The China Al and Autonomy Report

A biweekly newsletter on AI and autonomy developments in China

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

We begin this issue with a discussion of two PRC media reports commenting on the successes and challenges that the Russian military has experienced in its UAV and counter-UAV operations in Ukraine. Some of the challenges discussed include the inability of Russian radar systems to detect Ukraine's UAVs, large numbers of Ukraine's UAVs overwhelming Russia's air defense systems, and the Russian military's inability to obtain a sufficient supply of UAVs for the war effort. We also cover several PLA Daily articles examining intelligent warfare, discussing such topics as countering unmanned systems, cognitive warfare in a "post-truth" era, the importance of high-quality data in command decision-making, and hybrid warfare involving the metaverse. Recognizing the critical role of information fusion technologies in collecting data from various types of sources in an intelligentized warfare environment, the Chinese Institute of Command and Control has established the Information Fusion Professional Committee. PLA researchers are trying to use AI-enabled cubesats (satellites weighing less than 2 kg) to defend their satellites, envisioning that AI could be used to determine exactly when and where to release the cubesats to fend off enemy satellites. A journal article reveals that China's smart court SoS (system of systems) "now connects to the desk of every working judge across the country." The smart court SoS trains on 100,000 cases from across the country every day, and judges must provide an explanation if they disagree with the system's recommended case decisions. Meanwhile, the PRC government has fined ride-hailing company Didi \$1.2 billion for violating its laws on data security and personal information protection.

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RUSSIA-UKRAINE WAR

PRC media articles discuss the strengths and weaknesses of Russian UAV and counter-UAV operations in the Russia-Ukraine War. In analyzing UAV operations, <u>an article</u> from news site China.com¹ claims that Russian UAVs have made "remarkable breakthroughs" in recent years, and that the Russian military's use of UAVs has shown their "unlimited potential" in war. The article highlights that Russia's use of UAVs in Syria's civil war helped to test and refine Russian UAV technology and operations for future use. Nevertheless, according to the article, Russia's performance in the war in Ukraine has exposed several deficiencies, including the Russian military's insufficient numbers of UAVs to conduct required missions, lack of access to UAVs for all military units, and the outstanding need to procure large numbers of commercial ultralight drones to address the shortfall in UAVs.

In the area of counter-UAV operations in the Russia-Ukraine War, the Shanghai-based online media outlet *The Paper* reprinted an <u>article</u> by a researcher from the Space Intelligence and Information Research Institute, an organization subordinate to the defense industry conglomerate China Aerospace Science and Technology Corporation.² Citing Russian sources, the article claims that by the 118th day of the conflict, the Russian military had destroyed 211 aircraft, 132 helicopters, and 1,308 UAVs belonging to the Ukrainian military. The article further highlights that Russian air defense systems are "performing well and effectively supporting the expansion of Russia's combat advantage." At the same time, the article also acknowledges that Russian air defense systems have faced several challenges in defeating Ukrainian UAVs, stating that they are not cost-effective, are unable to engage Ukrainian UAVs at their maximum range, are overwhelmed by large numbers of Ukrainian drones, and have had difficulty detecting Ukrainian UAVs because of low-radar cross-sections. The author concludes that future counter-UAV systems will need to rely more on "new concept weapons," such as lasers and microwave weapons, which can strike faster and are less costly.

INTELLIGENT WARFARE

PLA Daily article discusses methods to counter unmanned systems. An <u>article</u> in *PLA Daily*, the official newspaper of the PLA, discusses four ways to combat unmanned swarm systems.³ They include the following:

- 1. Attacking the algorithms and computing power of Al-enabled systems. The article emphasizes using cyber and electronic warfare capabilities to counter Al-enabled unmanned swarms, especially through the degradation of algorithms.
- 2. Attacking the communication linkages involved with controlling unmanned systems. According to the article, whether unmanned systems are deployed in swarms or as individual platforms, they will need to be connected with human operators, sensors, weapon systems, and, in the case of swarms, other unmanned systems whose communication linkages can be attacked.
- 3. Attacking command and control nodes. The article states that special operations forces and the employment of a combination of kinetic and non-kinetic attacks against the command and control nodes of UAVs can effectively degrade UAV operations.

4. Attacking unmanned systems with multi-domain rapid response capabilities operating in joint operations. The article argues that attacking unmanned systems with only one type of system is too limited, and that unmanned systems can be defeated best with the use of a combination of different types of intelligent weapons and by taking advantage of the terrain.

