



The Hague Centre  
for Strategic Studies

**Fit for the Future?**

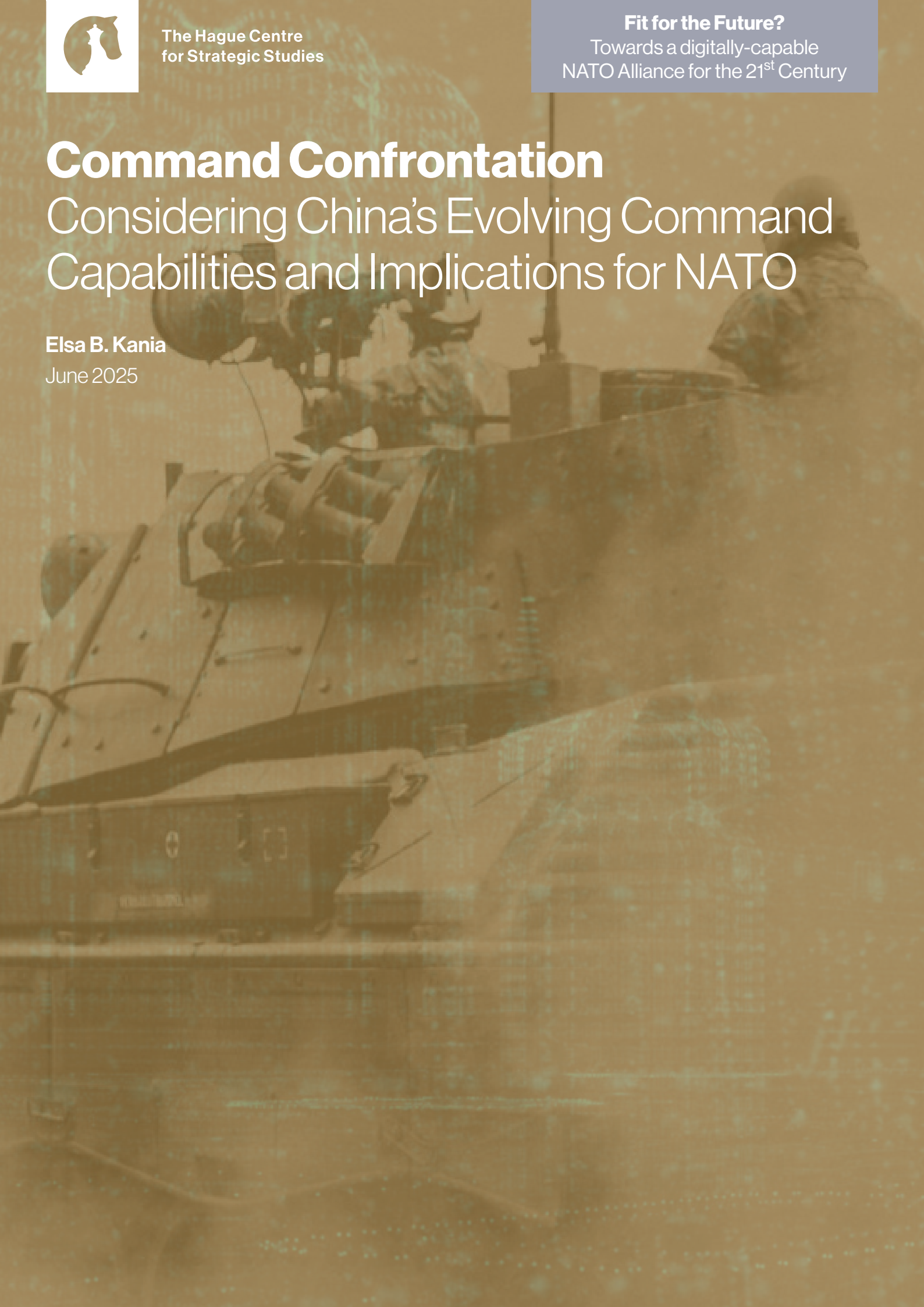
Towards a digitally-capable  
NATO Alliance for the 21<sup>st</sup> Century

# Command Confrontation

## Considering China's Evolving Command Capabilities and Implications for NATO

Elsa B. Kania

June 2025





## Command Confrontation

### Considering China's Evolving Command Capabilities and Implications for NATO

**Author:**

Elsa B. Kania\*, Adjunct Senior Fellow,  
Center for a New American Security.

\*The author's views are her own. This content is all derived from open sources and publicly available information.

**Editor:**

Tim Sweijs

June 2025

This HCSS paper is part of a series of guest contributions related to the "NATO's digital capabilities" project, established in the run up to the 2025 NATO summit in The Hague. The research was made possible through a financial contribution from Microsoft to the Hague Centre for Strategic Studies (HCSS).

© *The Hague* Centre for Strategic Studies. All rights reserved. No part of this report may be reproduced and/or published in any form by print, photo print, microfilm or any other means without prior written permission from HCSS. All images are subject to the licenses of their respective owners.

## Introduction

As NATO expands engagement with and explores options to contribute to deterrence in the Indo-Pacific, the primary threat and competitive challenge will be the Chinese People's Liberation Army (PLA). So too, as the PLA continues pursuing ambitions to become a world-class military, the impacts and implications of Chinese military power will be global. NATO's future force design and defense planning should be informed by assessments of the trajectory of China's military power and potential threats that PLA capabilities could present, including to NATO C4ISR systems. Chinese military leaders recognize that command capabilities will be critical to operational effectiveness in future warfare and for decades have dedicated considerable resources and consistent investments to developing not only command information systems (i.e., comparable to C4ISR) but also information operations capabilities, especially cyber and electronic warfare, to target adversary C4ISR. In a future crisis or conflict scenario, the PLA would be poised to leverage highly resilient, advanced command information systems and could exploit vulnerabilities in U.S. and NATO systems in its drive to achieve information dominance (制信息权).

The PLA is pursuing military reforms and innovations with the objective of leading in the development of emerging technologies and capabilities. Chinese strategists tend to regard advances in artificial intelligence (AI) especially as catalyzing continued progression of the Revolution in Military Affairs (RMA) that has animated Chinese military reforms and innovation since the 1990s. Traditionally, the PLA's theories of military command have drawn upon lessons learned from the U.S. and other NATO militaries in seeking to close the gap and catch up in its own ambitious agenda for military modernization. Today, the PLA regards the form of warfare as evolving from "informationized" (信息化) to increasingly "intelligentized" (智能化) in character, considering the expansive and transformative implications of AI for future warfare. The PLA regards the disruptive potential of AI in warfare, especially in command decision-making, as an opportunity to challenge the relative military dominance that the U.S. and NATO militaries have collectively maintained across recent history. The PLA aspires to "design" future warfare by developing capabilities that could be decisive in shaping dynamics on future battlefields.<sup>1</sup> As NATO pursues digital transformation, seeking to upgrade and enhance its C4ISR capabilities, China will present a competitive challenge, such that a comparative and potentially adversarial perspective can be useful in informing NATO initiatives.

