See also Anne L. Clunan, Peter R. Lavoy, and Susan B. Martin, eds., *Terrorism, War or Disease? Unraveling the Use of Biological Weapons* (Palo Alto, CA: Stanford University Press, 2008).

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programs.¹³ The People's Republic of China (PRC) propaganda and political education system continues to emphasize the immunity granted to Ishii as proof the United States has intentions to use biological weapons.¹⁴

The Cold War also saw accusations from China and the Soviet Union that the United States covered up Ishii's research and itself conducted biological warfare experiments in North Korea during the Korean War (1950-1953).¹⁵ Although Stalin's allegations of American bioweapons in Korea have been discredited, during World War II the United States did conduct a biological warfare research program 1942 in response to the suspected use of biological warfare agents by Germany and Japan.¹⁶ In 1947, President Harry S Truman secretly continued this biowarfare program and withdrew consideration of the 1925 Geneva Protocol on biological warfare from the US Senate. In 1949 and 1951, respectively, the United States tested non-pathogenic bacteria on naval facilities and vessels near the Virginia coast and San Francisco Bay and disseminated bacterial aerosols to test their effect, in experiments that "involved nearly 3400 people and several research and production facilities."¹⁷ In 1969, the United States dismantled its bio-warfare program and converted its facilities to defensive purposes and then ratified the Biological Weapon and Toxin Convention (BWTC) in 1975. Nonetheless, before ratification of the BWTC, the United States had weaponized ten bio-warfare agents and worked on delivery systems.¹⁸

These narratives, along with contemporary allegations of American bioweapons facilities in Ukraine, are repeated in China's Communist Party publications and have turned into effective anti-

¹³ Tsuneishi Kelichi, "Unit 731 and the Japanese Imperial Army's Biological Warfare Program," *The Asia-Pacific Journal* 3, iss. 11 (November 24, 2005): 1-9. See also Hal Gold, *Japan's Infamous Unit 731: Firsthand Accounts of Japan's Wartime Human Experimentation Program* (North Clarendon, VT: Charles E. Tuttle Co., 2019).

¹⁴ A recent example can be found in the Communist Party-controlled newspaper *China Daily*. See Zhao Xu, "Devil's Deal Stole Justice from the Dead," *China Daily*, March 12, 2022; "Unmasking the Crime of Unit 731," *China Daily*, July 28, 2015.

¹⁵ See Milton Leitenberg, "False Allegations of U.S. Biological Weapons Use during the Korean War," in Clunan, Lavoy, and Martin, eds., *Terrorism, War or Disease? Unraveling the Use of Biological Weapons*.

¹⁶ Leitenberg, "False Allegations"; Oliveira and Mason-Buck, et. al., "Biowarfare."

¹⁷ Oliveira and Mason-Buck, et. al., "Biowarfare," paragraph 1.1.3.

¹⁸ Friedrich Frischknecht, "The History of Biological Warfare," *European Molecular Biology Organization (EMBO) Reports* (June 2003, Supplement 1), S47-S52; Oliveira and Mason-Buck, et. al., "Biowarfare," paragraph 1.1.3.

US propaganda online.¹⁹ Indeed, PLA scholarship closely follows developments in US research, much of which is conducted at Fort Detrick, Maryland, at the US Army Medical Research Institute of Infectious Diseases (USAMRIID). Fort Detrick was the center of US Army biological research from 1943 to 1969, and today is home to the National Biodefense Analysis and Countermeasures Center.²⁰ The history described above helps explain why some in China view suspect that this research is evidence that the United States is developing biological agents for use in future war.

Contemporary PLA Attitudes on Biological Warfare

PLA thinking on biological warfare primarily takes place within its medical community and its major, higher-level educational institutions. PLA authors generally agree on two points: that the United States is conducting research on biological weapons, and that this research constitutes a threat to China.

