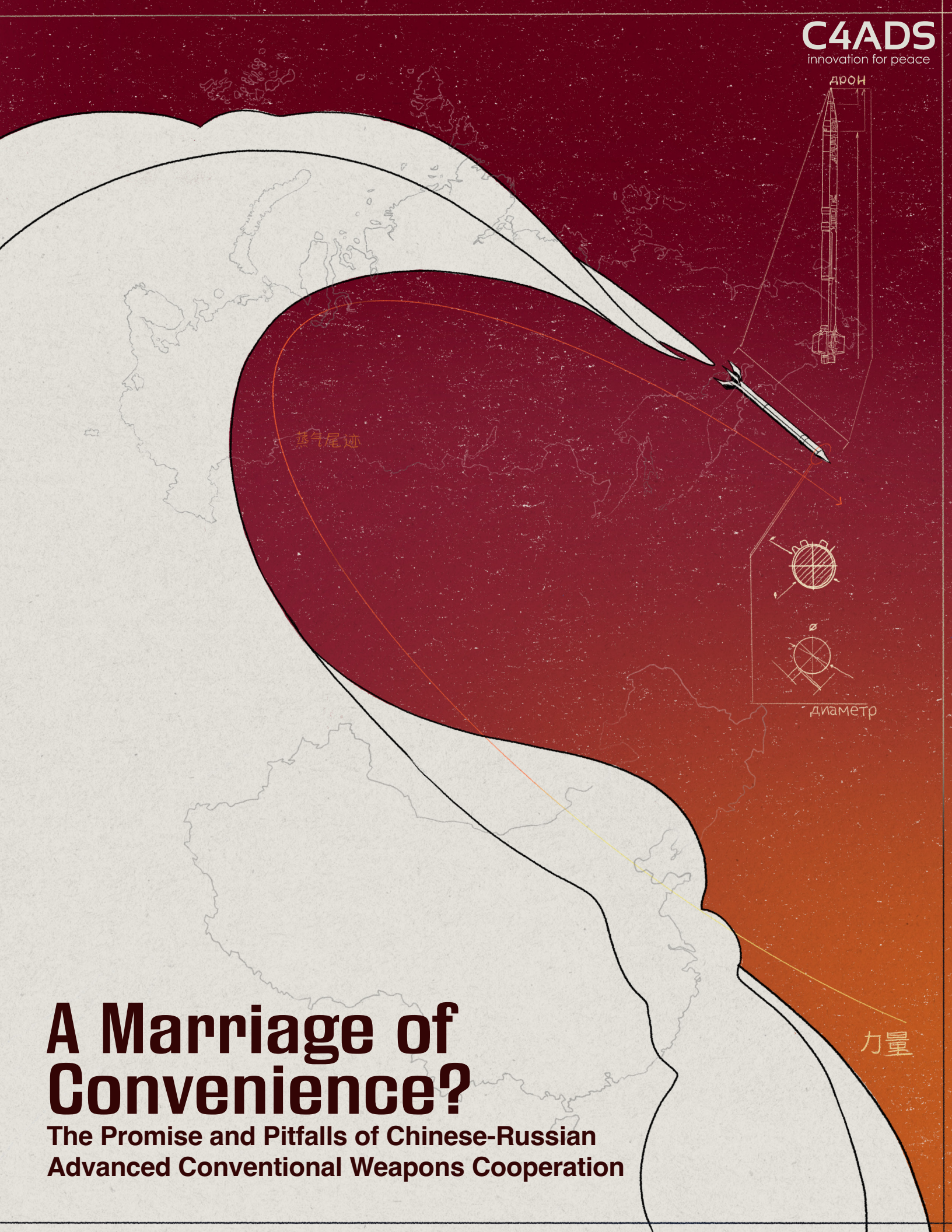




A Marriage of Convenience?

The Promise and Pitfalls of Chinese-Russian
Advanced Conventional Weapons Cooperation



ACKNOWLEDGMENTS

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C4ADS (www.c4ads.org) is a 501(c)(3) nonprofit organization dedicated to data-driven analysis and evidence-based reporting of conflict and security issues worldwide. Our approach leverages nontraditional investigative techniques and emerging analytical technologies. We recognize the value of working on the ground, capturing local knowledge, and collecting original data to inform our analysis. At the same time, we employ cutting-edge technology to manage and analyze that data. The result is an innovative analytical approach to conflict prevention and mitigation.

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About the Author

Allen Maggard is a senior analyst at C4ADS, where he investigates illicit procurement networks that supply the Russian defense industry with restricted technologies and dual-use goods. He holds a bachelor's degree in Slavic languages and criminology from Indiana University Bloomington and is currently a master's candidate at American University.

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EXECUTIVE SUMMARY

The “no limits” partnership between China and Russia—declared in the lead-up to the Kremlin’s February 2022 full-scale invasion of Ukraine—poses a challenge to the United States in multiple spheres.¹ Particularly concerning is the expansion of Chinese-Russian cooperation in industrial and scientific fields “upstream” of conventional arms transfers. Even as Russian arms exports to China have fallen due to the Chinese defense industry’s advancement, these deeper exchanges have persisted and even expanded across various levels of their respective defense industrial production and supply chains. The worst-case scenario is the emergence of a resilient defense industrial and technological axis capable of eroding the long-standing U.S. monopoly on precision warfare.²

This report examines three distinct forms of contemporary Chinese-Russian cooperation related to a cornerstone of modern precision warfare: advanced conventional weapons (ACW).³ This cooperation operates along near-, medium-, and long-term vectors. Drawing on China’s pervasive integration into global technology and industrial materials supply chains, private- and state-owned Russian companies work with their Chinese counterparts to offshore solutions meeting the Russian defense industry’s immediate wartime demand for military dual-use inputs, manufacturing competencies, and intellectual property. Joint research and development (R&D) enables Chinese and Russian state-owned defense industry entities (SODIEs) to validate existing ACW designs, minimize trial-and-error costs, and bridge the development gap between ACW design and production. Lastly, academic contacts between China and Russia, as reflected in joint publications between Chinese SODIE-affiliated specialists and staff and students at Russian defense industry-affiliated universities, suggest that networking and talent cross-seeding may institutionalize long-term ACW-related R&D partnerships between the two countries’ defense industries.

Chinese-Russian ACW cooperation rests on mutually beneficial asymmetries. Russia brings Soviet-legacy engineering and scientific capabilities while China offers vast industrial scale, advanced manufacturing, and a highly coordinated, well-funded system for channeling technological innovation into defense applications.⁴

But there are important caveats to their cooperation. Most importantly, Beijing appears to have limited ACW-related cooperation with Moscow when such cooperation does not serve China’s techno-nationalist ambitions.⁵ China ultimately needs access to U.S. and Western markets, capital, and technology more than it needs Russia.⁶ U.S. policymakers should prioritize working with allies to accelerate science and technology innovation while engaging Beijing and Moscow separately to introduce friction into their exchanges of ACW-related technologies and expertise.

GLOSSARY OF TERMS

ACW: Advanced conventional weapons. Weapons systems with high levels of precision, range, or destructive effect intended for use in conventional warfare. Used in this report to encompass submarines, unmanned aerial vehicles, air defense systems, precision-guided munitions, and electronic warfare systems.

ADM: Autonomous decision-making. Machine learning-based algorithms enabling unmanned vehicles to perform navigation, targeting, or combat maneuvers without continuous human input.

ALUS: Artillery-launched unmanned aerial vehicle system. An artillery-based platform for launching unmanned aerial vehicles over long distances.

AUV: Autonomous underwater vehicle. An unmanned, self-propelled underwater platform capable of executing pre-programmed or autonomously determined missions without a tethered connection to a surface operator. See also UUV.

C2: Command and control. The process whereby military commanders direct and coordinate operations by units in the field.

CHPL: Common high-priority list. A multilaterally developed list of goods, primarily semiconductors and related electronics, identified by Western governments as critical inputs to Russian weapons production and therefore subject to prioritized export control enforcement.

CNC: Computer numerical control. A manufacturing process in which pre-programmed software controls the movement of precision machine tools. CNC equipment is essential for producing complex components in aerospace, missile, and weapons manufacturing, and is subject to export controls in many Western jurisdictions.

Dual-Use Goods: Items, materials, software, or technology with both civilian and military applications. Export of dual-use goods is subject to licensing requirements and restrictions in most Western jurisdictions.

HS Code: Harmonized System code. A standardized numerical classification developed by the World Customs Organization used to categorize traded goods in customs declarations worldwide.

Knowledge transfer: In this report, the conveyance of technical documentation, R&D materials, test equipment, test results, and design specifications between entities in Russia and China through commercial trade channels. Distinct from finished weapons sales, knowledge transfers represent the upstream intellectual content required to develop, test, or reproduce a weapons system.

MCF: Military-civil fusion. A Chinese Communist Party national strategy to eliminate barriers between China's civilian research and commercial sectors and its military and defense industrial sectors, so that innovation in either advances military modernization. Used in this report to describe the policy environment in which Chinese universities, research institutes, and private firms may channel foreign-origin technology and expertise to the defense industry. The existence of MCF policies does not by itself establish that any particular collaboration serves a military end.

MLRS: Multiple launch rocket system. A ground-based artillery platform capable of firing salvos of unguided or guided rockets over extended ranges.

OFAC: Office of Foreign Assets Control. Agency of the U.S. Department of the Treasury responsible for administering and enforcing economic sanctions in service to America's foreign policy and national security objectives.

PLA: People's Liberation Army. The armed forces of the People's Republic of China, encompassing ground forces, the navy (PLAN), the air force (PLAAF), the rocket force (PLARF), the strategic support force, and the aerospace force.

R&D: Research and development. In the context of this report, R&D refers specifically to defense-relevant scientific and engineering activity aimed at designing, testing, or improving weapons systems or their constituent technologies.