In a future crisis or conflict scenario, the PLA would be poised to leverage highly resilient, advanced command information systems and could exploit vulnerabilities in U.S. and NATO systems in its drive to achieve information dominance.

<sup>1</sup> This concept recurs across several commentaries. See, for instance: Jia Daojin [贾道金], "First-class militaries design wars; designing armaments means designing future warfare" [一流军队设计战争 设计装备就是设计未来战争], PLA Daily, 18 January 2016, [http://www.xinhuanet.com/mil/2016-01/18/c\\_128639550.htm](http://www.xinhuanet.com/mil/2016-01/18/c_128639550.htm). Jia Daojin is affiliated with the PLA Academy of Military Sciences.

The PLA closely studied U.S. and Russian concepts, yet did not merely emulate foreign militaries, but were rather seeking to develop more unique approaches suited to its national conditions within the discipline of military command science.

## 1. China's Evolving Command Systems

Throughout the PLA's modern history, Chinese leaders have recognized that the development of modern command systems would be imperative to Chinese military modernization. The PLA's early efforts in "command automation" (指挥自动化, i.e. comparable to C3 systems) can be traced to a 1973 decision by then-Premier Zhou Enlai to establish a pilot project within the former Second Artillery Force.<sup>2</sup> After a promising demonstration, the CMC decided to expand these efforts throughout the force in 1978, and Deng Xiaoping personally emphasized the importance of military command systems modernization and development.<sup>3</sup> These initiatives gained traction during the 1980s with the initial development and subsequent introduction of command automation systems across the PLA, but initially confronted considerable challenges, due to China's relative technological backwardness at that time, and necessitated significant advancements in computing and communications technologies. In the process, the PLA closely studied U.S. and Russian concepts, yet did not merely emulate foreign militaries, but were rather seeking to develop more unique approaches suited to its national conditions within the discipline of military command science.

Among the first and most fundamental requirements for the PLA's command capabilities were capable communications. The PLA's recognition of the importance of resilient communications systems dates back to its earliest history and prompted progressive development of the National Defense Communications Network (NDCN, 国防通信网络), which centered on an extensive underground architecture of fiber optic cables.<sup>4</sup> The PRC's plans to develop satellites communications, starting in the 1970s and accelerating after the launch of the *Dongfanghong 2* in 1984, allowed for subsequent expansion of these space-based communications further augmented these enabling capabilities.<sup>5</sup> In the process, China's approach has often sought to combine and synchronize military and civilian developments, based on the concept of civil-military integration (军民结合). The continued development of information infrastructure was enabled by the nationwide development of optical fiber networks as foundational, augmented by expanding satellites and short-wave communications.<sup>6</sup>

As Chinese leaders observed global advances in information technology, these trends catalyzed continued emphasis on military command theories and systems throughout the

<sup>2</sup> For further reference, see: "Missile General Zhang Aiping: We can't not have a dog-beating stick" [导弹将军张爱萍：我们不能没有打狗棍], People's Daily Online, 5 July 2013, <http://dangshi.people.com.cn/n/2013/0705/c85037-22087796-4.html>. Fiona Cunningham, "Nuclear command, control, and communications systems of the People's Republic of China," *Tech4GS Special Reports*, 18 July 2019. Peter Wood, Alex Stone, and Thomas Corbett, "Chinese Nuclear Command, Control, and Communications," China Aerospace Studies Institute, March 2024, <https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLARF/2024-03-11%20Chinese%20Nuclear%20Command%20and%20Control.pdf>

<sup>3</sup> Ibid., and see: "Deng Xiaoping's Historical Contributions to Exploring and Pioneering the Path of Elite Troops with Chinese Characteristics" [邓小平探索和开创中国特色精兵之路的历史贡献], *People's Daily*, 5 January 2015, <https://web.archive.org/web/20250217053324/http://cpc.people.com.cn/n/2015/0105/c69113-26327736.html>. "China National Defense Informatization Construction Exposition" [中国国防信息化建设博览会], China National Defense Electronics Network [中国国防电子网], 13 April 2012, <http://www.e-gov.org.cn/article-93632.html>

<sup>4</sup> "Communications construction promotes informationization transformation of the people's military" [通信建设推动人民军队信息化变革], Communications Industry News Report [通信产业报], 15 April 2012. For further context, see: J. Michael Dahm, "China C4ISR and Counter-Intervention," Hearing on China's Evolving Counter Intervention Capabilities and Implications for the U.S. and Indo-Pacific Allies and Partners, 21 March 2024, [https://www.uscc.gov/sites/default/files/2024-03/J.Michael\\_Dahm\\_Testimony.pdf](https://www.uscc.gov/sites/default/files/2024-03/J.Michael_Dahm_Testimony.pdf)

<sup>5</sup> For general reference, see: Wu Guoxiang, "China's space communications goals," *Space Policy* 4, no. 1 (1988): 41-45. "Codename '331'" [代号"331"], Our Space [我们的太空], SASTIND, 7 April 2024, <https://www.sastind.gov.cn/n10086205/n10086403/c10497545/content.html>

<sup>6</sup> For context, see: "III. Modernization of the People's Liberation Army," in "China's National Defense in 2010," 31 March 2011, [http://www.china.org.cn/government/whitepaper/2011-03/31/content\\_22263445.htm](http://www.china.org.cn/government/whitepaper/2011-03/31/content_22263445.htm)



Overall, these decades of development might be regarded as a 'long march' toward creating an extensive architecture of command information systems, 'C4ISR with Chinese characteristics,' that apply lessons learned from U.S. and NATO approaches but incorporate higher levels of resilience and redundancy.

1990s. In particular, Chinese military academics and scientists closely scrutinized U.S. and NATO concepts of network-centric warfare. The Gulf War and NATO's Kosovo Air Campaign, as compelling demonstrations of the operational implications of such advances, informed changes in not only Chinese military strategy but also catalyzed attention to military command theories. Notably, the accidental bombing of the Chinese embassy in Belgrade during this campaign, which Beijing initially believed to be deliberate and is still characterized as such by some in the PLA to this day, galvanized Chinese leaders to accelerate the development of a range of advanced asymmetric capabilities.<sup>7</sup> In the decades that followed, the PLA would prioritize developing cyber and electronic warfare capabilities, recognizing that increased capabilities in network-centric warfare also created increasing vulnerabilities due to dependence on these networks.