While the PLA, the State Council, and the Ministry of Foreign Affairs maintain that they observe and uphold the BWTC and will not engage in the use of biological agents in war, CCP periodicals nonetheless charge that the United States may already be working on biological agents or human capabilities enhancement.²¹ In 2021, a Chinese foreign ministry spokesperson asked “why is the [United States] building so many biolabs around the globe? How much sensitive biological resources and information has the [United States] obtained from other countries? What kind of activities has the [United States] carried out in its Fort Detrick laboratory and other biolabs,

¹⁹ Zoe Strozewski, “China’s Claim About U.S. Biological Weapons in Ukraine Gets Traction Online,” *Newsweek*, March 11, 2022; “Access to suspicious US biolabs in Ukraine should be organized: Russian biotechnologist,” *Global Times*, April 5, 2022.

²⁰ Diana DiGangi, “Army Germ Lab Shut Down by CDC in 2019 Had Several 'Serious' Protocol Violations That Year,” ABC News, January 22, 2020.

²¹ “US Biolab Transparency Urged after Smearing China over Weaponization of COVID-19,” *Global Times*, May 20, 2021; Xiao, *The Science of Military Strategy 2017*, 165; “Chinese Disarmament Ambassador: Negotiations on the Verification Protocol of the Biological Weapons Convention Are Imperative,” *Xinhua News Agency* [hereafter Xinhua], September 9, 2021. Wang Xiaoli. “How Far Is the Ban on Biological Weapons?” Xinhua, October 29, 2020. (Author’s note: this link and article were valid on October 30, 2020. Since then, the PRC appears to have taken down the article. This is quite common in Chinese Communist Party web censorship.) See also, “Joint Statement of the Foreign Ministers of the People’s Republic of China and Russia on Strengthening the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction.” Ministry of Foreign Affairs of the PRC, October 27, 2021.

and what's the relationship between these biolabs and its 'next generation bioweapons'?"²² Zhang Shibo, a retired PLA lieutenant general and former NDU president, and Du Chao, a senior field grade officer who was assigned at the Nanjing Army Command Academy, argue that new technologies inevitably change warfare and make the use of biotechnology in warfare likely, including for large-scale killing.²³ Recent scholarly publication in this vein includes articles with titles such as "The 'Spear' and 'Shield' of National Biosecurity Defense" and [the need to] "Scientifically Grasp the Connotation and Essential Characteristics of Biological Warfare."²⁴ The 2017 edition of *SOMS*, for example, discusses biotechnology as an "emerging new form of strategic power."²⁵

Zhang writes that "the most effective [types of emerging biotechnology] are genetically engineered weapons designed to attack people of a specific racial or ethnic background."²⁶ To support his claim that such technology is possible, he alleges that in the United States, Monsanto, and DuPont laboratories are isolating the genes of various ethnic and racial groups. Zhang claims that it is possible that such genetically engineered technology could be turned into large-scale genetic weapons.²⁷

Colonel Du Chao, formerly of the Nanjing Army Command Academy, is an even louder voice accusing the United States of maintaining biological capabilities with the intent to use them. As a former senior leader—a colonel or senior colonel in PLA terms—who wrote while on the faculty of one the major institutions of higher education in the PLA, his impact on the PLA is comparable to that of a well-published faculty member of the US Army War College. Du's books are widely available to students at PLA academies, universities, and bookstores, as well as to people interested in the military, and PLA leaders. Even after his retirement, he published an

²² "US Biolab Transparency Urged," *Global Times*, May 20, 2021.

²³ Zhang, *The New High Ground of War*, 217-219; Du Chao, *China's Future Warfare and Environmental Security: 21st Century Questions and Research* (Shenyang: White Mountain Press, 2015); Du Chao, *China's Future Warfare* (Shenyang: White Mountain Press, 2012).

²⁴ Yang Xin and Yang Wenzhang, "Scientifically Grasp the Connotation and Essential Characteristics of Biological Warfare," *Chinese Journal of Social Sciences-Military Science* 4 (December 2021); Luo Xiaoru, "The 'Spear' and 'Shield' of National Biosecurity Defense," *Military Digest* 11 (June 1, 2020).

²⁵ Xiao, *The Science of Military Strategy 2017*, 165-166.

²⁶ Zhang, *The New High Ground of War*, 231-232.

²⁷ Zhang, *The New High Ground of War*, 232.

article in the CCP's military newspaper on future war.²⁸ Du's retirement appears to have not ended his influence among PLA readers.