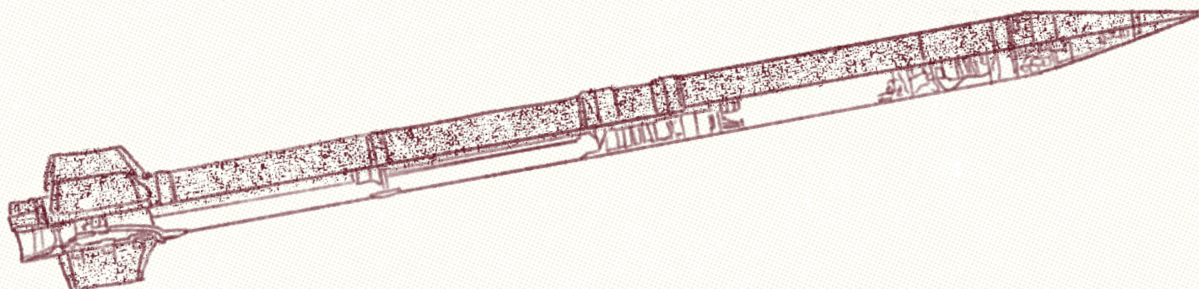
SCO: Shanghai Cooperation Organization. A Eurasian political, economic, and security organization. China and Russia are founding members and use the SCO as a venue to coordinate positions on regional security and multilateral governance.

SODIE: State-owned defense industrial entity. Used in this report to denote SOEs whose primary or substantial business activity is the design, development, testing, production, or export of weapons systems or defense-critical components. The term is used to distinguish entities with direct defense-production mandates from broader state-owned commercial holdings.

SOE: State-owned enterprise. A company in which a national government holds a controlling ownership stake.

UAV: Unmanned aerial vehicle. A powered aircraft that operates without an onboard pilot, controlled remotely or autonomously.

UUV: Unmanned underwater vehicle. An unpiloted underwater platform.



INTRODUCTION

Weeks before Russia's full-scale invasion of Ukraine in February 2022, Xi Jinping and Vladimir Putin declared a "no limits" partnership with "no 'forbidden' areas of cooperation."⁷ A subsequent May 2024 joint communique reaffirmed that China and Russia's alignment constitutes a response to U.S.-led containment efforts.⁸ China now provides a critical lifeline for the Russian defense industry, supplying over 90% of the latter's "high-priority" dual-use imports as of 2023.⁹ Equally significant, if less overt, is Beijing and Moscow's multitiered collaboration in relation to advanced conventional weapons (ACW).

This cooperation occurs along three vectors: (1) interactions among private Chinese and Russian companies foster sanctions-proof supply and production chains for dual-use goods critical to sustaining defense production; (2) transfers of technology and expertise between Chinese and Russian state-owned defense industrial entities (SODIEs) reduce the medium-term cost of realizing ACW designs; and (3) academic partnerships between Chinese and Russian defense industry-affiliated researchers lead the way for the long-term development of prospective ACW technologies. Mapping these arrangements is the first step toward disrupting them and blunting the potential resilience they afford to Beijing and Moscow. China's economic and technological heft shields such partnerships from Western sanctions. China neither endorses nor formally participates in Western sanctions and export controls targeting the Russian defense industrial base.¹⁰ Beijing has further used chokepoints on strategic commodities to deter U.S. restrictions targeting Chinese entities.¹¹ These factors incentivize partnerships between the two countries' defense industries, to the point where sanctioned Russian defense industry entities have offshored dual-use production to China. This arrangement enables China and Russia to secure their respective military modernization programs despite Western restrictions, and sustain progress toward diminishing the technological advantages held by Western militaries.

But Chinese-Russian ACW-related partnerships may also be self-limiting. Beijing and Moscow both seek technological independence from the West and are willing to cooperate toward that end, yet their relationship has never been symmetrical. Since the early 1990s, Beijing has pursued Russian ACW technology and expertise chiefly to build indigenous capability, while Western sanctions on Russia appear to have pushed Russian firms to accept terms that erode their market position. Moscow, for its part, remains wary of Chinese intellectual property theft and technological espionage, while Beijing appears to support Russian ACW production only when doing so serves Chinese interests. Anecdotal evidence from Russian media reports suggests not only that sanctions risks have nudged Beijing to limit exports of advanced Chinese-origin dual-use technologies to Russia, but also that Chinese firms involved in dual-use production are wary of sanctions exposure in dealing with Russian investors.¹² Indeed, advanced segments of the Chinese manufacturing industry reportedly remain dependent on foreign components,¹³ creating a potential pressure point for Western sanctions and export control policymakers to exploit. U.S. and Western policymakers should cautiously exploit unresolved economic and technological asymmetries, as well as divergences in national policy and strategic imperatives, to hinder further integration of Chinese and Russian ACW R&D and production. A combination of diplomatic engagement supported by a credible risk of secondary sanctions enforcement may encourage Beijing and Moscow to delimit the scope of their "no limits" relationship.

BACKGROUND

Shared opposition to U.S. influence and hegemony has transformed China and Russia's relationship from that of geopolitical rivals to strategic partners.¹⁴ Coordination began in the early 2000s through joint military exercises, weapons transfers, and political alignment in multilateral institutions like the Shanghai Cooperation Organization (SCO).¹⁵ Decades of military-technical cooperation, along with a mutual commitment to technological self-sufficiency,¹⁶ underpin Beijing and Moscow's present alignment. Transfers of final weapon systems and defense-critical technologies between China and Russia have historically exhibited a one-sided quality.¹⁷ Moscow provided massive industrial and military-technical assistance to Beijing prior to the Sino-Soviet split, with the Soviet Union playing a central role in standing up China's postwar defense industry.¹⁸

China emerged as the Russian defense industry's largest customer following the Soviet Union's dissolution and helped the Russian defense industry weather the transitional economic shocks of the 1990s.¹⁹ Russian arms plants transferred ACW technology and expert personnel to Chinese SODIEs, which preferred technology access and production rights to purchases of final weapon systems.²⁰ The "golden age" of Russia's arms trade with China spanned the late 1990s and early 2000s; defense sales reached US\$2.7 billion per year during this period, with Russia transferring a number of foundational technologies to China.²¹

Graphic 1: "Study the Soviet Union's advanced experience to build up our motherland." This 1953 Chinese propaganda poster illustrates Soviet support for Chinese industrialization.²²



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Russian sales to China have gradually tapered off since then,²³ as China has progressively closed the technological gap and built out its own domestic military-industrial base; China now reportedly surpasses Russia in production across several sectors.²⁴ Yet structural factors continue to drive Chinese interest in Russian ACW expertise. The Chinese defense industry's tendency toward organizational compartmentalization, top-down control, secrecy, and competition for state funding inhibits lateral knowledge-sharing between different Chinese military R&D institutes.²⁵ Under such conditions, partnering with Russian peer entities on ACW-related R&D may offer access to knowledge that domestic collaboration, for institutional reasons, cannot.

Graphic 2: *In May 2024, Russian physicist Anatoly Maslov was sentenced to 14 years in a strict-regime penal colony for treason. Russian media reports speculate Maslov had passed information on hypersonic weapons to China.*²⁶



Yet an element of distrust clouds Moscow's defense industrial relationship with Beijing. Analysts have linked multiple major Russian arms transfers directly to advances in Chinese military modernization efforts, especially with respect to military aircraft and aerospace defense systems.²⁷ The Russian state has not always exhibited a consistent attitude toward China's apparent theft of intellectual property from the Russian defense industry. Rosoboronexport, Russia's state-owned arms export agency, once attempted to demand legally binding guarantees to prevent unlicensed copying of Russian armaments and bulk purchases to mitigate risk, only for the Kremlin to overrule it in 2012.²⁸ In 2019, Russian state-owned defense industry conglomerate State Corporation "Rostec" (Rostec)²⁹ publicly accused China of illegally copying various Russian weapon systems on more than 500 occasions across 17 years, encompassing aircraft engines and air defense platforms.³⁰ Russian state security services are reportedly on edge due to concern that China might use the presumptive "no limits" partnership with Russia to acquire still more military technologies or recruit Russian military scientists.³¹

Cooperation between Chinese and Russian civilian research institutions on ACW-related topics presents another key concern for the Kremlin. Allegations of Chinese industrial espionage targeting Russian defense industry-affiliated universities have cropped up intermittently since the 2000s, occasionally resulting in public prosecutions of Russian academics.³² Russian scientists are caught in a structural