China elevated information as a core element of national and military power with the introduction of an agenda of informationization (信息化). For the PLA, this concept centered on leveraging information technologies to enable all aspects of military capabilities, which was integral in China's response to the global Revolution in Military Affairs, starting during under Jiang Zemin's leadership and continuing during Hu Jintao's tenure. However, even as the PLA progressed in developing and deploying command information systems across the force, jointness, integration, and interoperability remained critical challenges at this stage. The PLA's initial initiatives in command automation, while successful as proofs of concept for the potential of C3 systems, produced more disparate, fragmented systems. The limited capacity for information sharing or interoperability across services prompted a greater emphasis on standardization in the early 2000s.<sup>8</sup> As a result, the General Staff Department (GSD) Informatization Department oversaw the development and introduction of an integrated command platform (ICP) and new series of systems that were joint by design and could fulfill the PLA's emerging operational requirements.<sup>9</sup> In parallel, the development of joint datalinks, likely modeled off of those used by the U.S. and NATO, provided another critical enabling capability.<sup>10</sup>

The continued upgrading of command information systems in the years that followed facilitated the PLA's maturation as a modern military capable of conducting integrated joint operations.<sup>11</sup> Meanwhile, the launch of a growing number of satellites with an emphasis on advancing space-based intelligence, surveillance, and reconnaissance (ISR) capabilities, including the *Gaofen* and *Yaogan* constellations. These systems have contributed to dramatic expansion of the PLA's ISR architecture with regional coverage and beyond, while also

<sup>7</sup> Paul HB. Godwin, "Decisionmaking Under Stress: The Unintentional Bombing of China's Belgrade Embassy and the EP-3 Collision," *Chinese National Security Decisionmaking under Stress* (2005): 161-190. "The PLA's Secretive '995 Program' Created Blowout-style Development of Weaponry and Equipment" [解放军神秘"995工程"使武器装备呈井喷式发展], *Global Times*, 13 March 2015, <http://news.sina.com.cn/c/2015-03-13/102031602956.shtml>

<sup>8</sup> In particular, the CMC released and sought to implement the PLA Command Automation Construction Outline (指挥自动化建设纲要) and Command Automation Regulations (指挥自动化条例).

<sup>9</sup> Kevin Pollpeter, Eric Anderson, Joe McReynolds, Leigh A. Ragland, and Gary L. Thomas, "Enabling information-based system of system operations: The research, development, and acquisition process for the integrated command platform," *SITC Policy Briefs* 2014, no. 9 (2014).

<sup>10</sup> See again, for general reference. See also: J. Michael Dahm, "China C4ISR and Counter-Intervention." See also: Wang Bangrong [王邦荣], Li Hui [李辉], Zhang Andeng [张安等], "Status Quo and Future Development Trends of Tactical Data Links" [战术数据链的现状与未来发展趋势], *Firepower and Command (and) Control* [火力与指挥控制], 2007 (12):5-9.

<sup>11</sup> Huang Yi [黄艺], "On Promoting Innovative Development of Our Military Command Theories" [论推进我军指挥理论创新发展], *China Military Science* (Issue 3), April 2013.

Chinese military academics and strategists have long recognized the importance of cyber warfare to damage enemy C4ISR and other military networks, as well as civilian networks, as a means of 'winning without fighting.'

advancing potential targeting capabilities.<sup>12</sup> Overall, these decades of development might be regarded as a 'long march' toward creating an extensive architecture of command information systems, 'C4ISR with Chinese characteristics,' that apply lessons learned from U.S. and NATO approaches but incorporate higher levels of resilience and redundancy.<sup>13</sup> This is consistent with Chinese military concepts highlighting the pivotal importance of the 'system of systems' in the confrontation of systems that characterizes modern conflict.<sup>14</sup>

## 2. China's Advances in Information Operations Capabilities

The PLA consistently concentrated on advancing its information operations capabilities designed to target adversary C4ISR systems. Chinese military academics and strategists have long recognized the importance of cyber warfare to damage enemy C4ISR and other military networks, as well as civilian networks, as a means of 'winning without fighting.'<sup>15</sup> PLA theories of victory for informatized warfare have highlighted the potential advantages of a highly integrated approach to cyber and electronic warfare with the combined objective of targeting adversary networks and information systems to achieve battlefield information superiority, which is critical to overall operational advantage.<sup>16</sup> The PLA's leading theorists have tended to anticipate C4ISR systems will be the primary targets for strikes and envision pursuing a highly offensive approach to targeting enemy C4ISR in order to create paralysis, while seeking to preserve the continuity of their own command systems. Chinese military strategists have long recognized information power as pivotal in modern warfare especially when effectively integrated with firepower.

The PLA has reorganized its forces to accelerate its development of capabilities. Initially, the PLA established the Strategic Support Force in December 2015 as a force to allow for incubation and innovation in space, cyber, electronic, psychological, and other informational capabilities. The PLASSF has been rendered obsolete, since its core operational components have been divided into three new forces, each of which has been elevated and placed directly under CMC command. The debut of the PLA Cyberspace Force (PLACSF) in April 2024, which was created through elevating a core operational component of the PLASSF, marks the latest stage in the progression and operationalization of Chinese military cyber capabilities. In particular, the PLACSF is assessed to have established a Cyberspace Operations Base, which likely oversees critical offensive cyberspace capabilities.<sup>17</sup> The sophistication of PLA cyber operations is apparent, especially in campaigns seemingly designed to establish accesses in peacetime to adversary networks and critical infrastructures that could be weaponized in conflict. In particular, the "Volt Typhoon" campaign, initially exposed in spring 2023,

<sup>12</sup> For an overall assessment of trends in Chinese capabilities, see: Mark Stokes, Gabriel Alvarado, Emily Weinstein, and Ian Easton, "China's Space and Counterspace Capabilities and Activities," U.S.-China Economic and Security Review Commission, March 30, 2020, [https://www.uscc.gov/sites/default/files/2020-05/China\\_Space\\_and\\_Counterspace\\_Activities.pdf](https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf)

<sup>13</sup> For instance, this is apparent from China's deployment of information capabilities in the South China Sea. See: J. Michael Dahm, "South China Sea Military Capabilities Series," <https://www.jhuapl.edu/work/publications/south-china-sea-military-capabilities-series>

<sup>14</sup> Jeffrey Engstrom, "Systems confrontation and system destruction warfare," RAND, 2018.

<sup>15</sup> See, for instance: Ye Zheng [叶征] (ed.), *Lectures on the Science of Information Operations [信息作战学教程]*, Military Science Press [军事科学出版社], 2013, p. 41.