In two books published by then-Shenyang Military Region-controlled Baishan Press, Du argues that China must prepare for its most likely future adversary in war: the United States. Published in 2012, *China's Future Warfare* provides an overview of how future technology may influence the battlefield, strategy, and operational art. These ideas are not particularly alarming and reflect thinking about technology and future warfare found in most of the world's major military services.²⁹ His 2015 book, *China's Future Warfare and Environmental Security*, however, takes a very different tack.³⁰ In that book, Du argues that biological weapons like viruses, toxins, and genetic weapons can be powerful weapons in war because a small number of weapons can have a great effect on the battlefield.³¹ Du argues that China needs defenses against these weapons because the United States invests billions of dollars in research on biological weapons at Fort Detrick, to include work allegedly developing a genetically modified bedbug.³²

Concerns about the United States and biological programs it may be conducting are echoed in the 2017 version of *SOMS*. Here, the authors write that “developed countries, especially the United States, have adopted a series of measures to occupy the commanding heights [high ground] of military conflict in the biological field.”³³ *SOMS* portrays the United States as likely to engage in bio-warfare because the United States is the only nation that has used nuclear weapons to achieve its wartime objectives.³⁴ It argues that an enemy's drive to achieve political objectives in war has and can again lead to the use of weapons of mass destruction, emphasizing a direct link

²⁸ Du Chao, “The 36 Stratagems and Ancient Warfare: The Third Stratagem—Killing with a Knife,” *PLA Daily*, January 18, 2018, 4.

²⁹ See, for example, Margaret Kosal, “Science, Technology and the Future of War,” Modern Warfare Institute at West Point, October 2, 2016; Robert H. Scales, *Future Warfare Anthology: Revised Edition* (Carlisle, PA: Strategic Studies Institute, 2000).

³⁰ Du, *China's Future Warfare*, 55-65, 84-89, and 147-152.

³¹ Here, the reader should keep in mind that for all the havoc wreaked on China by Japan's Unit 731 in World War II, there were no significant effects on the battlefield. Rather, it was the civilian populace that took most of the effects. In this sense, biological weapons are analogous to a nuclear counter-value doctrine.

³² Du, *China's Future Warfare*, 94-95.

³³ Xiao, *The Science of Military Strategy 2017*, 171. The 2020 version contains the same language.

³⁴ Xiao, *The Science of Military Strategy 2017*, 171-172.

between the use of nuclear weapons and demands for the unconditional surrender of Japan in World War II.

The PLA not only fears biological warfare from the United States. Although the 2017 *SOMS* writing team believes the United States may have the most active and effective programs in military biotechnology, the authors argue that the greatest threat in the biological field is from biological terrorism or the use of bioweapons by rogue actors.³⁵ An AMS working group concluded that because biological weapons could be decisive on the battlefield and are “unmanned, formless, and soundless weapons,” they may be tempting to any enemy looking to accomplish political objectives.³⁶

An NDU multi-expert working group composed of doctors, microbiologists, PLA officers and strategists, and epidemiologists also explored China’s capabilities to respond to any future chemical, biological, radiological, or nuclear (CBRN) crisis. The working group was realistic in recognizing that such events could occur in war, but also could be brought about by disasters, the natural transmission of disease, or even terrorism. The main threat, according to the working group, emanated from Uighur and Muslim groups. Still, despite concerns about Uighur and Muslims groups, the working group rated the likelihood that bio-terrorism would be used against China as lower than that from the natural spread of disease or major war. They recommended that China establish a national system to respond to biological incidents of any kind and that there must be further work on the threat of bioterrorism against China.³⁷

There is no open-source discussion of the potential for the use of chemical, biological or nuclear weapons by PLA forces. However, to the PLA, the fears described above justify defensive biological warfare research. *SOMS* recognizes that the threat of epidemic diseases and includes discussions how biotechnology can be used to enhance the PLA and produce new biological

³⁵ Xiao, *The Science of Military Strategy 2017*, 170.

³⁶ Wei Xiaoqing and Wang Yumin, “The Realistic Threat of Biological Terrorism and Medical Countermeasures,” *Bulletin of the Academy of Military Medical Science* 32, no. 3 (June 2008): 281-283.