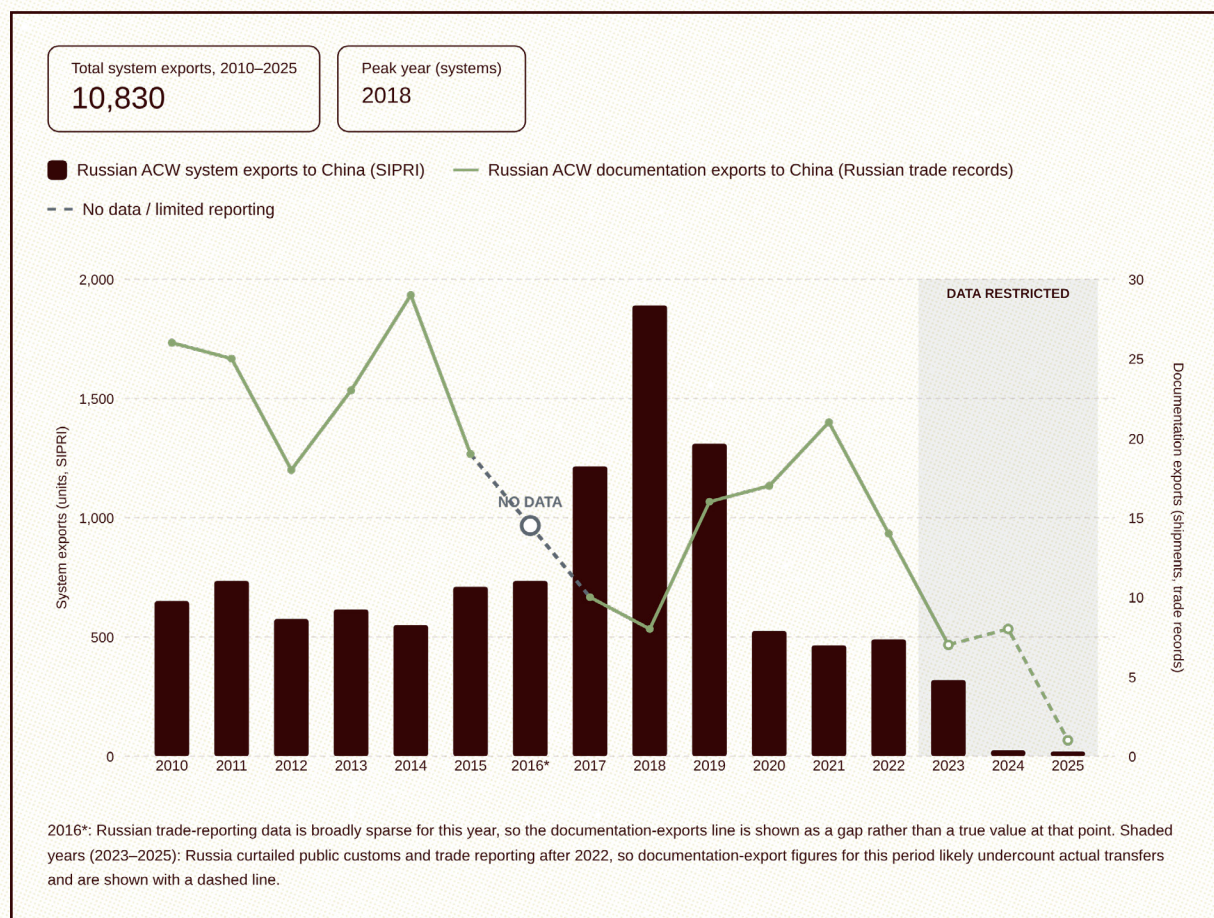
double bind: they cannot adequately fund their research without Chinese money but cannot take Chinese grants without becoming suspects in the eyes of the Russian security services.³³ According to World Bank data, in 2023, China spent 2.58% of its gross domestic product on research and development, compared with 0.94% for Russia..³⁴ As China's and Russia's leaders publicly boast of strengthening academic and research ties between their two countries,³⁵ the Russian security services tasked with policing those same ties are unlikely to relax their scrutiny. In March 2026, the Russian government began requiring Russian scientists to report foreign collaboration, presumably including engagement with Chinese counterparts.³⁶

External observers question whether China and Russia have the necessary motivation to institutionalize cooperation over the long term, whether generally or in the military-technical sense.³⁷ China and Russia share a “techno-nationalist” inclination which holds that the availability of sophisticated technology governs a state's ability to secure its interests.³⁸ Though this inclination incentivizes Beijing and Moscow to pursue indigenous innovation rather than trust-based sharing, in practice, Russia's relatively underdeveloped technological innovation ecosystem depends significantly on Chinese inputs.³⁹ But concerns among sections of the Russian elite—especially within Russia's defense industry, military establishments, and security services—regarding such dependency may lead Russia to limit sharing of more cutting-edge ACW systems or relevant technical expertise with China.⁴⁰

For now, the economic and diplomatic fallout from Russia's invasion of Ukraine subordinates these concerns over growing contacts with China to considerations of strategic necessity and tactical convenience.⁴¹ While public reporting on new Russian ACW system transfers to China is limited,⁴² and U.S. intelligence findings reported in U.S. media document only narrow technology-sharing initiatives, leaked documents suggest that Russian defense industry entities have continued to convey military-technical information and materials to China,⁴³ though assessing the scale of these latter transfers is likely complicated by efforts to censor Russian trade records after 2022.⁴⁴ (See Graphic 3)

The flow of military-technical assistance is not exclusively one-directional. While China publicly denies supplying weapons to support Russia's war against Ukraine, data show that China has become the primary supplier of the dual-use goods that keep Russia's defense industry running.⁴⁵ In 2023, China accounted for over 90% of Russia's “high-priority” dual-use imports.⁴⁶ Ukrainian forces routinely recover Chinese-origin critical components from downed Russian drones, missiles, and military equipment.⁴⁷

Graphic 3: ACW-related technical documentation transfers from Russia to China’s defense industry entities mapped against Russian ACW system exports to China, 2010-2025.⁴⁸



China functions as Russia’s primary sanctions evasion partner, providing Chinese-manufactured goods while also serving as a transshipment hub for Western-origin technology that Russia can no longer access directly. Supplying Chinese dual-use technologies to help sustain the Russian defense industry’s wartime output could also provide Beijing with data to gauge the reliability of Chinese-origin defense-critical manufacturing technologies. At the same time, China has reportedly restricted transfers of certain defense-critical inputs like high-precision machine tools and certain advanced standalone Chinese-origin chips to Russia, both of which are technologies designated for enhanced restrictions under the common high-priority list (CHPL).⁴⁹ This suggests that Beijing may refrain from supporting Moscow when doing so creates sanctions risk for Chinese companies involved in sectors critical to Beijing’s domestic technological innovation efforts.⁵⁰ Multiple commentators assert that Beijing’s need for access to U.S. and Western markets, capital, and technology ultimately outweighs its need for Moscow.⁵¹

The final-sales segment of the Chinese-Russian ACW relationship appears to be declining in relative importance as China’s domestic military-industrial base matures and modernizes. This is not necessarily a new trend, as observers noted China’s preference for Russian military technology and production rights for final ACW systems from the early 1990s.⁵² Recent analysis by the Stockholm International Peace Research Institute indicates that China reduced its reliance on imported weapons by 72% between the periods 2016-2020 and 2021-2025.⁵³ This trend corroborates historical media reports concerning the downward pressure exerted on Russian arms exports to China by the latter’s military modernization. In

late 2016, for example, a People's Liberation Army (PLA)-affiliated website reportedly opined that Russia had scrambled to conclude a deal to supply Su-35 fighter aircraft to China with the understanding that the jet would lose market share if not delivered before the rollout of the state-owned Aviation Industry Corporation of China's (AVIC) J-20 stealth fighter.⁵⁴ Similarly, commentators surmise that Beijing backed away from planned purchases of Russian Lada-class diesel-electric attack submarines during the late 2010s owing to technological improvements in China's own non-nuclear submarine fleet.⁵⁵

This shift reflects two mutually reinforcing dynamics. China's already moderate demand for finished Russian ACW systems diminished further as its own defense industry matured over the 2000s and 2010s. Sanctions imposed after Russia's initial invasion of Ukraine in 2014, meanwhile, constrained the former's access to Western capital and technology, reducing Moscow's incentive to restrict ACW-related knowledge sharing with China, now its primary source for capital and technology.

Assessing China and Russia's ACW cooperation primarily through the lens of arms sales thus misses the deeper architecture this report examines. More profound cooperation between Beijing and Moscow lies further upstream. Cut off from Western suppliers, China and Russia are building the foundations of an integrated ACW innovation and production ecosystem through consolidated military-technical cooperation and joint R&D partnerships, offshore production of defense-critical technologies and relevant supply chains, and increased academic exchanges and collaboration studying dual-use technologies and materials. Regardless of individual project outcomes, this system has the potential to foster a resilient environment through which Beijing and Moscow can accelerate ACW development independent of, and in resistance to, Western pressure. Yet these foundations are precarious and tentative. China's economic and technological advantages over Russia, Beijing's practice of withholding support to the Russian defense industry to avoid sanctions risk, and Russian counterintelligence scrutiny of research contacts with Chinese scientists all suggest that the consolidation of China and Russia's ACW ecosystems is neither inevitable nor irreversible.



METHODOLOGY

Since 2014, the United States and partner jurisdictions have layered two distinct but mutually reinforcing sets of restrictive measures against Russia. The first of these consists of sanctions—such as asset freezes, transaction bans, and the designation of specific individuals, entities, and economic sectors—which are designed to cut Russian actors off from Western financial systems and raise the cost of doing business with them, including for third-country firms exposed to the threat of secondary sanctions. The second category of restrictions consists of export controls which are designed to restrict Russia’s procurement of sensitive technologies, intellectual property, and other critical defense industry inputs by regulating their flow through Western supply chains, regardless of how they are financed. Together, these measures are designed to constrain Russia’s ability to sustain its war effort, reconstitute its materiel losses, and refurbish and advance its domestic defense industrial base over the long term. This report traces the past and recent trajectory of Chinese-Russian ACW-related cooperation, and examines how this cooperation both circumvents existing controls and hedges against potential future restrictions by integrating industrial bases while fostering exchanges of technical expertise “upstream” in ACW R&D and production lifecycles. (A table of relevant sanctions and export control measures is included in Appendix 1.)

To do so, this report draws on publicly available information from a wide range of sources. These include commercially available Russian trade records, which provide information concerning ACW-related “knowledge transfers” (i.e., technical documentation, R&D materials, test equipment, and media containing test results) between entities affiliated with the Chinese and Russian defense industries from 2010 to 2025. Such trade records include Russian customs conformity certificates, a category of documents certifying that imported items abide by the technical and regulatory standards set by Russia and the Customs Union of the Eurasian Economic Union.

The analysis also used original and third-party-collected Russian corporate records and Chinese corporate records compiled by WireScreen to map the present and historical ownership of legal entities involved in such knowledge transfers or in transfers of manufacturing equipment and precursor materials used in the production of ACW systems. Research for this paper further drew on academic publications indexed by Scopus and patent data to establish whether legal entities of interest, or their individual principals, are or were directly or indirectly involved in the Chinese or Russian defense industries, or in the supply thereof. Identification of Chinese and Russian defense industry suppliers principally relied on the use of public procurement records and commercial arbitration court filings, as well as financial records obtained by the Economic Security Council of Ukraine. Other sources include social media and leaked materials.

