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Welcome to the *China AI and Autonomy Report,* a biweekly newsletter published by CNA. Read in browser.

We begin with PRC media discussion of the Russia-Ukraine war and counter UAV operations. The Hong Kong-based *Phoenix News* reports that the Russian military has been successful in downing Ukrainian UAVs with the use of an integrated air defense system combining long-, medium-, and short-range missiles and artillery. An article in the *PLA Daily*, however, discusses some of the difficulties in countering UAVs and concludes that challenges will remain for some time. As for future warfare, a *PLA Daily* article urges its readers to move beyond a mentality focused on mechanized warfare and to focus instead on intellingentized warfare. The *PLA Daily* also carried a lengthy article on the use of "digital twin" technologies to improve the PLA's education, training, command and control, and research and development (R&D). Meanwhile, a student team from the PLA's National University of Defense Technology took two first-place finishes in an international robotics competition held in Bangkok. Moving away from military news, *Guangming Daily* discusses how technology can be used to address grassroots social governance issues. In industry news, both *Fortune* and the *Financial Times* report that venture capital firm Sequoia China will invest a likely record-breaking US$9 billion in PRC tech startups, focusing on PRC government priorities such as AI.

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RUSSIA-UKRAINE WAR

PRC media discuss lessons learned from Russian counter UAV operations. An article on the *Phoenix News* website, a Hong Kong-based television network partially owned by the PRC government, reports that the Russian military has shot down more than 100 Ukrainian UAVs, most of them the Turkish-manufactured TB-2, through the effective use of an integrated air defense system.[1] The article claims further that Russian air defenses have been so effective that the Ukrainian military has been forced to conserve its UAVs. According to the report, the Ukrainian military employed UAVs more freely at the beginning of the conflict.

The article attributes Russian success at downing Ukrainian UAVs to the coordinated use of the S-300 (SA-10 Grumble) long-range air defense missile system, the 9K37 (SA-11 Gadfly) medium-range air defense missile systems, the Tor-M2 (SA-15D Gauntlet) short-range air defense missile system, and antiaircraft artillery. The article states that the Tor-M2 has been particularly effective at engaging Ukrainian UAVs, and that the Russian procedure is to hand off engagement responsibilities to an S-300 or 9K37 unit if the UAV is beyond the range of the Tor-M2. For smaller UAVs that may not be worth the cost of a missile, responsibility for engaging the aircraft is handed over to antiaircraft artillery units.

The positive tone of this article differs from that of an article featured in newsletter issue 19 that discussed a number of shortcomings with the Russian air defense system's ability to shoot down UAVs, including issues surrounding the cost effectiveness of using missiles to shoot down inexpensive UAVs, the Ukrainian use of multiple UAVs to overwhelm Russia air defenses, and Russian forces' inability to detect Ukrainian UAVs because of their low-radar cross-section.

On the other hand, the *PLA Daily*, the official newspaper of the PLA, concludes that countering UAVs will continue to be difficult for the foreseeable future.[2] The article notes that as the war in Ukraine drags on, counter UAV technologies are receiving more attention. The report discusses the Russian Stupor anti-drone gun (which uses an electromagnetic pulse to disable UAVs) that, according to Russian media reports, has been used in Ukraine. The article states, however, that counter UAV operations can use both kinetic and non-kinetic means.[3] According to the article, UAVs have "had a significant impact on modern warfare, resulting in profound changes in existing combat theory, combat style, and combat environment." Counter UAV operations, however, are hampered by the difficulty in detecting UAVs over long distances, electronic warfare tactics to protect UAVs, and the encryption of signals to control UAVs.

INTELLIGENT WARFARE

***PLA Daily* article calls for increasing the practical application of AI, big data, and cloud computing.** The *PLA Daily* carried an article emphasizing the need for PLA personnel to understand the important changes that will be brought about by intelligentized warfare.[4] According to the article, neither the size of a military nor the amount of equipment it possesses will be the key to winning in future warfare. The article argues, therefore, that the PLA must move beyond thinking and training at the mechanized level to thinking about how to fight intelligentized warfare. The article states that "in recent local wars, intelligent combat has shown the first signs of success and has shown the potential to change the 'rules of the game' of war." The article argues three main points.