<sup>16</sup> *Ibid.*, p. 43

<sup>17</sup> John Costello, "The Cyberspace Force: A Bellwether for Conflict," *China Brief* (Volume 25, Issue 8), April 25, 2025, <https://jamestown.org/program/the-cyberspace-force-a-bellwether-for-conflict/>

has highlighted the scale and severity of such pre-positioning for potential attacks against critical infrastructure.<sup>18</sup>

The PLA has also advanced and diversified its EW capabilities dramatically, seeking to achieve electromagnetic dominance, while denying its adversaries' employment of the spectrum. As the 2024 Pentagon report on China's military power notes, potential targets for PLA EW include systems "operating in radio, radar, microwave, infrared, and optical frequency ranges as well as adversary computer and information systems."<sup>19</sup> Chinese advances have also included efforts to develop directed energy weapons, including for counterspace capabilities.<sup>20</sup> The PLA has also concentrated on the effective integration of EW in its training, while working to improve its own resilience when confronting complex electromagnetic conditions.

### 3. A New Era for China's Command Capabilities

In the course of the past decade, the PLA has reoriented its structure, training, and ongoing operations to facilitate continued transformation of its overall command capabilities. With historic reform, the Central Military Commission (CMC) established the CMC Joint Operations Command Center (JOCC), as well as new theater commands with their own JOCCs, as of January 2016. This restructuring created standing command structures in peacetime that are designed to be closely aligned with wartime command requirements, based on a concept of 'peace-war integration' (平战结合), such that ongoing operations can improve operational proficiency and preparedness.<sup>21</sup>

The PLA has routinely engaged in complex, multi-domain joint operations, aligned with a new emphasis on "peacetime employment of military forces," especially in exercises targeting Taiwan increasingly characterized as tantamount to rehearsals.<sup>22</sup> In the process, the PLA's emphasis on a unified, centralized approach to command at the strategic level and for coordination of integrated joint operations is balanced by recognition of the importance of commanders' exercising subjective initiative in a complex, uncertain battlefield environment.<sup>23</sup> That is, the theater commands could attempt to balance between and reconcile centralized and decentralized approaches to command at different echelons and across different missions and appear to be training to that pragmatic approach.<sup>24</sup>

<sup>18</sup> "China's Volt Typhoon shows signs of returning," Axios, 12 November 2024, <https://www.axios.com/2024/11/12/china-volt-typhoon-returns-security-scorecard>

<sup>19</sup> "Military and security developments involving the People's Republic of China 2024 annual report to Congress," 18 December 2024, <https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/military-and-security-developments-involving-the-peoples-republic-of-china-2024.pdf>

<sup>20</sup> Kristin Burke, "PLA Counterspace Command and Control," China Aerospace Studies Institute, December 2023, <https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLASSF/2023-12-11%20Counterspace-%20web%20version.pdf>

<sup>21</sup> "Strengthening joint combat systems and capabilities construction" [加强联合作战体系和能力建设], *PLA Daily*, 17 November 2023, [http://www.81.cn/II\\_208543/16267479.html](http://www.81.cn/II_208543/16267479.html)

<sup>22</sup> AMS Military Political Work Research Institute [军事科学院军队政治工作研究院], "Persistently using Xi Jinping's thoughts on strengthening the military to arm the whole military" [坚持不懈用习近平强军思想武装全军], Red Flag Manuscript [红旗文稿], 27 June 2022, [http://www.qstheory.cn/dukan/hqwg/2022-06/27/c\\_1128779366.htm](http://www.qstheory.cn/dukan/hqwg/2022-06/27/c_1128779366.htm)

<sup>23</sup> Wu Nan [吴楠], "Giving full play to the subjective initiative of frontline commanders" [充分发挥一线指挥员主观能动性], *PLA Daily*, 18 November 2024, [http://www.81.cn/yw\\_208727/16352568.html](http://www.81.cn/yw_208727/16352568.html)

<sup>24</sup> "Reviewing one year of implementation of the 'Chinese People's Liberation Army Joint Operations Outline (Trial)'" [《中国人民解放军联合作战纲要（试行）》施行一周年综述], *PLA Daily*, 5 January 2022, [https://www.mva.gov.cn/sy/xx/gfxx/202201/t20220105\\_55003.html](https://www.mva.gov.cn/sy/xx/gfxx/202201/t20220105_55003.html)

This restructuring created standing command structures in peacetime that are designed to be closely aligned with wartime command requirements, based on a concept of 'peace-war integration'.

The PLA's approach to C4ISR has included a highly integrated approach to information support and intelligence capabilities. The Cyberspace Force appears to be structured around five regional technical reconnaissance bases, each of which is likely aligned to provide signals intelligence support to the associated theater command.<sup>25</sup> The new Information Support Force, established in April 2024, based on elevating the PLASSF's former Information and Communications Base, is likely designed to enable advances in the "network information systems" (i.e., C4ISR and the related military networks and systems) that are critical to joint combat command.<sup>26</sup> The PLAISF will be the force behind the next stages of advances in PLA C4ISR and operationalizing new innovations. When Xi Jinping oversaw its founding ceremony in April 2024, his remarks called for the PLAISF to become a powerful modern force in accordance with 'strategic requirements of systems integration and full-domain support' and to contribute to 'coordinated construction and employment of network information systems.'<sup>27</sup>

This new force will likely become the center of gravity for PLA information-related capabilities, including efforts to integrate emerging technologies. Xi also called for the PLAISF to promote the "leapfrog development" of PLA network information systems when he visited and inspected the PLAISF in December 2024.<sup>28</sup> The PLAISF is likely taking on multiple dimensions of information support, as enabled by the integration of information and intelligence resources. As one *PLA Daily* commentary highlighted, the PLAISF should contribute to 'accelerating integration for system and of models of command and combat methods.'<sup>29</sup> So too, peacetime preparations through efforts to facilitate understanding of the battlefield environment, such as through collection and exploitation of big data at greater scales and speeds will be critical enablers of future capability.<sup>30</sup>

While prioritizing technological and organizational innovations, the PLA is also actively pursuing improvements in human factors. Starting in 2015, Chinese military leaders, including Xi Jinping himself, initially started to raise concerns about the "five incapables" (五个不会).<sup>31</sup> By this self-criticism, "some" Chinese commanders were deemed to be unable to: 1) judge the situation, 2) understand intentions of higher authorities, 3) make operational decisions, 4) deploy troops, and 5) deal with unexpected situations.<sup>32</sup> Such highly candid critiques prompted a

<sup>25</sup> John Costello, "The Cyberspace Force: A Bellwether for Conflict," *China Brief* (Volume 25, Issue 8), April 25, 2025, <https://jamestown.org/program/the-cyberspace-force-a-bellwether-for-conflict/>

<sup>26</sup> PLA Daily Commentator [解放军报评论员], "Create a new situation in the construction of our military network information system of systems" [开创我军网络信息体系建设新局面], February 21, 2025.