Several analytical workflows inform this report’s findings. For knowledge transfers, C4ADS filtered and manually reviewed Russian trade records to pinpoint shipments containing technical documentation or goods relevant to ACW R&D. Analysis focused on descriptions provided in Russian trade records regarding the goods contained in a given shipment, the intended end-use case for those goods, as well as the consignor, consignee, and payee involved in each shipment. Filtering shipment stakeholders by identifiers for known Chinese and Russian defense industry entities facilitated identification of Harmonized System (HS) classificatory codes particular to military-technical assistance programs.⁵⁶ These HS codes, in turn, enabled further filtering of Russian trade records to identify additional ACW-relevant shipments whose descriptions did not explicitly reference ACW systems.

Through the process described above, C4ADS determined that ACW-relevant knowledge transfers between Russia and China were typically associated in Russian trade records with a handful of HS codes, namely:

- 490199: Printed books, brochures, leaflets, and similar printed matter, whether or not in single sheets; other.⁵⁷
- 852349: Optical media; other than unrecorded.⁵⁸
- 902300: Instruments, apparatus, and models designed for demonstration purposes (for example, in education or exhibitions); unsuitable for other uses.⁵⁹

Subsequent analysis incorporated these HS codes into a shipment description filter, layering previously identified classificatory codes indicative of military-technical assistance to illuminate still more shipments of interest that were not highlighted through previous screens of Russian trade records.

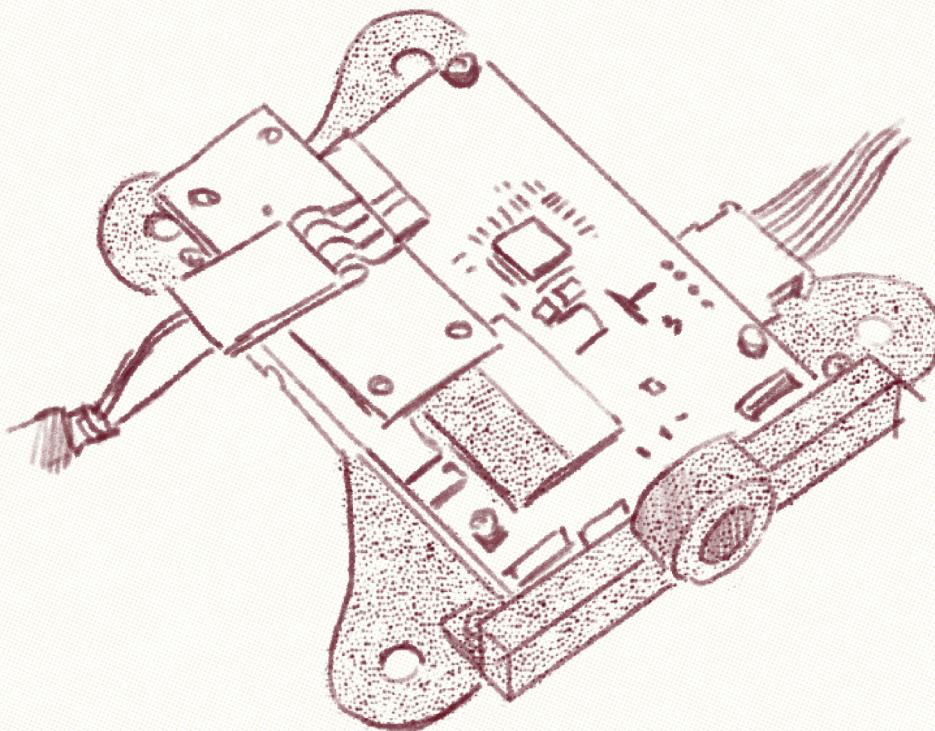
Separately, C4ADS used Russian corporate records as a proxy indicator for direct or indirect Chinese investment in ACW-relevant enterprises inside Russia. This workflow screened Russian corporate records and third-party data aggregators to identify Chinese-Russian joint ventures and Russian legal entities under exclusive Chinese ownership. It also tracked the entry of Chinese shareholders into companies previously under exclusive Russian ownership before and after the February 2022 invasion of Ukraine. Additional filters screened Chinese-involved Russian companies for All-Russian Classifier of Economic Activities codes denoting involvement in business activities with direct or indirect defense industrial connotations. C4ADS also employed Chinese corporate aggregators and patent databases to screen Chinese corporate shareholders of Russian companies for ties to Chinese defense industry entities or possession of patents with clear defense industrial applications.

To review Chinese-Russian scientific collaboration relevant to ACW technologies, C4ADS used various academic journal databases including Scopus and China National Knowledge Infrastructure. Preliminary analysis of these databases focused on identifying papers co-authored by persons affiliated with academic institutions and research institutes affiliated with the Chinese and Russian defense industries. Papers responsive to those conditions were then filtered by relevant academic journal or article title keywords to further pinpoint research with clear or likely ACW applications. The analysis further examined the bibliographies of authors of ACW-relevant research papers identified through this process to establish whether they had separately co-authored other research with persons directly affiliated with the Chinese or Russian defense industries.

Certain factors constrain this report's ability to provide a truly comprehensive assessment of the Chinese-Russian ACW development ecosystem. Military technology R&D programs are secret by design. But aside from the natural desire to deny rivals information about joint ACW-related R&D, Beijing and Moscow also likely want to limit their own exposure to domestic criticism from nationalist constituencies suspicious of sharing advanced military technologies. Russia's 2022 trade data blackout may also conceal transfers of military-technical documentation abroad to shield recipients from Western sanctions.⁶⁰ While available Russian trade records do evidence some exchanges reflective of joint ACW-related R&D after 2022, trade records alone do not reliably indicate whether such exchanges were productive, still less how they might have contributed to the development or modernization of ACW systems. The Russian trade records available to C4ADS at the time of this writing did not extend past March 2025, limiting the scope of this analysis of more contemporary manifestations of Chinese-Russian ACW-related transfers and cooperation.

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Furthermore, while analysis of academic publications can provide insight into the trajectories of Chinese and Russian ACW-related research efforts, such analysis cannot anticipate the specific military applications of such research with absolute certainty. As such, C4ADS has paired its analysis of these publicly available records with existing public reporting on Chinese-Russian cooperation in military technical and scientific research to corroborate and contextualize likely instances of ACW-relevant R&D cooperation between Chinese and Russian entities.



TPOLOGY AND CASE STUDIES

Chinese-Russian ACW-related cooperation operates along near-, medium-, and long-term timelines. Near-term cooperation frequently involves private Chinese and Russian companies acting to supply the Russian defense industry with key manufacturing and technological inputs, often in partnership with state-owned entities from the opposite country. Medium-term engagements entail exchanges between Chinese and Russian state-owned defense industrial entities (SODIEs) of technical documentation and testing services aimed at improving existing ACW systems. Academic contacts between Chinese and Russian specialists operate along the longest timeline of all, with scientific cooperation providing a foundation for informal networking opportunities conducive to the long-term institutionalization of ACW cooperation between both countries' defense industries. Case studies emblematic of these scenarios are presented in further detail below.

The Near Term: ACW-Critical Manufacturing Inputs and Components

Chinese and Russian companies—privately owned firms as well as state-owned enterprises—play a key role in building sanctions-resilient production and supply chains for the benefit of the Russian defense industry, including by offshoring elements of those chains from Russia to China. Moscow's principal gain from ACW cooperation with Beijing is to overcome Western sanctions and export controls on its defense industry, attaining a steady supply of dual-use goods critical to supporting Russia's wartime needs.⁶¹ To this end, private Chinese and Russian defense industry-adjacent firms are partnering with each other and with SODIEs from the opposite country to offshore dual-use production to China⁶² and acquire or sell Chinese intellectual property for use in creating ostensibly "Russian" dual-use products⁶³. Private Russian companies that produce consumables for defense-critical equipment boast of successful import substitution but use Chinese-origin precursor materials.⁶⁴ Left unaddressed, such forms of production and supply chain offshoring could give the Russian defense industry a durable supply of essential inputs for sustaining current—and potential future—military operations, one that circumvents the current body of sanctions and export controls meant to limit Russia's access to critical components.

But such offshoring also carries significant economic risks for Moscow. Because such arrangements create weak spots in Russian defense industrial supply chains, they may provide Beijing economic and technological leverage over Moscow in the future. Russian firms that relocate production to China may find their future competitiveness undercut by military-civil fusion (MCF) policies, which compel Chinese firms to gather technology and expertise provided by foreign partners for the Chinese defense industry's benefit. Beijing has also shown willingness to restrict trade and other commercial engagements that go beyond Russia's immediate, tactical needs and might give the Russian defense industry access to China's most cutting-edge technologies.⁶⁵ Private Chinese investment in the Russian defense industry probably focuses on projects that serve Beijing's strategic economic interests. The analysis identified comparatively limited evidence of transfers of final ACW systems between private Chinese and Russian companies.

Semiconductor Design and Fabrication

Private and state-owned Russian defense industry entities are partnering with Chinese peers to “offshore” the production of semiconductors —designated as critical to Russian military production per CHPL⁶⁶—to facilities inside China, effectively nullifying the intended effects of U.S. sanctions and export controls. One Russian SODIE has reportedly purchased intellectual property from a private Chinese defense contractor and acquired a controlling stake in a Chinese semiconductor fabrication equipment distributor. Another privately held Russian company has sought licenses to use Chinese semiconductor designs. Russian interest in the Chinese semiconductor industry is readily evident. Yet Beijing’s techno-nationalist priorities appear to have occasionally frustrated such partnerships.

