



# INTERSECTIONS

## Technology, National Security, and US-China Strategic Competition

With this issue, CNA's China and Indo-Pacific Security Affairs Division relaunches *Intersections*, a news digest describing the interplay between the People's Republic of China's (PRC's) technology acquisition efforts, US and partner nation responses, and critical and emerging technology risks to the US industrial base posed by those efforts. This issue features stories on counter-drone technology, undersea sensing and targeting, and PRC efforts to acquire semiconductor technology to support China's military artificial intelligence (AI) development.

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## COUNTER-DRONE TECHNOLOGY DEVELOPMENTS

With the proliferation of a variety of uncrewed aircraft systems (UAS) and other uncrewed vehicles, as highlighted by the [extensive use](#) of high-volume, low-cost drones in the Russia-Ukraine war, interest in new technologies to counter or neutralize these systems has grown. The US military, the People's Liberation Army (PLA), and other militaries worldwide are investing heavily in counter-drone technology to attempt to defend against new drone-related threats.

This section looks at recent claimed advances in counter-UAS technology by both China and the US as reported in PRC media and the US press. We begin with a story about counter-UAS technologies that the PRC is expected to showcase at China's largest airshow, the Zhuhai Airshow, this November.

**Counter-drone systems to be featured at upcoming Zhuhai Airshow.** At a September press conference for the upcoming 15th China International Aviation and Aerospace Exhibition (the Zhuhai Airshow) to be held in Zhuhai, Guangdong Province, PRC, the airshow's organizers and representatives from a number of participating organizations previewed their plans for this year's iteration.<sup>1</sup> The event, which is cohosted by the PLA Air Force and the Guangdong provincial government, is a high-profile display of aerospace and defense technologies that the PLA wants to showcase in public.<sup>2</sup>

According to the *South China Morning Post*, [drone and counter-drone systems](#) will be a particular focus of this year's airshow, which will feature a new exhibition space dedicated to drone systems and will debut multiple new or upgraded counter-drone systems.<sup>3</sup> For example, the China Electronics Technology Group Corporation ([CETC](#)), a state-owned enterprise that produces military- and dual-use electronics, stated that it plans to display a new low-altitude radar defense system intended for use in counter-drone operations.<sup>4</sup> Of note, in 2021, *Science and Technology Daily*, the official paper of the PRC Ministry of Science and Technology, reported on a similar low-altitude counter-drone radar developed by CETC. According to that report, the radar system's ability to detect low- and slow-flying small targets gives it an advantage over other air defense systems in detecting drones.<sup>5</sup> Although the maturity and efficacy of such counter-drone systems remains to be seen, their expected prominent place at the Zhuhai Airshow suggests, at a minimum, a sustained PLA interest in pursuing and fielding advanced counter-drone systems.

CETC's development of radar and other advanced technologies has benefited from both illegal technology transfer and legal international research collaborations. In 2010, a US federal court found two individuals [guilty](#) of transferring military-use electronic components, including technologies used in military radars, to several PRC entities, including CETC.<sup>6</sup> In addition, beginning in 2015, CETC built [research relationships](#) with at least three foreign research institutions: the University of Manchester in the United Kingdom, the University of Technology Sydney in Australia, and the Technical University Graz in Austria.<sup>7</sup> Research topics under these collaborations have included radio astronomy instruments, wireless technology, and microsatellites.<sup>8</sup>

**The PLA may have mounted a laser system with counter-drone uses on a naval ship.** According to an August article in *The War Zone*, a US defense news website that describes the "use of open-source intelligence" as a "key facet of the site's reporting,"<sup>9</sup> recent photographs of a PLA Navy (PLAN) Type 071 amphibious transport dock suggest that the ship may have been equipped with a new laser weapon during a refit. The potential capabilities of such a system remain unclear, but *The War Zone* [notes](#) that they could include functioning as an optical dazzler and contributing to counter-drone defenses.<sup>10</sup>

Although the purported addition has not been publicly confirmed and the system's capabilities (assuming that it exists) remain uncertain, authoritative PRC media commentary does indicate that the PLA is interested in developing and using laser technology, including as a counter-drone capability. For example, a February 2024 article published in *PLA Daily*, the PLA's official newspaper, asserts that directed energy weapons, including lasers, are well suited to providing low- and super-low-altitude air defense and are particularly effective at countering large drone swarms.<sup>11</sup> Similarly, another *PLA Daily* article from May 2024 assesses that although laser systems still face multiple technical obstacles, they will eventually gain an advantage over traditional air defense missiles and anti-aircraft guns in combatting drones and drone swarms because of their lower cost and greater accuracy as well as their ability to modulate their power output.<sup>12</sup>

The PRC's efforts to develop laser technologies may benefit from illegal technology transfer. As discussed in [Issue 10](#) of *Intersections*, in April 2024, officials in Germany arrested three individuals for allegedly transferring a high-powered dual-use laser, as well as other sensitive data, to the PRC's Ministry of State Security—China's principal civilian intelligence agency.<sup>13</sup> This is an example of how the PRC uses espionage and other illegal and sub rosa methods to illegally access, or "[burglarize](#)," foreign technologies.