<sup>27</sup> "Inauguration Ceremony of the PLA Information Support Force Convened in Beijing; Xi Jinping Presented Military Flag and Delivered Instructions" [中国人民解放军信息支援部队成立大会在京举行 习近平向信息支援部队授予军旗并致训词], Xinhua, 19 April 2024, <http://www.news.cn/politics/leaders/20240419/49989c-4326f04ab6ac63d93a2073c8f6/c.html>

<sup>28</sup> "Xi Jinping inspected the Information Support Force: Striving to construct a strong modern Information Support Force; promoting leapfrog development of our military network information systems" [习近平视察信息支援部队：努力建设一支强大的现代化信息支援部队 推动我军网络信息体系建设跨越发展], Xinhua, 5 December 2024, [https://www.gov.cn/yaowen/liebiao/202412/content\\_6991157.htm](https://www.gov.cn/yaowen/liebiao/202412/content_6991157.htm)

<sup>29</sup> PLA Daily Commentator [解放军报评论员], "Create a new situation in the construction of our military network information system" [开创我军网络信息体系建设新局面], 21 February 2025.

<sup>30</sup> Song Yuangang [宋元刚] and Shao Longfei [邵龙飞], "Military Big Data: An Accelerator of Military Intelligence Transformation" [军事大数据：军事智能变革的加速器], *PLA Daily*, 6 September 2019, [http://www.81.cn/2019zt/2019-09/06/content\\_9623518.htm](http://www.81.cn/2019zt/2019-09/06/content_9623518.htm)

<sup>31</sup> "Striding forward in line with requirements of being able to fight and win – Reviewing implementation since the 18th CCP National Congress of Chairman Xi's important instructions for the whole military and armed police forces to concentrate on building combat power" [按能打仗打胜仗要求阔步前行——党的十八大以来全军和武警部队贯彻落实习主席重要指示大抓战斗力建设述评], Xinhua, 14 January 2016, [http://www.xinhuanet.com/mil/2016-01/14/c\\_128626915\\_2.htm](http://www.xinhuanet.com/mil/2016-01/14/c_128626915_2.htm)

<sup>32</sup> Ibid. For a more detailed analysis, see also: Dennis J. Blasko, "PLA Weaknesses and Xi's Concerns about PLA Capabilities," Testimony before the U.S.-China Economic and Security Review Commission Panel on "Backlash from Abroad: The Limits of Beijing's Power to Shape its External Environment," 7 February 2019, [https://www.uscc.gov/sites/default/files/Blasko\\_USCC%20Testimony\\_FINAL.pdf](https://www.uscc.gov/sites/default/files/Blasko_USCC%20Testimony_FINAL.pdf)

While prioritizing technological and organizational innovations, the PLA is also actively pursuing improvements in human factors.



surge of efforts in training and major exercises to improve commanders' proficiency, including through a focus on 'command confrontation' with combat-realistic, adversarial training leveraging opposing forces (i.e., with specialized 'blue' forces as OPFOR). These efforts have also extended to attempts to cultivate the capabilities of frontline and 'grassroots commanders' at lower echelons, looking to improve their proficiency in decision-making and capacity to exercise "subjective initiative". Meanwhile, at the PLA's National Defense University, there have been major reforms to curriculum and increasing emphasis on education about emerging technologies in future warfare.<sup>33</sup> While PLA reporting and commentaries still allude to not having 'fully resolved' the 'five incapables,' the progress that has occurred within the past decade should not be dismissed.

## 4. Technology and Transformation in Command

### 4.1. Theories of Command Intelligentization

The PLA has been actively exploring and experimenting with potential 'intelligentized' approaches to command decision-making. AlphaGo's defeat of leading human players in the game of Go in 2016 sparked debate within the PLA about the implications of AI for the future of command.<sup>34</sup> The CMC Joint Staff Department highlighted the importance for the PLA to advance intelligentized command decision-making in developing a joint operations command system, through leveraging AI, as well as big data, cloud computing, and other advanced technologies in a 2016 commentary.<sup>35</sup> Starting from 2017, national planning and leadership guidance explicitly endorsed and elevated the pursuit of military intelligentization, including leveraging AI in support of command decision-making, as well as other priority applications, which accelerated initiatives and experimentation.<sup>36</sup>

The PLA has sought to explore these dynamics and the potential for 'human-machine integration' or confrontation through dedicated initiatives in wargaming. There have also been dedicated initiatives to develop AI systems for decision support that could be tested in wargames, including a series of challenges and competitions, and progressively transitioned to operational employment, reportedly including the 'War Skull' (战颅) systems developed at the PLA National University of Defense Technology.<sup>37</sup> Yet PLA experts on command and wargaming recognize the dramatic increase in complexity and uncertainty associated with the actual battlefield. In parallel, the PLA's efforts to improve its situational awareness and preparedness have incorporated efforts to develop and employ military big data.

<sup>33</sup> See, for instance: "NDU Graduate School promotes education for war, accelerating talent cultivation" [国防大学研究生院为战施教加快人才培养], *PLA Daily*, 14 September 2024, [http://www.mod.gov.cn/gfbw/gfjy\\_index/jsyxgfs/16338407.html](http://www.mod.gov.cn/gfbw/gfjy_index/jsyxgfs/16338407.html)

<sup>34</sup> Guo Ruobing [郭若冰] and Si Guangya [司光亚], "Military Command Facing New Challenges in the Era of Intelligentization" [接近智能化时代军事指挥面临的挑战], *China Military Science*, July 2016.

<sup>35</sup> CMC Joint Staff Department [中央军委联合参谋部], "Accelerate the Construction of a Joint Operations Command System with Our Nation's Characteristics—Thoroughly Study Chairman Xi's Important Sayings When Inspecting the CMC Joint Operations Command Center [加快构建具有我军特色的联合作战指挥体系——深入学习贯彻习主席视察军委联指中心时的重要讲话], *Seeking Truth* [求是], 15 August 2016.