Technology is key to winning war. The article warns that the US military is planning for 60 percent of its ground platforms to be "intelligentized" by 2030, and that the PLA cannot allow a technological gap to develop between itself and other militaries. As a result, the article urges its readers to take science and technology as the "key point" to winning future wars. In particular, it calls for increasing the practical application of AI, big data, and cloud computing to "unveil" the mystery of intelligent warfare and bring about the effective integration of the land, sea, air, space, electromagnetic, and cyber domains.

Training should be data driven. The article recommends developing advanced training tools to improve the effectiveness of training and adds that training should be data-centric and incorporate the latest technologies. In addition, it should focus on creating databases covering strategy and tactics from the command level to the individual service personnel; develop data analytic tools; and increase the use of simulations and wargames.

Personnel should be trained on AI and autonomous systems. The article recommends that personnel be trained to use intelligent technologies. In addition, the PLA should match future military needs with training and emphasize the training of personnel who are currently working with traditional technologies. At the same time, the PLA should work to integrate intelligent technologies with existing equipment and to develop new intelligent technologies to shorten the time needed to evolve weapons and equipment from possessing "weak intelligence" to possessing "strong intelligence" and then to possessing, ultimately, "super intelligence."

***PLA Daily* article discusses advantages of using "digital twins" to enhance training, education, command and control, and R&D.** The *PLA Daily* carried an article on the advantages of applying "digital twin" technologies to military applications.[5] A digital twin is a digital representation of a real-world entity or system. Digital twins are created by outfitting an actual object with sensors to collect data on its shape, size, and performance, which is then used to create a replica of the object or system in virtual reality. The article discusses four applications for digital twin technologies, discussed below.

Enhanced education. Digital twin technologies can be used to create replicas of objects to improve teaching. For example, the article explains how the technology can be used to instruct personnel on how to maintain the AL-31, a Russian-manufactured jet engine used on the PLA Air Force's J-10 fighter aircraft. The article notes that the best way to learn how to maintain a machine is to take it apart physically, but that jet engines are often not available for instruction, and, if they are, are complex systems with tens of thousands of parts. The article adds that using traditional two-dimensional blueprints may not be adequate to reinforce learning effectively. Digital twin technology, on the other hand, allows for the digital visualization of components with complex structures that are not easily physically disassembled, like jet engines. A digital twin can more intuitively show the structure of a machine and how it should be taken apart and can demonstrate virtually how the machine operates, thus making teaching more effective.

Auxiliary decision-making using a virtual battlefield. In a more futuristic application, the article states that digital twins can be made of battlefields, which will allow commanders to understand the battlefield situation through a virtual representation updated in real time. Thus, commanders who are not physically present on the battlefield can gain a comprehensive, real-time understanding of the environment that will allow for better decision-making.

Immersion training. Digital twin technologies can be used to create a training environment in virtual reality that will allow military personnel to train in seemingly real and dynamic scenarios. According to the article,

digital twin technologies can combine real and virtual elements so that trainees' sense of touch, smell, vision, and hearing are fully immersed, thus significantly improving training.

Research and development. Digital twin technologies can also be used in R&D. According to the article, the use of a virtual R&D model based on digital twin technology can help avoid multiple revisions of physical components and can help optimize design solutions. By virtually adjusting specifications, a product can be switched to a specified model for testing, significantly reducing the development and finalization time of new equipment. During operation, real-time monitoring can be achieved by the real-time feedback of sensor data that can be compared with the model's tolerances.

GOVERNMENT POLICY

PRC State Council approves the creation of a joint conference system to guide implementation of digital economy development.[6] On July 25, a government circular announced the new system of joint conferences, stating that those meetings would promote big data development and Internet+ initiatives, and organize reform measures for the development of the digital economy.[7] The new joint committee, led by the National Development and Reform Commission, includes 20 organizations, including the Cyberspace Administration of China and the Ministry of Science and Technology, and various regulatory agencies. At least one plenary meeting will be held per year, but "study meetings" on particular topics may also be submitted to the joint committee.