Russian producers of ACW-critical microelectronics are likely involved in limited engagement with China’s semiconductor industry to circumvent Western economic and technological controls. But China’s role in helping the Russian defense industry evade Western sanctions and export controls on semiconductors—which are essential to ACW platforms ranging from guided missiles to AI-enabled drones⁶⁷—is well documented.⁶⁸ Chinese consignors originated over half of the more than 625,000 shipments of CHPL tier-one semiconductors, including chips made by Western companies, imported to Russia between February 2022 and December 2024.⁶⁹ Analysis of these data strongly suggests that the Chinese and Russian semiconductor industries are growing beyond imports of transshipped Western chips, albeit on a limited basis.

Beijing’s and Moscow’s techno-nationalist priorities will very likely restrict direct cooperation between the Chinese and Russian semiconductor industries to offshoring arrangements by the latter and regulated incorporation of the former’s chip designs into Russian microelectronics. China’s semiconductor design and fabrication capabilities have grown markedly over the past several years.⁷⁰ Engagement with the Chinese semiconductor industry promises not only to bolster Russian chipmakers’ potential for innovative import-substitution but also to diminish the Russian defense industry’s reliance on restricted Western-origin microelectronics. Comments by Russian government officials and Russian media reports indicate that Kremlin-backed initiatives to grow the Russian semiconductor industry may extend to investment in “small and unprestigious” Chinese chip foundries.⁷¹

Yet Beijing is likely reluctant to supply Russia with its most advanced chip designs, to preserve the Chinese semiconductor industry’s technological and commercial edge and to limit Chinese chipmakers’ exposure to Western secondary sanctions.⁷² Conversely, the Kremlin likely wishes to restrict the volume of Chinese microchips in sensitive Russian electronics supply chains on national security grounds.

A - 1**Case Study: Element**

PJSC Element (hereafter, Element)⁷³—a Russian state-owned microelectronics holding subject to OFAC sanctions since 2022 and whose subsidiaries have received funding under Russian defense industry investment programs⁷⁴—would likely benefit from China’s advanced semiconductor fabrication and design ecosystem. Though there is limited evidence to determine whether these activities are geared toward the production of military-grade microchips, Element’s apparent efforts to integrate itself into Chinese semiconductor production and supply chains would likely facilitate the company’s ability to produce military-grade microelectronics despite being subject to Western sanctions and export controls.

Analysis of Russian media reports and Element’s financial reporting indicates that Element incorporated at least four subsidiaries in China in summer 2025, likely for the purpose of localizing production of microchips and chipsets.⁷⁵ Element’s annual report for fiscal year 2024, issued in June 2025, indicates that the company had begun to assemble chipsets inside China, a detail absent from Element’s 2023 annual report.⁷⁶ Element has reportedly also sought out Chinese language instructors to prepare staff for reading Chinese technical documentation.⁷⁷ On April 17, 2026, Russian electronics industry monitor *CNews* reported that Element had acquired intellectual property related to power electronics from Chinese defense contractor Shijiazhuang Tonhe Electronics Co., Ltd. for more than 100 million rubles (approximately US\$1.3 million as of April 2026).⁷⁸ Ten days later, *CNews* further reported that one of Element’s Chinese companies had acquired a 100% stake in another Chinese firm through which Element had purchased unspecified equipment, possibly related to semiconductor fabrication.⁷⁹

Element’s efforts in China likely fit into a recent Russian government initiative aimed at developing its domestic semiconductor industry. The Russian government approved the creation of a “United Microelectronics Company” (OMK) in January 2026 to pool the Russian semiconductor industry’s assets into a full-cycle chip manufacturing complex, according to Russian media reports.⁸⁰ OMK will reportedly be built on a company affiliated with Russian financial conglomerate PJSC Sberbank⁸¹—the latter subject to full OFAC and European Union (EU) blocking sanctions since April and July 2022, respectively⁸²—which obtained a stake in Element in January 2026 as well.⁸³ OMK strategists are reportedly exploring purchases of shares in smaller Chinese foundries to secure production capacity for Russian customers, though experts caution that Chinese fabs may turn away state-linked or sanctioned Russian investors and are unlikely to give away technical documentation.⁸⁴

A - 2

Case Study: Tramplin Electronics

Separately, LLC Tramplin Electronics,⁸⁵ a privately held Russian microelectronics company not subject to sanctions or export controls at the time of this writing, is developing new chips based on Chinese semiconductor architecture. Russian media reports from April 2026 indicate that Tramplin has invested more than one billion rubles (approximately US\$13 million as of April 2026) in developing a microprocessor based on a novel chip architecture designed by Chinese semiconductor company Loongson Technology Co., Ltd. (hereafter, Loongson).⁸⁶ Known as Irtysh, the chip in question is intended for use in computer server applications and is reportedly compatible with Western-origin graphics cards, though it appears to perform at a level lower than processors based on Western-origin chip architectures.⁸⁷

The Chinese and Russian governments both appear to have reservations concerning Loongson's entry into the Russian semiconductor market. Beijing reportedly blocked exports of Loongson's most advanced chips in December 2022 owing to sensitivities regarding their use within the Chinese defense industry, only to allow limited exports to Russia in October 2023, purportedly due to U.S. export controls imposed against Loongson in March of that year.⁸⁸ Though Tramplin Electronics reportedly secured certifications permitting the sale of Loongson-produced servers inside Russia in July 2026, Russia's Ministry of Industry and Trade warned the previous April that Tramplin's incorporation of a Chinese-origin design for its Irtysh chip could pose a national security risk, according to documents reviewed by Russian tech news outlet *CNews*.⁸⁹

Means of Production: CNC Machine Tools and Cutting Instruments

At least one Russian CNC machine tool producer likely plans to offshore production of advanced machine tool models to China. If successful, schemes like this could overcome the existing body of relevant sanctions and export controls to give Russia's defense sector a reliable supply of capital goods critical to the production of a variety of ACW systems.⁹⁰ This is analogous to Element's reported efforts to fabricate semiconductors inside China.

But as with microelectronics, offshoring CNC machine tool production to China also raises contradictions. Russian dual-use technology manufacturers must rely on a foreign country to produce the very goods prioritized under Kremlin techno-nationalist policies. Similarly, Russian producers of critical machine tool consumables use Chinese-origin precursor materials in their manufacturing processes. Beijing has meanwhile shown itself willing to restrict exports of advanced Chinese CNC machine tools to Russia,⁹¹ possibly owing to the Chinese CNC machine industry's continued reliance on foreign inputs, which leaves it vulnerable to Western sanctions and export controls.⁹² These dynamics increase Russia's dependence on China, turning machine tool technology and related inputs into a durable point of leverage that Beijing can exploit over Moscow, but also expose advanced segments of the Chinese manufacturing industry to external economic and technological restrictions.

A - 3

Case Study: Stankomashstroy

LLC Stankomashstroy (Stankomashstroy)⁹³ is a privately owned Russian CNC machine tool producer and a documented Russian defense contractor subject to OFAC sanctions since November 2023.⁹⁴ Stankomashstroy and an affiliated company, LLC Stankomash (formerly known as LLC Trading House Stankomashstroy),⁹⁵ made sales to multiple Russian SODIEs in 2025, including ballistic missile manufacturer JSC Votkinsk Plant⁹⁶ and air defense systems producer JSC Izhevsk Electromechanical Plant “Kupol.”⁹⁷ Public reporting indicates that Stankomashstroy plans to offshore production of its CNC machine tools to an industrial park in China’s Shaanxi province, which would likely facilitate Stankomashstroy’s ability to provide the Russian defense industry with a CNC machine tool supply chain that skirts Western sanctions and export controls.

In June 2017, Stankomashstroy signed an investment agreement with two unspecified Chinese companies in the presence of the mayor of the Shaanxi province city of Baoji.⁹⁸ Photos from the signing event show a Stankomashstroy principal shaking hands with an individual seated behind a placard identifying him as a representative of Baoji Machine Tool Group Co., Ltd. (BMTG).⁹⁹ Chinese corporate records indicate that BMTG’s ultimate beneficial owners include several Chinese state and state-owned entities, including the State Council of the People’s Republic of China,¹⁰⁰ though BMTG does not appear to be subject to any sanctions or export controls at the time of this writing.

Graphic 4: General Director of Stankomashstroy Oleg Alexandrovich Kochetkov shaking hands with Chen Dapeng, assistant director of the Xianyang High-Tech Zone, August 2023.¹⁰¹



While analysis of Chinese corporate records did not identify evidence of a joint venture between Stankomashstroy and BMTG, Stankomashstroy representatives appear to have visited BMTG's plant in March 2024.¹⁰² Stankomashstroy's coverage of the latter visit references the Xianyang High-Tech Zone—also based in Shaanxi province—where Stankomashstroy agreed in August 2023 to set up a plant for producing five-axis machine tools, which are critical assets for precision manufacturing of complex defense components.¹⁰³ General Director of Stankomashstroy, Oleg Alexandrovich Kochetkov, separately met with the mayor of Baoji in January 2024 to discuss the plant as well as the “formation of new production chains” and “developing engineering competencies in the interests of Russia's technological sovereignty.”¹⁰⁴ A person sharing Kochetkov's first name and surname incorporated a company named Shaanxi Stermasi Technology Co., Ltd. in Shaanxi province in 2023, according to WireScreen,¹⁰⁵ though additional research is required to corroborate whether that entity is connected to the aforementioned five-axis machining center plant.

A - 4

Case Study: Microbor and Virial

Russia has also become dependent on China for machine tool consumables critical for defense production.¹⁰⁶ The cases of manufacturers of Russian machine-tool cutting instruments LLC Microbor¹⁰⁷ and LLC Virial¹⁰⁸ illustrate this dependency. Despite receiving Russian government subsidies specifically to produce cutting instruments,¹⁰⁹ Russian trade records show both Microbor's and Virial's production relies on imports of powdered cubic boron nitride and carbide from China.¹¹⁰ Microbor and Virial made sales to multiple Russian SODIEs between 2023 and 2024, including to main battle tank manufacturer JSC Research and Production Corporation “Uralvagonzavod”¹¹¹ and air-to-air missile producer JSC State Engineering Design Bureau “Vypel.”¹¹² Further analysis of these records indicates that Microbor and Virial's imports of Chinese-origin precursor materials and cutting instruments surged after February 2022,¹¹³ suggesting that the Russian defense industry has deepened its reliance on China for even the most basic manufacturing inputs. Neither Microbor nor Virial appear to be subject to sanctions or export controls at the time of this writing.