<sup>36</sup> In July 2017, China's ambitions in AI captured global attention with the issuance of the New Generation AI Development Plan (新一代人工智能发展规划), which included direction for new-generation AI technologies to support command decision-making, military deductions, defense equipment, and other applications. See: "State Council Notice on Issuance of the New Generation AI Development Plan" [国务院关于印发新一代人工智能发展规划的通知]. "Xi Jinping's Report at the Chinese Communist Party 19th National Congress" [习近平在中国共产党第十九次全国代表大会上的报告], *Xinhua*, 27 October 2017, [http://www.china.com.cn/19da/2017-10/27/content\\_41805113\\_3.htm](http://www.china.com.cn/19da/2017-10/27/content_41805113_3.htm)

<sup>37</sup> "From 'waiting on instructions' to 'taking the initiative,' observing 'War Skull II' winning on intelligent game field" [从“坐等指令”到“主动出击”，看“战颅二号”制胜智能博弈场], National University of Defense Technology, 20 December 2020, <https://www.nudt.edu.cn/xwgg/hdss/f7bf2e55cb4f4872b05d5f2ac83aeca6.htm>

AlphaGo's defeat of leading human players in the game of Go in 2016 sparked debate within the PLA about the implications of AI for the future of command.

Despite dedicated national initiatives seeking to establish China as a world leader in AI, the initial introduction of ChatGPT highlighted that a gap still remained relative to frontier efforts.

The PLA's drive to advance intelligentized capabilities for future warfare is a critical element of its quest to become a world-class military by mid-century. Xi Jinping's report to the 20<sup>th</sup> Party Congress in October 2022, expounded upon his guidance, including: force development: "increase the proportion of new combat forces in new domains, accelerate the development of unmanned intelligent combat forces, and coordinate the construction and application of network information systems."<sup>38</sup> His comments continue calling upon the PLA to 'optimize' joint operations command systems and promote advances in capabilities for reconnaissance and early warning, joint strikes, battlefield support, and other support systems. In particular, increased automation in ISR capabilities, such as through the design and deployment of AI-enabled satellites capable of edge processing, can accelerate the analysis of data and generation of critical insights to drive decision-making.<sup>39</sup>

The PLA's intense interest in AI tools and techniques for C4ISR is consistent with a highly scientific outlook on warfare and the features of command. Across multiple militaries, debates have emerged about the appropriate combinations of human and machine intelligence that would be required for future command, including questions of whether human commanders should remain in, on, or out of the loop. Relative to discourse in U.S. and NATO militaries during this timeframe, the PLA's approach appeared to be relatively pragmatic, focused on identifying concepts that would be operationally advantageous, rather than equating more traditional modalities of human control as an absolute requirement. However, PLA leaders have tended to recognize the importance of the human element. Liu Guozhi, then director of the CMC S&T Commission, anticipated in 2016 that human-machine composite (人机混合) intelligence would become the 'highest form of future intelligence.'<sup>40</sup> The concept of human-machine hybrid or combined approaches to intelligence and decision-making remains a major focus within China's command and control discipline. The increased complexity of modern warfare and anticipated acceleration in the tempo of operations are seen as necessitating increasing integration of human and machine intelligence to enable effective collaboration. This could present a new paradigm for future command decision-making.

The PLA has been quick to react to new trends in technological developments. Despite dedicated national initiatives seeking to establish China as a world leader in AI, the initial introduction of ChatGPT highlighted that a gap still remained relative to frontier efforts. The initial responses among PLA military academics and scientists to the advent of ChatGPT highlighted the impact of this catalytic moment, which revealed the speed and success of advances in large language models (LLMs). China's development of indigenous LLMs for a range of applications has since accelerated, as has interest in military applications. For instance, Hu Xiaofeng (胡晓峰), a PLA NDU leading expert in wargaming, anticipates ChatGPT could be employed for a range of applications, including data analysis, decision support, and natural language processing.<sup>41</sup> The success of DeepSeek was also regarded

<sup>38</sup> "Xi Jinping: Holding high the great banner of socialism with Chinese characteristics and working together to construct a modern socialist country in an all-round way—Report at the 20th National Congress of the Communist Party of China" [习近平: 高举中国特色社会主义伟大旗帜 为全面建设社会主义现代化国家而团结奋斗——在中国共产党第二十次全国代表大会上的报告], Xinhua News Agency [新华社], 25 October 2022, [http://www.gov.cn/xinwen/2022-10/25/content\\_5721685.htm](http://www.gov.cn/xinwen/2022-10/25/content_5721685.htm).

<sup>39</sup> "Chinese lab, company to develop "space computing constellation,"" *People's Daily*, 4 July 2024, <https://en.people.cn/n3/2024/0704/c90000-20189270.html>

<sup>40</sup> "National People's Congress Representative Liu Guozhi: Artificial Intelligence Will Accelerate the Process of Military Transformation" [人大代表刘国治: 人工智能将加速军事变革进程], China National Radio Network [央广网], 8 March 2017. "Lt. Gen. Liu Guozhi: military intelligentization development is a strategic opportunity for our military to turn sharply to surpass" [刘国治中将: 军事智能化发展是我军弯道超车的战略机遇], CCTV News, 22 October 2017.

<sup>41</sup> Hu Xiaofeng [胡晓峰], "ChatGPT, how should we regard [it]?" [ChatGPT, 我们该怎么看], China Military Online, 21 March 2023, [http://www.81.cn/jfjbmap/content/2023-03/21/content\\_335979.htm](http://www.81.cn/jfjbmap/content/2023-03/21/content_335979.htm)

The increased employment of intelligent weaponry could emerge as central features for the battlefield and could operate autonomously based on real-time mission planning systems.

as a major milestone with significant implications beyond the pride and prestige, given the outlook for developing more advanced, efficient systems. Going forward, the use of LLMs for accelerated processing of information could facilitate open-source intelligence and generation of courses of action for planning, as well as potential applications in psychological warfare, even as inherent limitations are likely to persist, especially in such complex, uncertain conditions as real-world battlefields.<sup>42</sup> Across the PLA, there is growing interest and exploration of 'military large language models' (MLLMs) that could improve operational efficiencies, including possible improvements when applied to the 'OODA' (observe, orient, decide, act) loop and process.<sup>43</sup> PLA researchers also suggest next-generation command information systems could employ multiple 'C2-AI' agents.<sup>44</sup>

PLA strategists expect new paradigms of command with could enable effective integration of information and firepower for more precise targeting and destruction of adversary battle networks. The increased employment of intelligent weaponry could emerge as central features for the battlefield and could operate autonomously based on real-time mission planning systems. The Chinese defense industry is exploring options to deliver such capabilities. For instance, China Electronics Technology Group Corporation (CETC) chief scientist Lan Yushi (蓝羽石) described in an interview how the smart "brain" that command information systems provide can serve as a multiplier for force combat effectiveness, and as the "epitome of advanced technology," necessitate innovation to adapt to technological developments and fulfill operational requirements.<sup>45</sup> CETC and several other defense industry and commercial enterprises, have sought to develop systems that provide those features.