³⁷ Wei and Wang, “The Realistic Threat,” 282.

weapons.³⁸³⁹ One result of this is that the PLA emphasizes defense and preparation in the event of the use of biological agents, including by standing up a large number of units devoted to chemical, biological, and radiological defenses. The PLA has twenty-five or twenty-six chemical warfare defense brigades (depending on how reserve units are accounted for), as well as two research institutes, demonstrating genuine concern of an attack on China. By comparison, the US Army has in its active inventory has one CBRN command comprising two CBRN brigades, five CBRN battalions, six technical reconnaissance companies, five chemical reconnaissance detachments, and fifteen hazard response companies spread around the United States and in the Republic of Korea.⁴⁰

The search for the origins of the COVID-19 virus, which seems to have first begun infecting humans in Wuhan, China, has led to speculation that it may have escaped from the Wuhan Institute of Virology of the Chinese Academy of Sciences, China's only registered biological safety level 4 (BSL-4) facility.⁴¹ BSL-4s are the highest security facilities where research on the deadliest aerosol-transmitted diseases takes place.⁴² Unless international organizations are permitted to investigate such allegations or non-Chinese intelligence agencies comment publicly on the allegations, it is impossible to know if additional BSL-4-type research facilities exist and whether offensive or defensive programs are being pursued.

There exists historic and current suspicion that Wuhan is not the only BSL-4-type lab in China and that others may be conducting biological weapons research. From a historical perspective, Ken Alibek, who defected to the United States from Russia in 1992, made allegations that China had conducted biological warfare research and had an accident at one of their

³⁸ Concerns over epidemic diseases and their effect on military operations were heightened when Chinese peacekeepers were exposed to Ebola in West Africa in 2014. See "Chinese Peacekeepers Continue to Work Despite Ebola Outbreak," *China Daily*, August 4, 2014.

³⁹ The reader should keep in mind that the topic was fresh in the minds of Chinese citizens. The 2003 SARS epidemic significantly impacted the Chinese population and affected the PLA.

⁴⁰ US Army CBRN School, "Active CBRN Unit Locations," no date.

⁴¹ *High-Containment Biosafety Laboratories: Preliminary Observations on the Oversight of the Proliferation of BSL-3 and BSL-4 Laboratories in the United States, before US House of Representatives Subcommittee on Oversight and Investigations, Committee on Energy and Commerce* (2007) (testimony of Keith Rhodes).

⁴² Han Xia, Yi Huang, Haixia Ma, Bobo Liu, Weiwei Xie, Donglin Song, and Zhiming Yuan, "Biosafety Level 4 Laboratory User Training Program, China," *Emerging Infectious Diseases* 25, no. 5. (May 2019).

facilities.⁴³ More recently, an Israeli military doctor, Dany Shoham, expressed belief that there may be more facilities in China distributed around the country where biological, nuclear, and chemical warfare tests have been conducted and research is still ongoing.⁴⁴

The Blend of Offense and Defense in PLA Doctrine

Given the nature of PLA doctrine regarding the interrelationship between offense and defense, the potential existence of undeclared facilities should be of concern to the United States armed forces. As China defines its active defense strategy, even defensive research and programs can quickly translate into offensive programs or weapons. There are good reasons to be wary of PLA intentions. Since the basic doctrine of the PLA was set out by Mao Zedong as combining offensive action in what was characterized as a defensive posture, that doctrine has been refined over the decades.⁴⁵ Basic PLA doctrine is described as the active defense, combining offensive action into what is called a defensive posture.⁴⁶ Three authors writing in the Communist Party's military newspaper *PLA Daily* explain that

“Active defense is fundamentally in defense, and the essence is positive. Defense refers to adopting a position of self-defense strategically, establishing a strategic posture to resist aggression and defend one's own interests; active refers to attaching importance to

⁴³ William Broad and Judith Miller, “Soviet Defector Says China Had Accident at a Germ Plant,” *New York Times*, April 5, 1999, 3. Ken Alibek (Kanatjan Alibek) defected to the United States years before he made this allegation. He cited Soviet sources in his allegation.

⁴⁴ “Israeli Expert: China Might Have Created the Coronavirus,” *Israel Today*, February 9, 2020. Shoham also raised the possibility that the COVID-19 coronavirus was created in a Wuhan laboratory; however, most experts believe it was not.