PLA Daily article discusses cognitive warfare in a "post-truth" era. The concept of cognitive warfare, which involves public opinion, psychological, and legal domains, has been linked to AI because of AI's ability to model and analyze culture, human cognition, group emotion, and social behavior.⁴ An article on this topic in the *PLA Daily* titled "Narrative Contest: The Cognitive Battle in the 'Post-Truth Era'" states that the contest over "narratives" has become an important component of the cognitive domain battlefield, and that the reality that different groups can view the same facts differently has become an important manifestation of cognitive war. As a result, cognitive warfare is based on "competing truths" that seek to change adversary perceptions.

The article argues that in the "post-truth era," people are guided more by emotions than truth. It claims, however, that the effectiveness of cognitive warfare is not in telling lies, but in telling partial truths that, although not incorrect, provide a misleading picture of the overall situation. As a result, conflict arises over "competitive truths," where each side tailors its message based on partial truths that provide the basis for action.

The article offers three strategies for winning the "competition of truths." They include the following:

- 1. *Focus on positive outcomes.* According to the article, the human brain pays attention to results and ignores background information. Thus, messaging should focus on a positive end result rather than the difficulties or errors made in the process of getting to that result.
- 2. *Focus on numbers.* According to the article, the human brain finds it easier to accept facts based on numbers. Thus, messaging should focus on providing numbers and statistics that support an action even if, when taken into context, they do not provide an accurate picture of the entire situation.
- 3. *Focus on the characterization of the issue*. According to the article, a side can attempt to justify its actions by characterizing them in a positive light that hides their true nature.

The article also provides three ways for determining the complete truth of an argument or message. They include the following:

- Adhere to logic. The article recommends following only objective and logical reasoning that is not swayed by emotion. It recommends drawing an "information puzzle" to determine if the facts are sufficient to derive the stated conclusions. If key facts are lacking, one should consider what the other party has not said.
- 2. *Trace the motivation*. The author recommends understanding the motivation of the other party and why they may be selecting certain facts over others.
- 3. *Find the complete truth.* The author recommends analyzing all facts to determine the complete truth.

A *PLA Daily* article discusses intelligent warfare as hybrid warfare involving the metaverse. The *PLA Daily* carried a highly theoretical article on the nature of intelligent warfare that describes it as a combination of military, economic, diplomatic, public opinion, and cultural actions.⁵ In regards to military measures, the article reports that intelligent warfare is gradually overturning the traditional modes of warfare by stressing the advantages of operational command algorithms, unmanned systems, and combat style diversification.

According to the article, hybrid warfare will become more prominent as AI technologies become more widely used across the broad spectrum of human endeavors. As a result, future warfare will involve a confrontation across the entire spectrum of national security domains. The article highlights the use of AI-enabled systems to create so-called "butterfly effects," where one apparently small act can trigger a combination of events leading to profound changes.

The article also asserts that victory in intelligent warfare means gaining superiority in the "cognitive space of human brains and computer chips." According to the author, winning an intelligent war relies on turning the opponent into a "fool" or, in other words, degrading the opponent's access to data to the point where they can no longer act coherently. The author predicts that future actions in intelligent warfare will, in part, take place in the metaverse, which will partly replace the violence and bloodshed of physical warfare.

The author also states that AI systems can be self-learning, and, as a result, intelligent warfare will be characterized by repeated virtual confrontations that will involve less physical violence and lead to operational innovations, the optimization of defenses, and the development, over time, of the means to exploit adversary vulnerabilities.

PLA Daily article emphasizes the role of big data in command decision-making. A PLA Daily article argues that in the era of intelligent warfare, traditional warfare command decision-making based on intuition and "small data" will give way to decision-making based on big data.⁶ The article claims that pure human decision-making increasingly will be unable to meet the fast-paced battle rhythm of intelligent warfare and will require AI-assisted command decision-making. In this regard, command decision-making in intelligent warfare will be assisted through simulations that will experiment, test, and optimize actions prior to an operation.

The article argues that to aid in decision-making, situational awareness should be enhanced by a networked system of sensors that will be optimized through data mining and deep learning so that a large number of heterogeneous data streams can be obtained from multiple sources to recognize changes on the battlefield. With such a system, commanders will be able to base decisions not on the results of actions but on predetermined decisions based on extensive modeling and simulations. This will result in an emphasis on collecting large amounts of high-quality data.

Despite the article's emphasis on Al-assisted decision-making, the author concludes that the greatest dilemma of human-machine collaborative decision-making is the interaction between humans and machines. Uncertainty in human-machine interaction and low-quality data may produce unpredictable and unexplained results. Thus, commanders should seek not only to build as high quality a database as possible but also to define the level of human involvement in decision-making so that humans can intervene to override Al systems when necessary.

PLA Daily article discusses measures to reduce the fog of war in intelligent warfare. A PLA Daily article argues that although AI and improved sensor technologies are reducing the traditional "fog of war" characterized by too little information, it is being replaced by a new fog of war in which commanders may be confused by too much data or data that are of poor quality or inaccurate.⁷ The article reports that an

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"explosive growth" in data has led to redundant and obsolete data overwhelming the amount of useful information.