#### 4.2. Industry Advances and Commercial Contributions

The PLA's capacity to bring into play advances from Chinese defense industry and commercial enterprises could be critical to future progress. There has been a range of partnerships and stakeholders convened to support these efforts, ranging from defense industry leaders, such as from the China Electronics Technology Group Corporation (CETC), which has contributed to command systems for decades. Although the full extent of progress to date is difficult to anticipate from publicly available information, several partnerships and showcasing of new initiatives and systems hint at current directions of development. Of note, in 2018, CETC's 28<sup>th</sup> Research Institute and Baidu had reportedly established the Intelligent Command and Control Technologies Joint Laboratory (智能指挥控制技术联合实验室),

<sup>42</sup> "Will artificial intelligence dominate battlefields? From ChatGPT, looking at military applications of AI" [人工智能会主宰战场吗？从ChatGPT看人工智能的军事应用], *PLA Daily*, 13 April 2023, <https://app.xinhuanet.com/news/article.html?articleId=6be22b80d81229b63c6f975123889a94>

<sup>43</sup> See, for instance: SUN Xuyun [孙煦云] and YAO Wei [姚伟], "Exploration of Large Model Technology Application for Intelligentized Operations" [面向智能化作战的大模型技术应用探索], *Command Information Systems and Technology* [指挥信息系统与技术], 2024, 15(06): 28-35. DOI:10.15908/j.cnki.cist.2024.06.004. The authors are affiliated with the CETC 28th Research Institute. LI Xiaodong [李晓冬], LIU Xiaoyi [刘小毅], WANG Xinpeng [王鑫鹏], "Application Conception of C2-AI Agents Based on Large Language Model (LLM) Chain of Thoughts (CoT)" [基于LLM思维链的指挥控制智能体应用设想], *Command Information Systems and Technology* [指挥信息系统与技术], 2024, 15(06): 21-27. The authors are affiliated with PLA National Key Laboratory of Information Systems Engineering.

<sup>44</sup> See, for instance: SUN Yi [孙毅], ZHENG Yu [郑雨], HUANG Haiyan [黄海燕], Zhang Hui [张慧], Quan Jichuan [权冀川], "Multi-loop Nested LLM-based Multi-Agent Command and Control Processes" [多循环嵌套的大语言模型多智能体指挥控制过程], *Journal of Command and Control* [指挥与控制学报], 2024, 10(06): 732-739. The authors are affiliated with the PLA 63<sup>rd</sup> Research Institute and Laboratory for Big Data and Decision, National University of Defense Technology; the College of Command and Control Engineering, Army Engineering University; and Joint Operations College, National Defense University.

<sup>45</sup> "Sticking to firm belief, leading leapfrog development of command information systems — Dialogue with Chinese Academy of Engineering Academician Lan Yushi" [坚守如磐信念，引领指挥信息系统跨越发展——对话中国工程院院士蓝羽石], *China Daily Network* [中国日报网], February 8, 2023, <https://cn.chinadaily.com.cn/a/202302/08/WS63e38a0ea3102ada8b22e403.html>

The promotion of a more extensive, integrated innovation ecosystem for commercial technologies available to support military applications could contribute to future capabilities development with relevance for C4ISR and beyond.

which was described at the time as intended to concentrate on increasing the level of 'intelligentization' in command information systems, such as through incorporating big data, artificial intelligence, and cloud computing.<sup>46</sup> CETC also displayed an 'intelligentized operations mission system' reportedly as capable of "learning independently" and "summing up combat experience" at the 2018 Zhuhai Airshow.<sup>47</sup>

During the 2024 Airshow, CETC's 28<sup>th</sup> Research Institute featured a new "multi-domain joint combat command and control system" characterized as capable of integration and processing of ISR resources and intelligent, effective assistance to commanders.<sup>48</sup> At the time, Norinco also displayed what it characterized as an 'intelligent precision strike system'.<sup>49</sup> CETC has developed several specialized systems, such as the 'Boundless 2.0' (无界2.0) designed for intelligent command and control based on multi-source intelligence fusion, which reportedly provided a reconnaissance and intelligence information system," intended to improve time-sensitive responses and countermeasures in combat.<sup>50</sup> The extent of developments and experimentation almost certainly are more extensive than that which is publicly displayed, revealed, and marketed.

And against the backdrop of China's national strategy of military-civil fusion (军民融合), a series of new startups have entered the arena.<sup>51</sup> For instance, Starsee (摄星智能) has advertised itself as specialized in a military intelligence and promoted systems for decision support (e.g., weapons-target pairing) and platforms for open-source intelligence for military applications.<sup>52</sup> Utenet (瀚亭科技) has recently introduced and promoted to military audiences a series of AI models and platforms intended to support intelligence and decision-making.<sup>53</sup> ADASpace, which provides data services for remote sensing, has emerged at the forefront of efforts to deploy AI-enabled satellites and computing in space.<sup>54</sup> Given the company's emphasis on serving as a military-civil fusion enterprise, such dual-purpose developments could be employed to accelerate processing of imagery to identify targets. The promotion of a more extensive, integrated innovation ecosystem for commercial technologies available to support military applications could contribute to future capabilities development with relevance for C4ISR and beyond.

<sup>46</sup> "CETC 28<sup>th</sup> Research Institute and Baidu Company establish the "Intelligent Command and Control Technology Joint Laboratory" promoting military-civil fusion deeply advancing toward the domain of new technologies" [中国电科28所与百度公司成立"智能指挥控制技术联合实验室"推动军民融合向新技术领域纵深迈进], January 23, 2018, [www.sohu.com/a:218485100%E2%80%AD\\_%E2%80%AC779538](http://www.sohu.com/a/218485100%E2%80%AD_%E2%80%AC779538)

<sup>47</sup> "Military Expert Wang Mingliang: From the China Airshow Regard Future Intelligentized Warfare" [军事专家王明亮：从中国航展看未来智能化战争], Xinhua, 11 November 2018, [http://www.xinhuanet.com/politics/2018-11/11/c\\_129991032.htm](http://www.xinhuanet.com/politics/2018-11/11/c_129991032.htm). "CETC displays military-civil fusion network information systems at the China Air Show" [中国电科携军民融合网络信息体系亮相中国航展], Xinhua, 6 November 2018, [http://www.xinhuanet.com/politics/2018-11/06/c\\_1123673604.htm](http://www.xinhuanet.com/politics/2018-11/06/c_1123673604.htm)

<sup>48</sup> "Commercial aerospace flourishing on many points; Jiangsu S&T elements shining at the 15th China Airshow" [商业航天多点开花 江苏科技元素闪耀第十五届中国航展], 13 November 2024, <http://js.people.com.cn/n2/2024/1113/c360301-41039893.html>

<sup>49</sup> "Military Expert Wang Mingliang: From the China Airshow Regard Future Intelligentized Warfare" [军事专家王明亮：从中国航展看未来智能化战争].