A - 5

Case Study: OSK.Wintech

While the majority of the case studies presented above involve Russian defense-adjacent firms investing in production inside China, the OSK.Wintech case presents one prominent instance in which investment ran the other way. The deal in question was made possible by the exit of Western suppliers as a result of sanctions. This case suggests that opportunities for market capture made possible by the sanctions risk-induced exit of Western companies inform Chinese decision-making regarding investment in the Russian defense industry. However, further research of Russian corporate records may be warranted to identify more indirect forms of Chinese investment.

In August 2025, PJSC Krasnoe Sormovo, a subsidiary of Russia's state-owned United Shipbuilding Corporation (OSK)¹¹⁴ shipbuilding concern, established a joint venture with Wuxi Ruierfu Marine Propulsion System Co., Ltd.,¹¹⁵ a privately owned Chinese company that could be connected to China's state-owned shipbuilding concern China State Shipbuilding Corporation (CSSC),¹¹⁶ to produce azimuth thrusters in Russia.¹¹⁷ Western sanctions provided Wuxi Ruierfu an opening to partner with Krasnoe Sormovo: OSK had previously ordered azimuth thrusters from a German company, only for deliveries to halt after Krasnoe Sormovo came under U.S. sanctions following Russia's February 2022 invasion of Ukraine.¹¹⁸ The resulting joint venture took the form of a Russian legal entity, LLC OSK.Wintech, with 70% of its shares allocated to OSK and the remaining 30% to Wuxi Ruierfu.¹¹⁹ Unlike OSK, Krasnoe Sormovo, and CSSC, neither Wuxi Ruierfu nor OSK.Wintech appears to be subject to any external economic or technological restrictions at the time of this writing.¹²⁰

Final ACW Systems

Though evidence of Russia offshoring production of full ACW systems is limited, Russian conformity declarations, social media, and leaked documents corroborate reports of a privately owned Russian defense contractor's plans to expand from importing final counter-UAV (C-UAV) systems from China to partnering with Chinese firms in developing such systems for the Russian military.¹²¹ Such an arrangement would satisfy Russia's urgent battlefield need for C-UAV capabilities given the drone-intensive nature of contemporary military operations in Ukraine and provide China with an opportunity to study Russia's use of Chinese C-UAV systems under battlefield conditions and fine-tune those systems accordingly in preparation for a potential military conflict over Taiwan.¹²²

A - 6

Case Study: TSK Vektor

LLC TSK Vektor¹²³ is a privately owned Russian defense contractor that is importing final counter-UAV systems from China.¹²⁴ Documents leaked in August 2023 indicate that TSK Vektor proposed developing counter-UAV systems for the Russian military in partnership with a consortium of Chinese companies, including a research institute, an end-to-end manufacturing facility, a logistics company, and an insurance company.¹²⁵ Russian declaration of conformity records confirm that TSK Vektor actively imports finished counter-UAV systems from China, while social media posts indicate that Russian forces are using such systems in the field.¹²⁶ TSK Vektor has been subject to sanctions and export controls from multiple jurisdictions since 2024.¹²⁷

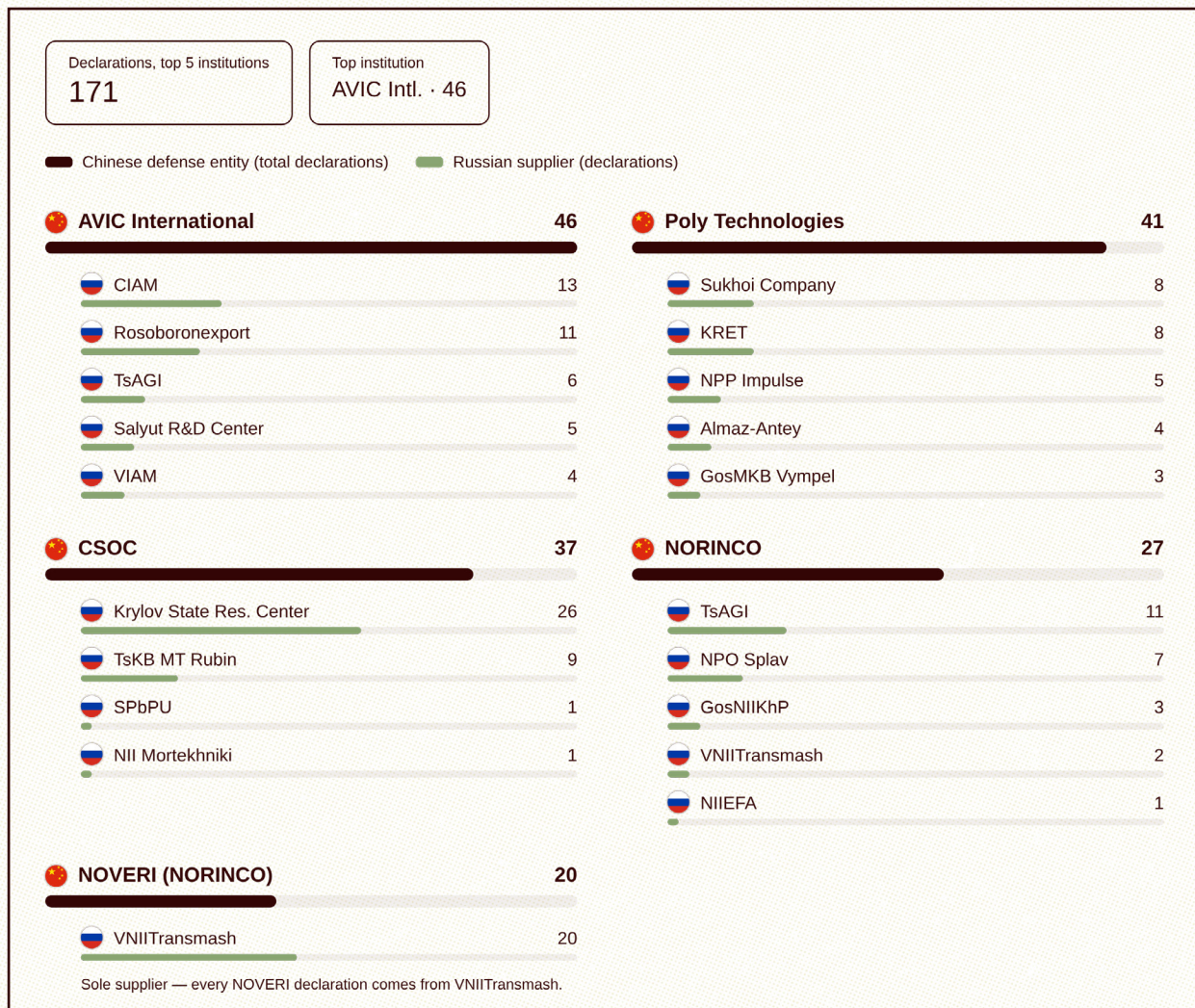
The Medium Term: State-to-State Design Sharing and Knowledge Transfers

Moscow is likely building on existing engagements to expand military-technical cooperation with Beijing and secure continued Chinese support for the Russian defense industry. Such collaboration operates as a resource multiplier and a commitment mechanism that reduces R&D costs while giving impetus to increased bilateral engagement between Chinese and Russian SODIEs.¹²⁸ Available Russian trade records from the 2010s onward indicate that Chinese and Russian SODIEs had already engaged in military-technical cooperation and that this cooperation continued in ACW-related knowledge transfers after Russia's February 2022 invasion of Ukraine.¹²⁹

Chinese-Russian state-level ACW R&D collaboration represents a lasting strategic challenge to U.S. and allied policymakers.¹³⁰ Joint ACW R&D pushes Chinese and Russian SODIEs together into sustained contact conducive to trust-building, an important task given that China also has a record of purloining Russian weapon designs.¹³¹ This collaboration has persisted even as the Chinese defense industry closes military technology gaps with Russia,¹³² though to what extent transfers of ACW technology and expertise by Russian SODIEs have facilitated China's catch-up remains unclear.

C4ADS assesses that Russia contributes niche expertise where it retains a genuine but increasingly slim technological edge, while China applies the transferred knowledge to accelerate ostensibly indigenous ACW programs. The analysis identified active collaboration between Chinese and Russian SODIEs through 2024 across multiple ACW systems—including conventional submarines, combined operations C2 systems, artillery-launched UAV systems, and aerospace designs and materials—which are detailed in the case studies below. Many of the engagements under concern predate Russia's February 2022 invasion of Ukraine but persisted thereafter. Structural factors limiting domestic R&D collaboration may also have incentivized Chinese SODIEs to seek out Russian ACW expertise.¹³³

Graphic 5: Chinese defense industry entities’ acquisition of technical materials from Russian peers, 2010-2025 (not including 2016).¹³⁴



Submarines

Chinese and Russian SODIEs likely engage in bidirectional exchanges of submarine technology. Russian trade records provide evidence of Chinese-Russian submarine technology collaboration from the 2010s through Russia’s February 2022 invasion of Ukraine. These trade records document exchanges of technical documentation and testing materials that corroborate existing media reports of joint Chinese-Russian conventional submarine design efforts, according to a maritime security expert consulted for this paper.¹³⁵ The exchanges under concern may have improved the automation technologies onboard fourth-generation Russian diesel-electric submarines and reduced the noise profile of equivalent Chinese submarines.¹³⁶