The article does not directly address how to mitigate the effects of too much data and poor-quality data. Instead (as with other articles that have appeared in the *PLA Daily*), the article claims that advantages in battlefield transparency lie in the effective use of big data. It argues that the side with the technological advantage of big data will be able to achieve a "one-way transparency" that can make the battlefield more transparent and lead to operational advantage through the effective collection and processing of information and more accurate data. Unlike other articles on big data that stress the importance of Alenabled decision-making, this article emphasizes the "creative decision-making" of commanders based on rational thinking and careful judgement and on adjusting plans based on changes in the battlefield situation.

NEW ORGANIZATIONS

Information Fusion Professional Committee (IFPC) is established under the Chinese Institute of Command and Control (CICC). According to the <u>CICC</u>, a PRC professional association for those working on command and control technologies, the IFPC held its inaugural meeting on July 2 in Beijing. Experts and scholars from PLA research institutions, including the Academy of Military Sciences, the Air Force Research Institute, and the National University of Defense Technology, attended.⁸ According to the <u>official press</u> release for the event, the committee was established to consolidate the strengths of academia and industry, to form a platform for cooperation and development that has "international vision and influence," and to promote interdisciplinary integration, academic collaboration, and government-industry-university-research cooperation in the field of information fusion. The press release also emphasized the importance of information fusion technology, which involves multiple types of sensors and platforms to provide "all-source information," in informatized and intelligentized warfare environments, asserting that that the "power to control information" would be a "key factor" for winning in modern warfare. Of note, the new committee is formally affiliated with Nanjing StarSee Intelligent Technology Co., Ltd.—a company that, according to its chairman, has been "committee to combining advanced AI technology with operational concepts and military needs."

RESEARCH AND DEVELOPMENT

PLA researchers study use of AI-enabled cubesats to conduct space warfare. The South China Morning Post reports that PLA researchers affiliated with the National University of Defense Technology have written an article on the use of a large orbital platform to deploy cubesats (satellites weighing less than 2 kg) to defend PRC satellites against attack.⁹ The <u>article</u> appeared in *Chinese Space Science and Technology*, a PRC peer-reviewed journal published by the China Academy of Space Technology.¹⁰

According to the article, the complexity and rapidity of space warfare necessitates the use of AI, and AI could be used "to determine exactly when and where to release the cubesats so they could fend off enemy satellites." The researchers used a "greedy algorithm" (an algorithm that makes the most optimal choice at each stage) to conduct simulations to determine the "direction of orbit transfer, when the cubesats should be released, and the timing of encounters with other satellites." According to the article, "the algorithm was

able to plot a mission that used the least fuel, offering a route that would cost 96kg (212 lbs) of fuel and take 68 hours; it also suggested the shortest mission time that would cost 950 kg of fuel and take 18 hours." The article notes that an orbital carrier could also be used to conduct in-orbit refueling and maintenance.

New J-10 variant with dorsal spine revealed. The US-based website *The War Zone* <u>reports</u> that images have appeared on the internet of a new J-10 fighter aircraft variant that features a dorsal "spine" running the length of the aircraft's fuselage.¹¹ The article reports that the spine "could potentially house a variety of systems, including expanded countermeasure and electronic warfare systems, as well as communications and passive sensors" and additional space for fuel. The article also posits that the additional space provided by the spine could house electronics for AI or autonomous capabilities, such as those required for the <u>"loyal wingman"</u> concept. The J-10 is a multi-role fighter aircraft developed by the Chengdu Aircraft Industry Group.



On the left: an image of the J-10. On the right: an image of the new J-10 variant with dorsal spine. Sources: Liu Xuanzun, "Pakistan's Acquisition of Chinese J-10C Fighter Jets Significant for Both Sides: Analysts," *Global Times*, Feb. 20, 2022, <u>https://www.globaltimes.cn/page/202202/1252714.shtml</u> and Tyler Rogoway, "China's J-10 Fighter Spotted in New 'Big Spine' Configuration (Updated), *The War Zone*, July 20, 2022, <u>https://www.thedrive.com/the-war-zone/chinas-j-10-fighter-spotted-in-new-big-spine-configuration</u>.