Big data, AI, cloud computing, and related technologies are touted as key to "cracking the technical code" and modernizing China's responses to social governance problems. Recent commentary published in *Guangming Daily*, the official newspaper of the Chinese Communist Party Propaganda Department, describes how intelligent applications are crucial to solving grassroots social governance problems.[8] The article describes four main concepts critical for "modernization of people-centered intelligent development." First, party-building must play a leading role; party committees and government departments should plan data systems that break old "data gaps" and link cadres at all levels. Second, data sharing must be emphasized, with the article arguing that integrated data platforms must be developed and used. Third, data security and the legal frameworks must be deepened. In this context, the commentary noted that the 2021 Data Security Law of the PRC was an important step for ensuring data security management and privacy.[9] The fourth concept is the "talent environment," which holds that "personnel and salary systems" must adapt and create "talent demand prediction" models and other mechanisms to manage talent better at all levels of government.

INDUSTRY

Sequoia China invests US$9 billion in PRC tech funds. *Fortune* reports that Sequoia China, an affiliate of the Silicon Valley-based venture capital firm Sequoia Capital, has raised a potentially record-breaking US$9 billion to invest in four PRC tech funds.[10] The amount may be the largest ever raised by a single firm to invest in PRC startups. The investment comes at a time when Beijing's crackdown on big tech has reduced the value of PRC tech stocks by $1.5 trillion since late 2020.

Sequoia China is led by Neil Shen, who is the only venture capitalist delegate to the Chinese People's Consultative Conference (CPCC). According to the *Financial Times*, Shen gave a speech at the annual CPCC

session in March that was interpreted as outlining Sequoia China's investment priorities. In that speech, Shen reportedly recommended that China invest in "deep tech," such as AI and robotics, and "hard tech," such as electric vehicle batteries and semiconductors. If the reporting is correct, Sequoia China's move could mark a shift in its investment strategy away from consumer-oriented companies to one more aligned with the PRC government's science and technology priorities.[11] Previously, the firm has invested in delivery giant Meituan, ride-hailing service Didi, and the e-commerce giant Alibaba, and introduced US companies LinkedIn and Airbnb to China. Meituan, Didi, and Alibaba have all been fined by the PRC government as part of its crackdown on big tech, and LinkedIn and Airbnb have since left the China market.

ROBOTICS

National University of Defense Technology students win "best-in-class" for two of five major categories in an international robotics competition. *China Military Online*, the PLA's official news and information portal, announced that a National University of Defense Technology (NUDT) team competed in the international robotics competition, known as RoboCup, held in Bangkok, Thailand, on July 11–17.[12] The NUDT team, "NuBot," won best-in-class for search and inspection and for the exploration and mapping scenario. The group of doctoral students developed independent algorithms that allowed the robot to maneuver over stairs and other complex obstacles. The NuBot team's rescue robot featured a low-weight robotic arm weighing 5 kg with a reach of 1.5 meters.

RESEARCH & DEVELOPMENT

The *Global Times*, a state-owned media outlet with a strong nationalistic bent, reports that the FH-95 electronic warfare UAV has recently conducted a performance test in northwest China.[13] The FH-95, a multirole UAV capable of carrying a 250 kg payload and a 24-hour loiter time, was developed independently by the China Aerospace Science and Technology Corporation's Aerospace Times Feihong Technology Corporation (ATFTC). According to Chen Jianguo, ATFTC's general manager, "drones capable of electronic warfare, reconnaissance, and early warning will become essential in combat as they can conduct remote detection outside the defense area or carry out tactical feints and saturated attacks in coordination with manned aircraft." The article reports that the FH-95 "completed its first test flight in 2017, was delivered to a key client in 2019, and received its first export contract in 2021."

ATFTC promotional material for the FH-95. Source: "Stealth Drones, Cruise Missiles, CASC 'Feihong' UAV Debuts at Air Show for First Time" (隐身无人机、巡飞弹，中国航天 "飞鸿"无人机将首次亮相航展), *Sohu*, Sept. 24, 2021, https://www.sohu.com/a/491810671_260616.

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