China’s submarine fleet—particularly its conventional, non-nuclear-powered fleet—was initially built on Soviet and Russian technology, though the Chinese Navy has since shifted to domestically produced platforms.¹³⁷ However, U.S. government sources assert China’s domestic nuclear submarine program continues to benefit from “substantial Russian technical assistance,” including submarine acoustic

signature reduction.¹³⁸ Experts assess that Chinese-Russian submarine collaboration encompasses acoustic reduction technologies, non-nuclear propulsion systems, automated C2 and weapon control systems, and submarine hull design, with Russian submarine SODIE JSC Central Design Bureau of Marine Technology Rubin (hereafter, Rubin),¹³⁹ a subsidiary of Russian state-owned shipbuilding conglomerate OSK,¹⁴⁰ serving as a critical nexus.¹⁴¹ Rubin is subject to U.S., EU, Japanese, and Taiwanese export controls, as well as to U.S., EU, and Japanese sanctions.¹⁴²

Media reports have long hinted at the extent of joint Chinese-Russian submarine technology exchanges. Chinese and Russian media reports from the early- to mid-2010s suggest Russia's fourth-generation Amur 1650 conventional attack submarine¹⁴³ paired Russian acoustic and propulsion technology with diesel-electric engine components and electronic command and weapon control systems from China.¹⁴⁴ Russia and China continued to jointly develop a non-nuclear submarine as recently as August 2020, according to Russian state media citing a Russian Federal Military-Technical Cooperation Service spokesperson.¹⁴⁵

A - 7

Case Study: Rubin-CSOI

Trade records corroborate these otherwise sparse public reports of joint Chinese-Russian submarine technology development. Analysis of these trade records indicates that Rubin engaged with PLA procurement authorities and China Shipbuilding and Offshore International Co., Ltd. (CSOI)¹⁴⁶—the foreign trading arm of Chinese state-owned civilian and military shipbuilding conglomerate CSSC—from at least August 2015 through April 2023 on the joint development of submarine-related technologies.¹⁴⁷ Across those eight years, Rubin sent PLA procurement authorities and CSOI a series of 12 shipments, valued at over US\$80 million; the descriptions provided for these shipments, while vague, appear to involve conceptual designs for a conventional submarine.¹⁴⁸

Two shipments made by Rubin to CSOI in October 2019 and January 2020 contained documentation related to various submarine-related tests,¹⁴⁹ including tests intended to gauge cavitation, a natural phenomenon detrimental to submarine stealth.¹⁵⁰ These details suggest that Rubin helped CSOI validate Chinese submarine quieting technology, according to a maritime security expert consulted for this report.¹⁵¹ The available data indicates that CSOI also provided Rubin with materials for use in submarine tests between December 2019 and September 2022.¹⁵² These materials included control instruments and console parts for testing a submarine “information control system,” with the September 2022 shipment citing a joint design and production contract.¹⁵³

Airborne Assault C2 Capabilities

Russian SODIEs working in coordination with Rosoboronexport have enhanced the PLA's ability to conduct multidomain military operations by providing Chinese peers with airborne assault C2 technology. Like Rubin's work with CSSC on submarine technology, these transfers reflect Russian SODIEs supplying Chinese peers with ACW technology potentially critical to PLA operations against Taiwan and raise the question of efforts to attain military interoperability between China and Russia.¹⁵⁴ Unlike Rubin and CSSC, however, the transfers at issue appear to have only benefited Russian SODIEs financially and did not entail reciprocal access to Chinese ACW technology. These transfers are further consistent with a sustained effort to deepen the PLA's reliance on Russian military technology for power projection purposes.

A - 8

Case Study: NIISU-CETC

Available Russian trade records, corroborated by leaked documents, indicate that financially beleaguered Russian C2 systems producer JSC Research Institute of Communication and Control Systems (hereafter, NIISU)¹⁵⁵ provided software, hardware, and R&D support to Chinese state-owned military and civilian electronics conglomerate China Electronics Technology Group Corporation (CETC)¹⁵⁶ from 2019 through early 2025 as part of this effort. The majority of the PLA's amphibious force equipment is domestically produced, though Beijing did acquire two Russian air-cushion utility landing craft in 2012, later building an additional two in China under license.¹⁵⁷ Similarly, while China's airborne force equipment is also primarily domestically produced, analysts have noted similarities between Chinese infantry fighting vehicles and Soviet and Russian analogs.¹⁵⁸

NIISU is subject to U.S., EU, and Japanese sanctions, among other jurisdictions, and is covered by U.S., EU, Japanese, and Taiwanese export controls.¹⁵⁹ OFAC has barred U.S. persons from investing in or purchasing securities from CETC, while several CETC subsidiaries are subject to U.S., Japanese, and Taiwanese export controls.¹⁶⁰

Leaked documents and reports from other organizations indicate that Rosoboronexport engaged NIISU to provide an automated airborne assault C2 system for PLA use under a contract signed with CETC in 2019.¹⁶¹ This contract committed NIISU to perform experimental design work aimed at incorporating this C2 system, referred to under the apparent codename Sword (Меч), into the chassis of the Chinese CSK-131A "Dongfeng" armored vehicle.¹⁶² The leaked documents indicate that Rosoboronexport engaged several other Russian SODIEs to supply amphibious assault vehicles and air-dropped armored personnel carriers parallel to NIISU's engagement with CETC.¹⁶³ NIISU probably regards the Sword project as a financial lifeline first and foremost.¹⁶⁴

The leaked Sword project documents indicate that the R&D components of the project largely relate to integrating Russian and Chinese software and hardware.¹⁶⁵ The documents further indicate that Russia would adapt and provide technical support for fusing Russian and Chinese technology, including adopting China's BeiDou satellite navigation system and friend-or-foe identification system, with both parties reportedly planning supplies of simulation programs to facilitate testing.¹⁶⁶

As reported by independent Russian media outlet The Insider, Russian trade records dating from 2020 to 2024 contain traces of the Sword project as well, corroborating the leaks and the project's existence.¹⁶⁷ Further review of Russian trade data indicates that Rosoboronexport, via NIISU, exported at least three shipments of technical documents to a CETC entity between December 2020 and June 2022.¹⁶⁸ The shipments bear the contract number signed between Rosoboronexport and NIISU to support the development of the equipment for China.¹⁶⁹

Drone Swarm Launch Systems

Russia's defense industry has probably advanced the PLA's ability to mass deploy drone swarms—a group of multiple drones whose individual conduct is autonomously coordinated in pursuit of a common objective¹⁷⁰—through the provision of ALUS technology. The PLA views ALUS platforms as a means of deploying UAVs into hostile territory with minimal flight time and exposure to air defenses, enabling sustained target identification, designation, and engagement,¹⁷¹ all capabilities critical in a Taiwan military contingency.¹⁷² These transfers further point to how individual instances of ACW cooperation between Chinese and Russian SODIEs might encourage subsequent engagements aimed at integrating certain sectors of both countries' defense industries.

A - 9

Case Study: SPLAV-Norinco

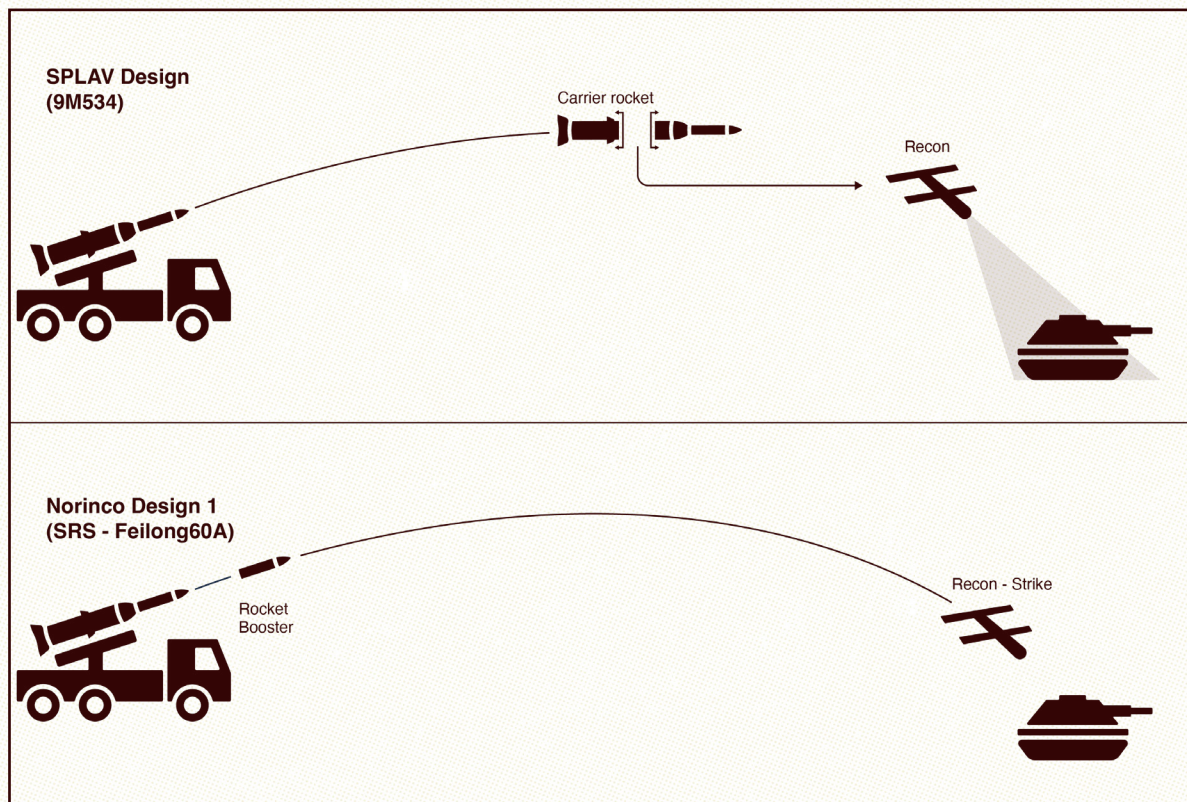
Russia's leading MLRS producer, JSC Science and Production Association "SPLAV" (hereafter, SPLAV),¹⁷³ likely provided Chinese arms conglomerate China North Industries Group Corporation Limited (hereafter, Norinco)¹⁷⁴ with ALUS designs between 2014 and 2022.¹⁷⁵ SPLAV's engagement with Norinco, like Rubin's with CSSC and NIISU's with CETC, reflects transfers to Chinese SODIEs of Russian ACW technology useful for potential PLA military operations against Taiwan. Public reporting, including SPLAV's press releases, corroborates the PLA's long-standing interest in SPLAV's MLRS-based ALUS designs.¹⁷⁶ Among other jurisdictions, SPLAV is subject to U.S., EU, and Japanese sanctions, and to U.S., EU, Japanese, and Taiwanese export controls.¹⁷⁷ Norinco is subject to U.S. investment sanctions and Japanese and Taiwanese export controls.¹⁷⁸