⁴⁵ See Mao Tse-tung, “Problems of Strategy in China's Revolutionary War, December 1936,” in *Selected Works of Mao Tse-tung, Volume I* (Peking: Foreign Languages Press, 1975): 184-186, 199-200, and 205-208. See also Mao Tse-tung, “Problems of Strategy in Guerilla War Against Japan, May 1938,” in *Selected Works of Mao Tse-tung, Volume II* (Peking: Foreign Languages Press, 1967), 82-91. Note: The 1957 English language editions use the Wade-Giles transliteration for Mao Zedong and Beijing, not the Pinyin. Some of these principles can be found in Samuel B. Griffith, trans., *Mao Tse-Tung on Guerilla Warfare* (New York: Frederick A. Praeger Publishers, 1961), 101-107; Zhang Yun, “Active Defense: China's Military Strategy Since 1949,” *International Relations of the Asia-Pacific* 20, no. 3 (September 2020): 515–517.

⁴⁶ Ling Shengyin, Zhou Min, and Sun Ying, “Unswervingly Adhere to the Strategic Idea of Active Defense,” *Chinese Communist Party News Network*, April 19, 2017. The lead author, Ling Shengyin, is a PLA senior colonel logistics specialist with a medical background.

offensive actions in war preparations and campaign battles, and achieving the purpose of strategic defense through campaign and tactical offensives. Active defense means adhering to the organic combination of strategic defense and offensive in campaign and combat.”⁴⁷

Artificial Intelligence, Cognitive Warfare and Soldier Enhancement

The Chinese scientific and military communities are also examining how technological advances in computing and artificial intelligence can enhance human performance in war through human-machine interfacing.⁴⁸ While formerly the province of science-fiction writing, examples of human-machine interfacing in warfare are already being to be applied on the battlefield: tablets, phones, and computers with touch-screens are examples of human-machine interface, as are helmets for pilots that allow the pilot to control an airplane or weapons from a screen. There seems to be strong agreement that China should pursue programs that use artificial intelligence to improve decision-making and cognitive enhancement for offensive warfare.⁴⁹

The PLA continues to study these topics and to introduce soldiers and leaders to the relevant concepts and possibilities. One article in the *PLA Daily* discuss the way that “cognitive confrontation” will create a “new face” of future warfare.⁵⁰ The article argues that “in terms of military competition, the fields of physics and psychology are merging and create a formless battlefield; the competition can turn means to effect peoples’ spirit [will to fight and morale] and psychological condition.”⁵¹ In other words, artificial intelligence and other intelligitized innovations can affect how Chinese soldiers act and think, or alternatively, can attack the morale and will of enemy soldiers. The author advocates for the capability to attack or counterattack in cognitive space and “control or counter-control” the cognitive space of one’s own forces or the

⁴⁷ Ling, Zhou, and Sun, “Unswervingly Adhere,” 1.

⁴⁸ Sally Gao, “A Review of Man-Machine Interface Design Research in China,” *Advanced Materials Research* 566 (September 2012): 645-649.

⁴⁹ Xi Jinping, “Build and Strengthen the Informatization Strategy for Strategic Weapons,” in Xi Jinping, *A Collection of Important Concepts and Lectures on National Defense and Military Building* (Beijing, PLA General Political Department Political Editorial Group: 2014), 23-26, and 47-54; Li Yize, et. al., “Cognitive Confrontation: A New Domain of Future Conflict,” *PLA Daily*, January 28, 2020, 3.

⁵⁰ Li, “Cognitive Confrontation.”