INDUSTRY

PRC government fines Didi \$1.2 billion. The PRC government has fined ride-hailing company Didi Global \$1.2 billion to settle its yearlong investigation into the company's cybersecurity practices. According to the *Washington Post*, the Cyberspace Administration of China determined that Didi "illegally collected 12 million pieces of 'screenshot information' from users' mobile photo albums and excessively accumulated 107 million pieces of passenger facial recognition information and 1.4 million pieces of family relationship information, among other violations."¹²

The settlement of the case is expected to clear the way for Didi to add new customers.¹³ In July 2021, PRC regulators <u>ordered</u> smartphone operators to stop offering Didi's ride-hailing app after accusing the company of illegally collecting users' personal data just days after the company announced its intention to publicly list on the New York Stock Exchange.¹⁴ That move was widely seen as part of the government's broader crackdown on big tech. Likewise, the resolution of the case is seen as potentially signaling an easing of the government's regulatory oversight of the industry. On May 17, in a <u>speech</u> to tech executives, PRC Vice-Premier Liu He stated that the government supported the development of the industry and overseas public listings for companies.¹⁵

Mercedes-Benz subsidiary and Tencent cooperate on autonomous driving. On July 11, Mercedes-Benz subsidiary Daimler Greater China Ltd. and Tencent Cloud Computing Beijing Ltd. signed a memorandum of cooperation in the field of autonomous driving. ¹⁶ According to <u>reporting by Pandaily</u>, the strategic cooperation aims to strengthen R&D resources and to support Mercedes-Benz and Nvidia, a leading US company in AI software and hardware, in jointly developing autonomous vehicle technology in China. To realize this goal, the cooperation agreement establishes a laboratory to accelerate R&D in autonomous driving and to enable Mercedes-Benz to serve the PRC market.¹⁷ Senior Executive Vice President from Mercedes-Benz China Dr. Hans Georg Engel stated that Mercedes-Benz "is the first automobile enterprise in the world to meet the strict requirements for an L3 automated system," and in China, it is "intensively developing and testing the current and next generation automated driving systems." As part of the cooperative agreement, Tencent will provide "integrated, high-performance and stable cloud service support for Mercedes-Benz through IT architecture," and tools and platforms to provide a "rich experience in autonomous driving, big data, and AI." This is not the first time Mercedes-Benz and Tencent have cooperated—in 2015, Mercedes-Benz, in partnership with Tencent, became the first luxury carmaker to launch an in-car service for customers in China called MyCar.

PRC company places second in international AI competition. <u>Star.Vision Aerospace Group</u>, a PRC company involved in developing AI satellites and remote-sensing data mining, won second place in the "Multimodal Learning for Earth and Environment 2022" competition sponsored by MIT Lincoln Laboratory.¹⁸ The <u>competition</u> focused on using machine learning to address global problems in earth and environmental monitoring. The company also won honors in "matrix completion" and "multimodal image translation," which provides "a new perspective for long-term monitoring of rainforest changes and helping resolve frequently encountered 'headaches' in optical satellite image acquisition due to dense cloud coverage."

POLICY AND LAW

Shenzhen issues first intelligent and connected vehicle (ICV) regulations in China, allowing L3 autonomous vehicles on its roads.¹⁹ On June 25, the Standing Committee of the Shenzhen Municipal People's Congress issued "Administrative Regulations of Intelligent and Internet-Connected Vehicles in Shenzhen." ²⁰ The new regulations allow ICVs on Shenzhen roads after they obtain the appropriate registration certificates, license plates, and driving licenses. *Pandaily* reports that the regulations are notable because, for the first time in China, an official document defines rights, responsibilities, and definitions of L3-and-above autonomous driving technology, removing policy obstacles and enabling them to be on the road.²¹ For example, the regulations articulate the responsibilities for ICVs in traffic violations and accidents. Traffic violations committed by ICVs are the responsibility of drivers. If a traffic accident is caused by a quality defect in the vehicle, the driver can claim compensation from the car manufacturer and sellers after bearing the liability for damages according to law. The regulations will enter into force on August 1 of this year.²²

Study reveals prevalence of AI used in China's court system. In a recent issue of *Strategic Study of CAE*, a journal published by the Chinese Academy of Engineering (CAE), lead author Xu Jianfeng of the Information Center of Supreme People's Court of China stated that China's smart court SoS (system of systems) "now connects to the desk of every working judge across the country" (see <u>here</u> for text of study).²³ The system, which trains daily on 100,000 new cases from across the country, relies on machine learning technology to automatically screen court cases, recommend laws and regulations, draft legal documents,

and alter perceived human errors in verdicts. Judges must consult AI on their cases, and if they reject the AI-generated recommendation, the system requires an explanation. ²⁴ According to <u>reporting</u> by the *South China Morning Post*, the smart court SoS is not without fault: some critics say judges simply adhere to the AI recommendation instead of going through the trouble of challenging the system, even if the recommendation is less suitable for the case. A judge at a People's Court in Jiangsu Province stated that "AI cannot do everything" and expressed the need to reduce the public's high expectations for AI and to defend the role of the judge. ²⁵

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