**PRC-Laos joint military exercises feature counter-drone technology, tactics.** In July, approximately 300 PLA and 900 Laotian troops took part in joint exercises at the training grounds of the Kommadam Military Academy of the Lao People's Army, located on the outskirts of Vientiane, the capital.<sup>14</sup> According to *PLA Daily*, during the exercises, soldiers from both nations participated in training exercises involving the use of drone countermeasures.<sup>15</sup> A video published on the *PLA Daily* website about the counter-drone exercises reports that the exercise included training on countering reconnaissance drones, "bomb-carrying drones," and kamikaze drones.<sup>16</sup> In the video, a PLA soldier states that they employed a variety of counter-drone systems and tactics, including using an "anti-drone gun" against reconnaissance drones, lasers to intercept "bomb-carrying drones," fast and agile first-person view (FPV) drones to collide with and therefore disable the bomb-carrying drones, and a "net gun" to catch and ground kamikaze drones.<sup>17</sup>

The drones shown in the video seem to be small quadcopter drones, a type of drone that is cheap and often available from commercial vendors.<sup>18</sup> Indeed, FPV drones were originally developed as hobbyist racing drones, and the FPV drone used in the video to collide with and disable other drones appears to be operated with a remote control made by DJI, a PRC commercial drone company.<sup>19</sup> The PRC currently dominates the commercial drone market, with DJI alone holding a [74 percent](#) global market share.<sup>20</sup> DJI has received [investments](#) from the PRC government,<sup>21</sup> and two researchers affiliated with the Atlantic Council, a US international affairs think tank, argue that this financial support may contribute to DJI's current market power because it allegedly allows the company to sell its drones abroad at [below-market prices](#).<sup>22</sup> As shown in the exercises discussed above, off-the-shelf drone technologies that originate in the civilian commercial sector are increasingly playing a role in PLA drone and counter-drone operations and are one example of how China seeks to benefit from its [civil-military fusion](#) strategy.<sup>23</sup> In this context, the PRC's superiority in the commercial drone market could allow it to control the supply of a valuable future military technology and support PLA innovation in both drone and counter-drone tactics.<sup>24</sup>

## UNDERSEA SENSING AND TARGETING ADVANCES

Undersea sensing is critical to submarine warfare and is expected to be a decisive factor in any future maritime conflict. In addition, emerging technologies such as uncrewed submersible systems and the deployment of AI for target recognition are expected to have significant effects on the future of warfighting in the undersea domain. Given the importance of these technologies, the PRC is using various tactics, including illegal activities, to acquire related components and information from overseas. This section looks at an advance claimed by China in sonar for uncrewed submersibles.

**Researchers at PLA-affiliated institution reportedly develop high-power sonar system for use in uncrewed submersibles.** In March 2024, the *South China Morning Post* [reported](#) that researchers at the National Key Laboratory of Underwater Acoustic Technology at Harbin Engineering University had announced in a peer-reviewed academic article that they had developed what may be the world's smallest phased array sonar system.<sup>25</sup> According to the research team, the small size of the newly developed sonar system means that it can be installed on small submersibles, including uncrewed submersibles. At the same time, because the system uses phased array sonar, it is more sensitive than traditional sonar systems.<sup>26</sup>

The researchers' affiliation with Harbin Engineering University lends their discovery military significance. As a member of the "Seven Sons of National Defense," a group of seven PRC universities with deep ties to the PLA and PRC defense industry, Harbin Engineering University is a [leading center](#) for defense technology research and is closely affiliated with the PLAN.<sup>27</sup> Furthermore, the laboratory with which the research team is affiliated, the National Key Laboratory of Underwater Acoustic Technology, has previously developed [hydroacoustic technologies](#) for use in undersea warfare systems.<sup>28</sup> As such, the researchers' article provides insight into the technologies that the PLA is seeking to develop and field.

China's emphasis on advancing in submersible technology, particularly for military use, has led to attempts to acquire key components overseas via espionage, including involvement by Harbin Engineering University-affiliated individuals. In 2016, for example, Amin Yu, a Chinese national living in the US, was [sentenced](#) to federal prison for illegally obtaining systems and components for submersibles from US companies from 2002 to 2014.<sup>29</sup> Multiple coconspirators were listed in Yu's plea agreement, which specifies that these individuals were "working for" Harbin Engineering University and allegedly used the components Yu provided them to develop uncrewed underwater vehicles.<sup>30</sup> This case is an example of how personnel at PRC defense-affiliated universities have been linked to the theft of sensitive technologies with defense applications.