⁵¹ Li, “Cognitive Confrontation.”

enemy.⁵² Given the way that technology is developing, such actions may involve forms of information operations or the use of man-machine interface. Doing so, according to the article, allows for the establishment and control of psychological superiority in warfare, the core concept of which is to “seek the loss or reduction of the decision-making ability and will to resist of the enemy” while improving these cognitive factors in one’s own forces.⁵³

Another article builds on the PLA’s study of US Air Force Colonel John Boyd’s ideas about the “OODA Loop,” the cycle of “observe–orient–decide–act” for decision-making during combat operations.⁵⁴ The authors, both PLA officers, argue that advances in AI will lead to what they call “cognitive warfare” by rapidly providing a common understanding of complex battlefield systems that can improve decision-making in warfare.⁵⁵ Another article looks to the United States and Russia for examples of how AI can improve combat operations and change warfare.⁵⁶ In general, articles in China on biomedical threats treat the United States as the most advanced country in the field of neuro-cognitive research.⁵⁷

Other studies focus on the more direct lethal consequences of human-machine interfacing. One study from a PLA military medical university calls for “building a new concept of combat forces” that applies “brain science” to the power of weapons and to humans to improve the chance to win.⁵⁸ Luo Xu and his co-authors believe that the PLA should consider developing new forms of combat forces that specialize in applying what is known about the brain and human-machine interface to weapons and forms of combat.

⁵² Li, “Cognitive Confrontation.”

⁵³ Li, “Cognitive Confrontation.”

⁵⁴ John R. Boyd, “Destruction and Creation,” in *A Discourse on Winning and Losing* (Quantico, VA, 1987).

⁵⁵ Yang Feilong and Li Shijiang, “Cognitive Warfare: Leading the Contest in the Era of Intelligence,” *PLA Daily*, March 19, 2020, 7.

⁵⁶ Zhang Guoning, et. al., “Military Applications Have Great Potential and We Should Increase Investment in Various Ways to Promote Artificial Intelligence—How to Change the Face of War,” *PLA Daily*, November 19, 2020, 1.

⁵⁷ Hu Jianxin. “How Should We Respond if Biological Warfare Arrives?” *Selected Issues of Legends and Biographical Literature*, July 20, 2020; Ai Lan, “The Dark History of Military Virus Research: Opening the Tip of the Iceberg in American Biological Laboratories,” *Selected Issues of Legends and Biographical Literature*, August 6, 2021.

⁵⁸ Luo Xu, et. al., “Military Brain Science Factors of Battle Effectiveness Under a New Concept of Operation Strategies,” Third Military Medical University, Chongqing, China, (November 2015) Vol. 13.

An article in *PLA Daily*, intended for a wide audience in the PLA and other interested readers, argues that the application of AI and cognitive confrontation can help with “decapitation operations,” weakening enemy decision-makers and creating new battlefield conditions favorable to PLA forces.⁵⁹ The author notes that the use of AI can create a stable means for the use of unmanned aerial vehicles (UAVs) to decapitate an enemy’s lead decision-maker or its entire command and control system by allowing for the coordination of large numbers of UAVs in an attack. This requires the development of the proper algorithms to be applied by AI to create a kill chain against the enemy. Thus, with AI what was a killing chain becomes more of a “kill network” that can use the PLA’s decentralized nodes to attack the enemy. By kill network, Wu Ming Wen means that an entire network of weapons or weapon systems can be used in a way that resembles what the United States calls cooperative target engagement.

While the PLA is clearly exploring how twenty-first century technologies can enhance human performance in war, it is possible that these developments will only mitigate existing weaknesses rather than create new advantages in warfighting. The emphasis on AI and decision-making could be a way for the Chinese military to compensate for its own weaknesses imposed by a rigid Party system and a command and control system that emphasizes top-down instruction and leadership over innovation and individual thinking. Xi Jinping has been very critical of PLA leaders’ inadequate understanding of modern military affairs and the capacity for twenty-first century decision-making.⁶⁰ Xi has criticized some of the elements of the PLA as being characterized by “five incapables”: being unable to:

- 1) judge the battlefield situation,
- 2) understand the intent of senior leaders,
- 3) make operational decisions,
- 4) organize and arrange troops [on the battlefield], and
- 5) deal with unexpected situations.⁶¹

⁵⁹ Wu Mingwen, “The Use of Artificial Intelligence—‘Decapitation’ Operations Present a Different Scene,” *PLA Daily*, April 14, 2020, 4.

⁶⁰ For an excellent summary of Xi’s critiques, see Dennis J. Blakso, “PLA Weaknesses and Xi’s Concerns about PLA Capabilities,” Testimony before the United States—China Economic and Security Review Commission, Washington, DC, July 7, 2019.