<sup>50</sup> "'Lingxi" and "Wujie 2.0" on the same stage! CETC displays hundreds of exhibits at the (Zhuhai) Air Show" [灵犀"无界2.0"同台！中国电科携数百展品亮相航展], Southern Metropolis Daily [南方都市报], November 12, 2024, <https://www.163.com/dy/article/JGQFVFQK05129QAF.html>

<sup>51</sup> Zhang Peigao [张培高], "Actively Promoting Military-Civil Fusion toward Military Intelligentization Advances" [积极推动军民融合向军事智能化进军], National Defense [国防], 2018.

<sup>52</sup> See, for instance: "Starsee Intelligence assists the new era national defense, leading the new trend of military intelligentization" [摄星智能助力时代新国防，引领军事智能化新潮流], 9 July 2021.

<sup>53</sup> See: "Tianji · Military Large Model" [天机 · 军事大模型], <https://www.utenet.com/military-model>

<sup>54</sup> Wes Davis, "China's ADA Space has launched the first of a planned 2,800-satellite network of AI supercomputers," The Verge, 18 May 2025, <https://www.theverge.com/news/669157/china-begins-assembling-its-super-computer-in-space>



#### 4.3. *The New Fogs and Frictions of Warfare*

Even as the PLA appears enthusiastic about the apparent potential of emerging capabilities for future C4ISR, calls for cooler thinking and careful attention to the risks and challenges associated with these advances have also arisen. In particular, PLA commentary has highlighted the importance of avoiding cognitive biases, including concerns about the “cocoon room effect” specifically.<sup>55</sup> This phenomenon characterizes how learning algorithms can direct users to increasingly homogeneous information, thereby ‘trapping’ their perceptions and understanding of reality within a shrinking ‘cocoon.’ This dynamic could create adverse impacts on military decision-making, considering commanders could be especially susceptible to distortions in perspective due to the time constraints, complexities, and uncertainties in the operational environment. The PLA recognizes the importance of ensuring the human factor is fully appreciated, including improvements in information literacy and technical safeguards.

Nonetheless, there is a risk that with increased intelligentization of multiple components of C4ISR, issues of bias or safety could create unforeseen distortions in decision-making. The tendency of AI systems, especially LLMs, to make mistakes and have hallucinations can introduce errors that tend to be difficult to detect without careful validation. Certain constraints or idiosyncrasies in data used for training can also raise the risks, especially where there is a potential for interaction between biases in human cognition and machine intelligence. So too, against the backdrop of a complex, contentious international environment, as competition between the U.S. and China intensifies, the incentives to develop counter-AI capabilities, such as data poisoning or exploitation of vulnerabilities in models, also could prove destabilizing or potentially escalatory. In this regard, the ways in which these dynamics play out in the Asia-Pacific and with Chinese military developments particularly may have global consequences.

### 5. Challenges and Implications for NATO

Ultimately, the PLA seeks to design and redefine future warfare in ways that could disrupt the military balance in the Indo-Pacific and worldwide. The PLA is driven to keep pace with foreign militaries and inspired to seek to surpass them, as evident in calls for ‘leapfrog development’ or ‘overtaking on a turn’ (弯道超车).<sup>56</sup> The degree of transformation in the PLA’s approach to command, to include pursuing major reforms to structures and developing advanced systems, challenges claims that the PLA could be inflexible or incapable of such adaptation. Currently and in historical perspective, the PLA’s approach appears to be informed by a degree of technological determinism that results in a pragmatic, adaptive approach to developments that seeks to balance recognition of the importance of human factors with a drive to introduce technological innovations.

<sup>55</sup> Nie Xiaoli [聂晓丽] and Wang Zhe [王哲], “Cocoon Room Effect”: New Fog of the Intelligentized Battlefield [“茧房效应”: 智能化战场新迷雾], *PLA Daily* [解放军报], 4 January 2022, [https://www.81.cn/ll/2022-01/04/content\\_10120407.htm](https://www.81.cn/ll/2022-01/04/content_10120407.htm). The notion of “information cocoons” was initially intruded by Cass Sunstein. Several points in this section are adapted from: J. Michael Dahm and Elsa B. Kania, “The Advent of Intelligent Power: The Evolution of China’s Outlook on Military Informationization and Intelligentization,” which is forthcoming with the U.S. National Defense University.

<sup>56</sup> So too, China’s historical experiences of the dangers of technological backwardness seems to have resulted in a heightened sensitivity to emerging technological developments. “Strategic capabilities in newly emerging domains: an important focus for a new type of military to achieve ‘overtaking on the turn’” [新兴领域战略能力：一支新型军队实现“弯道超车”的重要着力点], *PLA Daily* / Jun Zhengping Studio [钧正平工作室], 8 March 2024, [http://www.81.cn/zt/2023nzt/jzpgzs\\_244884/16292328.html](http://www.81.cn/zt/2023nzt/jzpgzs_244884/16292328.html)

The PLA is driven to keep pace with foreign militaries and inspired to seek to surpass them, as evident in calls for ‘leapfrog development’ or ‘overtaking on a turn’,

In this regard, assessing and anticipating the PLA's progression and persistent challenges will remain an enduring undertaking. So too, based on China's approach and informed by previous reports in this series, NATO should:

- Continue investing in improving the resilience of NATO C4ISR, especially against advanced adversary electronic warfare and cyberspace offensive capabilities, and evaluate potential vulnerabilities of current systems.
- Improve integration of commercial technologies, and expand partnerships with leading enterprises to promote integration of AI.
- Develop the data resources, sharing protocols, and requisite infrastructure to facilitate adoption of emerging technologies.
- Accelerate experimentation with AI-enabled systems to enhance ISR and decision support.
- Ensure best practices for safety, validation, and assurance of new AI systems remain a priority and focus of efforts.
- Ensure NATO command structures and systems are postured appropriately for rapid response and potential transitions to crisis or conflict.



The Hague Centre  
for Strategic Studies

**HCSS**

Lange Voorhout 1  
2514 EA The Hague

**Follow us on social media:**

@hcssnl

**The Hague Centre for Strategic Studies**

Email: [info@hcss.nl](mailto:info@hcss.nl)  
Website: [www.hcss.nl](http://www.hcss.nl)