## SEMICONDUCTORS AND MILITARY AI

As AI technology rapidly advances, including autonomous decision-making capabilities, global concern increases about the potential for military AI systems to cause unintended harm in either peacetime or wartime scenarios. Meanwhile, governments and militaries are concerned that whoever advances most rapidly in military AI development will gain a significant warfighting edge over competitors. This section looks at how the PRC is employing a range of tactics to continue acquiring a critical technology for AI development—advanced computer chips—despite US attempts to stem the flow of these chips to China through export controls.

**PRC continues to advance in AI for military use, supported by evasion of US export controls.** In October 2022, the US Department of Commerce’s Bureau of Industry and Security (BIS) imposed [controls](#) on the export of advanced semiconductors to China.<sup>31</sup> These controls, later [updated](#) in 2023,<sup>32</sup> are [intended](#) to stem the flow of advanced chips that provide the high-end processing power to enable PRC military advances in areas such as AI.<sup>33</sup> However, according to an August 2024 *New York Times* [report](#), PRC companies and chip importers have become increasingly creative at evading the restrictions and maintaining the flow of advanced chips into the PRC.<sup>34</sup> According to the report, these companies and individuals have engaged in the following tactics, among others:

- Smuggling chips into mainland China through third countries to which the export of advanced chips is legal, such as Singapore
- Creating a new company to manufacture servers designed for training AI models in partnership with US companies Nvidia, Intel, and Microsoft
- Downgrading the performance of chips intended to be shipped to the PRC market enough to comply with the letter of current export restrictions while maintaining most of the chips’ practical utility for AI training
- Continuing to pursue efforts to manufacture advanced chips in mainland China<sup>35</sup>

Facing the above means of skirting or otherwise nullifying US export restrictions, US policy has continued to evolve. In September, for example, BIS published a new rule that [prohibits](#) the export of advanced chipmaking tools to the PRC without an export license.<sup>36</sup> However, according to the *New York Times* report, the effectiveness of the export restrictions thus far has been [limited](#), and entities connected with the PLA continue to obtain chips that support military AI applications.<sup>37</sup>

The PRC’s use of a variety of tactics to evade US export restrictions shows key aspects of China’s economic toolkit: specifically using intermediate entities to purchase off-limits technology and forming partnerships with foreign firms to access technology. For example, the *New York Times* report notes that PRC executives from Sugon—a company with PLA ties that had been put on the US Commerce Department’s Entity List in 2019—created a new company called Netrix shortly thereafter that acquired chips for its servers from Nvidia, Intel, and Microsoft. According to the report, Netrix shares an office complex with Sugon in the city of Kunshan, and procurement documents indicate that Netrix has sold server equipment containing Nvidia and Intel chips to some of Sugon’s former customers, including universities that host defense labs.

## NOTES

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- <sup>10</sup> Thomas Newdick, "Laser Weapon Appears on Chinese Amphibious Assault Ship," The War Zone, Aug. 19, 2024, <https://www.twz.com/sea/laser-weapon-appears-on-chinese-amphibious-assault-ship>.
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<sup>17</sup> “The Enemy of Drones Has Arrived!”, Fan Enda (范恩达), “Shuttles: Aerial ‘Racecar Drivers’ [穿梭机：空中‘赛车手’],” *PLA Daily* [解放军报], Nov. 3, 2023, [http://www.81.cn/szb\\_223187/szbqxq/index.html?paperName=jfjb&paperDate=2023-11-03&paperNumber=09&articleid=918492](http://www.81.cn/szb_223187/szbqxq/index.html?paperName=jfjb&paperDate=2023-11-03&paperNumber=09&articleid=918492); “China-Laos ‘Friendship Shield-2024’ Joint Exercise, Follow Laos Military Reporter and Visit Unmanned Equipment on the Exercise Field [中老‘友谊盾牌-2024’联合演习 跟随老挝军事记者探访演习场上的无人装备],” CCTV [央视网], July 17, 2024, <https://tv.cctv.com/2024/07/17/VIDEjEuswEDwLBPI3e1tK2X8240717.shtml?spm=C53074552346.P4BWJvVoMUKy.0.0>.

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<sup>25</sup> Stephen Chen, “China’s Powerful Advanced Sonar Systems Are Now Small Enough to Fit on Unmanned Submersibles,” *South China Morning Post*, Mar. 23, 2024, <https://www.scmp.com/news/china/science/article/3255947/chinas-powerful-advanced-sonar-systems-are-now-small-enough-fit-unmanned-submersibles>.

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This work was created in the performance of Federal Government Contract No. N00014-22-D-7001.

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11/6/2024

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DNL-2024-U-039879-Final

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