⁶¹ Shaanxi Military District, “Not a ‘Good Start,’ Focusing on Insufficiencies,” *PLA Daily*, February 5, 2015, 9.

PLA leadership has also potentially been adversely impacted by corruption in the ranks. Allegations have been made that some officers had bribed superiors for promotions up and down the chain of command.⁶² These factors may not fully account for the PLA's emphasis on artificial intelligence and automated, algorithm-driven decision-making, but the PLA expects AI to speed decisions and help take human indecision out of the process.

Conclusion and Recommendations

In Chinese military and military-associated policy and research institutes, serious thinking takes place about what approaches potential enemies might be developing for future war. There is a clear mistrust among Chinese leaders of the BWTC and of the intentions of potential enemies. While individual authors have often provided sharp, inflammatory commentary on the capabilities and threats China may face, study groups at departments and institutions like the AMS or NDU provide more considered analysis. In the medical and scientific research community there are programs to explore defenses against organisms and biological agents. Although the PLA authors cited in this paper who believe it is inevitable that biological agents will be used in future warfare such as Zhang Shibo and Du Chao in the PLA were not promoted by Xi Jinping after the 2016 military reorganization, some in the PLA continue to explore how the biotechnology revolution may affect warfare.⁶³ There is active research going on in China to take advantage of AI, machine learning, and man-machine interface to improve the performance of troops. The PLA call for grasping “the relationship between intelligent weaponry and current weaponry construction” and to aim at “disruptive and extraordinary measures and paths” to realize the opportunities in developing an ‘intelligentized’ military.⁶⁴

The 2017 edition of *SOMS* closes its section on biotechnology and warfare with a discussion of why the PLA should “seize the commanding heights in the biological field,” while its

⁶² See Dennis J. Blasko, “PLA Weaknesses,” and Dennis J. Blasko, “The Chinese Military Speaks to Itself, Revealing Doubts,” *War on the Rocks*, February 18, 2019.

⁶³ Kenneth W. Allen, et. al., “Updated-The PLA’s New Organizational Structure: What is Known, Unknown and Speculation, Parts 1 and 2,” *Jamestown Foundation* (February 2016); Tai Fengshun. “Observation: The Terrifying ‘Demon’: How Do Biological Weapons Go to the Battlefield?” *The Paper*, April 8, 2021. See also Yang and Yang, “Scientifically Grasp,” and Luo, “The ‘Spear’ and ‘Shield’.”

⁶⁴ Xiao, *The Science of Military Strategy 2017*, 179.

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section on artificial intelligence and the application of new technology indicates the need to adopt AI as a national and military priority with a reference to the 1956 national program to create “two bombs and one satellite”—the Cold War-era effort to develop nuclear weapons, nuclear delivery systems, and man-made satellites in response to perceived hegemonic threats from the United States and the Soviet Union.⁶⁵⁶⁶

SOMS does not distinguish between using new technologies like AI and genetic biology for defense or offense. The comparison to the “two bombs and one satellite” program to the effort on AI and genetic biology is a call for China to be able to respond to technological developments in other countries and militaries by ensuring its own capability to use comparable technology. This can then become a form of deterrence if the PLA has the capability (like nuclear weapons) or a threat to escalate and use the weapons. In this author’s experience, when senior Party officials, PLA officers, or Chinese military writers tout the achievements of foreign militaries that are widely accepted as the most powerful and most likely future enemy, it is an implicit call for the PLA to be able to develop similar capabilities. This means that the United States and its allies and partners must continue to be vigilant and monitor what the PLA is doing, while maintaining our own defenses.

US Response

Any response by the United States against Chinese biological, AI, and machine-man interface research needs to be a whole of government approach that also pairs with industry, researchers, and academia.

How should the United States address these issues?

- 1) The US Army needs more than the two CBRN defense brigades in its active inventory. At the same time, the United States should continue research on CBRN defenses and ensure that military training teaches troops to recognize signs of a CBRN attack and how to respond to suspected biological and chemical agents.

⁶⁵ Lin Qi, “‘Two Bombs, One Satellite’ Spirit Honored at Exhibition in Beijing,” *China Daily*, September 6, 2021; CGTN, “What is the Spirit of ‘Two Bombs and One Satellite’? - CPC in 100 Years,” CCTV-9 News, June 28, 2021.

⁶⁶ Xiao, *The Science of Military Strategy 2017*, 171-172 and 179.

- 2) The Congressional Research Service and Government Accountability Office should audit and investigate all medical and biological research partnerships with China today, whether by the United States, its allies, or other countries. Essential questions should focus on determining who is gaining the most from these programs and the dangers posed.
- 3) Congress should explore passing a biological and cognitive warfare-oriented bill or act to limit the Sino-American cooperation on new biomedical research programs. A precedent exists in the Wolf Act, which prevents the National Aeronautics and Space Administration (NASA) from cooperating with Chinese without direct congressional approval.⁶⁷ A similarly worded amendment to defense spending bills would be in line with the recommendations to limit Chinese advances.
- 4) The United States should consider confidence building measures with China. These should be modeled on the United States-Soviet Intermediate-Range and Shorter-Range Missile Treaty (INF Treaty) between the United States and the Soviet Union, which had provisions for challenge inspections and included neutral parties on the inspecting teams.⁶⁸ Active cooperation in confidence building and verification may help reduce mistrust on both sides. The author participated in INF Treaty verification inspections and the relationships between the officers of the two sides improved with more direct contact.
- 5) A very different approach is proposed by Robert Zoellick in *Foreign Affairs*. Zoellick suggests “a new international biological security agreement” that could enhance cooperation on biological threats involving “health and veterinary authorities.”⁶⁹ He recommends fostering cooperation in case of a disease outbreak. Such an approach has

⁶⁷ Representative Frank Wolf sponsored an amendment that prevents NASA from spending funds to cooperate with China without Congressional permission. The author suggests a similar amendment to the Defense Appropriations Act that ensures that DOD funds do not finance projects involving AI, cognition, and biological research with PRC entities. The “Wolf Amendment” is part of Public Law 112–10, Sec. 1340.

⁶⁸ US Department of State, “Treaty Between the United States of America and The Union Of Soviet Socialist Republics On The Elimination Of Their Intermediate-Range And Shorter-Range Missiles (INF Treaty),” December 8, 1987.

⁶⁹ Robert B. Zoellick, “Before the Next Shock: How America Can Build a More Adaptive Global Economy,” *Foreign Affairs* 101, no. 2 (March/April 2022): 98.

merit and could help address the concerns both China and the United States have about future programs linked to zoonotic viruses and biotechnology. While a practical suggestion, one wonders if Chinese obfuscation on the origins of and attempts to keep concealed the spread of SARS-CoV-2 (COVID-19) makes Zoellick's suggestion impractical.

- 6) The United States and its allies need to collaborate on intelligence activities to determine whether there may be current Chinese research on biological warfare, as some, like Shoham, have alleged.⁷⁰ Regardless of how many biological research facilities exist in China, the controversy over the origins of COVID-19 and the poor record of China's cooperation with researchers in the origins of the disease mean that the United States must undertake measures with allies to determine what research is going on in China and to determine the role that biological warfare or synthetic biology may play in China's defense programs.

US scholar Elsa Kania, a think-tank researcher and excellent scholar of Chinese working on her doctorate at Harvard University, argues that the United States will "confront unprecedented challenges" from China's military as it looks to improve "an operational advantage" through artificial intelligence and cognitive enhancement.⁷¹ She and co-author Wilson VornDick have studied the PLA's recent exploration of bionic parts and robotics for soldier enhancement, exoskeletons, and gene-edited soldiers with superior musculature or cognition.⁷²

⁷⁰ Dany Shoham, "China's Biological Warfare Programme: An Integrative Study with Special Reference to Biological Weapons Capabilities," *Journal of Defence Studies* 9, no. 2 (April-June 2015): 131-156.

⁷¹ Elsa B. Kania, "Minds at War: China's Pursuit of Military Advantage through Cognitive Science and Biotechnology," *Prism* 8, no. 3 (2020): 83-101.

⁷² Elsa Kania and Wilson VornDick, "China's Military Biotechnology Frontier: CRISPR, Military-Civil Fusion, and the New Revolution in Military Affairs," *China Brief* 19, iss. 18 (October 8, 2019).