Russian media first reported on SPLAV's work with unspecified Chinese counterparts on an MLRS-based ALUS system in September 2015.¹⁷⁹ In March 2018, an executive with SPLAV's parent company, JSC Science and Production Concern "Machine Engineering Technologies,"¹⁸⁰ (Techmash) stated that SPLAV had begun "joint experimental design work" on an MLRS-based ALUS with "the Chinese side."¹⁸¹ SPLAV began supplying Norinco with technical documentation related to a "reconnaissance rocket" known as the KR-30RRS in February 2014.¹⁸² SPLAV continued supplying technical documentation related to the KR-30RRS to Norinco through December 2015.¹⁸³ Following an apparent six-year pause, Russian trade records suggest that SPLAV dispatched another likely batch of KR-30RRS-related technical documentation to Norinco on April 12, 2022.¹⁸⁴

Additional analysis identified no public references to the KR-30RRS, which is probably a code name for the 9M534 rocket, an MLRS-based ALUS design first unveiled by SPLAV in 2004.¹⁸⁵ Intended for SPLAV's 9K58 Smerch (hereafter, Smerch) MLRS platform, the 9M534's principal payload consists of a loitering reconnaissance UAV known variously as the T-90 and Product 9M61, which separates from the rocket after launch to collect targeting data for follow-up artillery strikes.¹⁸⁶ Russian media citations from October 2018 further report that the T-90's designer, Kazan-based Closed JSC Eniks (hereafter, Eniks),¹⁸⁷ received an order from an unspecified foreign state to create reconnaissance drones launchable from the 9K58 Smerch.¹⁸⁸

SPLAV's ALUS designs may have informed Norinco's development of its own drone swarm ALUS system. In March 2025, the Chinese government unveiled the Feilong 60A, a reputedly swarm-capable loitering reconnaissance strike drone designed for launch from Norinco's SR-5 MLRS platform.¹⁸⁹ Unlike Eniks' T-90 drone, which deploys from SPLAV's 9M534 rocket during post-launch flight, the Feilong 60A employs a disposable rocket booster to launch from the SR-5 before engaging in self-sustained flight.¹⁹⁰ Norinco separately tested a cannon-launched reconnaissance-strike ALUS known as Sky Eye or Tianyan (天眼) in June 2025, according to Hong Kong-based *the South China Morning Post*.¹⁹¹ It is possible (even likely) that Norinco developed the Sky Eye's ALUS separation mechanism using designs or data provided by SPLAV.¹⁹² These developments suggest SPLAV's documented knowledge transfers accelerated Norinco's development of ALUS platforms, though this assessment rests primarily on the functional equivalence between the systems at issue.

Graphic 6: Differences and similarities between MLRS-launched UAV systems designed by SPLAV (Russia) and Norinco (China).¹⁹³



SPLAV's apparent transfer of ALUS designs to Norinco may also have piqued Beijing's interest in jointly developing loitering munition platforms with Russian support.¹⁹⁴ In July 2026, independent Russian media outlet *The Insider* published a leaked slide deck detailing a proposal by a PLA military scientist to combine Russia's battlefield experience and China's advanced mass manufacturing capabilities for the joint production of autonomous loitering munitions.¹⁹⁵ The proposal positions China as an ACW production partner with Russia rather than as a mere recipient of Russian ACW know-how. The slide deck in question, which reportedly originated from a November 2023 Chinese-Russian military-technical cooperation conference, also includes a diagram that depicts MLRS-launched rockets flying across a narrow body of water to release drone swarms against ground targets on the opposite shore.¹⁹⁶ This diagram likely constitutes an oblique illustration of how the PLA would deploy ALUS in military operations across the Strait of Taiwan.

Aerospace Testing

Russian state-owned aerospace research institutions are helping Chinese peers and SODIEs test aircraft materials and designs, likely including for aerial ACW systems. The aerospace testing engagements identified include materials testing and wind tunnel tests for gauging the aerodynamic performance of airframe designs.¹⁹⁷ Iain Boyd of the University of Colorado Boulder's Aerospace Mechanics Research Center notes that such testing lowers development costs by verifying that aerospace designs can sustain flight before they are built into a test airframe for real-world trials.¹⁹⁸

Aerospace testing exchanges also help China and Russia's aerospace sectors overcome environmental and infrastructure bottlenecks that impede airframe research and development. Russia, for example, lacks a tropical climate that would allow plain-air testing of how airframe components fare in hot and humid environments, an important consideration for Russia's arms exports. This makes China, whose southernmost provinces do host a tropical climate, an ideal partner for aerospace materials testing of the sort described. Conversely, Russia boasts a robust and experienced aerospace testing base which Chinese SODIEs can use to cope with bottlenecks at home. Though the number of Chinese aerospace testing facilities has expanded in recent years, Boyd notes that China's growing aerospace testing base may still lack certain competencies already in Russia's possession.

A - 10**Case Study: VIAM-STERI**

C4ADS' analysis identified two instances of ACW-relevant convergence between the Chinese and Russian SODIE-adjacent aerospace testing entities. Engagement between the All-Russian Scientific Research Institute of Aviation Materials (VIAM)¹⁹⁹ and China's Southwest Technology and Engineering Research Institute (also known as No. 59 Research Institute,²⁰⁰ hereafter, STERI)²⁰¹ provides an illustration. VIAM is a Russian state-owned materials science center that conducts R&D related to aviation materials for aerospace, defense, and industrial customers.²⁰² STERI, a unit of Chinese SODIE China Ordnance Equipment Group Corporation, describes itself as a "large-scale national defense research institute" and reportedly specializes in environmental testing of military and civilian materials.²⁰³ VIAM is subject to Taiwanese export controls and to U.S., UK, and Japanese sanctions.²⁰⁴ STERI appears to operate free of sanctions or export control designations at the time of this writing.

VIAM and STERI's collaboration dates to at least 2012. The two institutes held a joint conference on climatic materials testing in November 2012.²⁰⁵ VIAM conducted a site visit in October 2019 to a STERI facility in China's Hainan province to test the corrosion resistance of various coatings, sealants, and other materials under tropical climatic conditions.²⁰⁶ A contemporary VIAM press release notes that STERI's Hainan facility serves as the "main center" for environmental tests of foreign-origin materials intended for use in the Chinese market.²⁰⁷

STERI has tested military dual-use materials for VIAM. Russian trade data shows that from August 2019 to October 2024, STERI conducted climatic testing on a range of VIAM-supplied aerospace materials, ranging from metallic alloys to rubber and plastics.²⁰⁸ The shipments began two months after VIAM visited STERI's testing station in Hainan, suggesting the tests focused partly on how the materials performed in a tropical climate.²⁰⁹ The materials tested included an enamel coating known as AK-1206 (AK-1206), which has been used to coat Russian military transport aircraft.²¹⁰

A - 11

Case Study: TsAGI-Norinco

Chinese SODIE Norinco appears to be using a cornerstone of Russia's aerospace testing infrastructure to branch out into designing aerial ACW systems. Federal Autonomous Institution "Central Aerohydrodynamic Institute" (hereafter, TsAGI)²¹¹ is one of Russia's leading aerospace R&D institutes and operates multiple wind tunnels for aerodynamic testing of civilian and military aircraft.²¹² Prior to Russia's February 2022 invasion of Ukraine, TsAGI maintained ties with Chinese defense industry entities, including AVIC, Norinco, and China Precision Machinery Import-Export Corporation, China's state-owned arms trading monopoly.²¹³ Russian trade records indicate that between 2014 and 2022, TsAGI transferred aerodynamic test materials, technical documentation, and aircraft models used in wind tunnel testing to these entities on 19 occasions, with Russian state-owned arms export monopoly Rosoboronexport listed as the payee for nine.²¹⁴

TsAGI is subject to U.S. and EU sanctions and to U.S., EU, Japanese, and Taiwanese export controls.²¹⁵ Nonetheless, TsAGI has deepened its collaboration with Norinco since 2022. It provided Norinco with Chinese-origin scaled model aircraft tested in TsAGI's wind tunnels, along with related aerodynamic testing data, at least nine times between 2022 and 2024.²¹⁶ Rosoboronexport again appears as the payee for the flying-wing model documentation TsAGI transferred to Norinco, indicating that the documentation was intended for military end-use.²¹⁷ TsAGI's extensive aerospace testing experience dovetails with apparent efforts by Norinco to diversify into aircraft design.

Although traditionally focused on land systems, Norinco has expanded into UAV development over the past decade, notably through its acquisition of a majority stake in Xi'an Aisheng Technology Group (hereafter, Xi'an Aisheng, formerly the 365th Research Institute).²¹⁸ Xi'an Aisheng is a long-running military UAV developer linked to Northwestern Polytechnical University (NWPU), one of a group of civilian universities with deep and long-standing institutional ties to the Chinese military and defense industry known as China's "Seven Sons of National Defense."²¹⁹ Xi'an Aisheng and NWPU have researched flying wing UAVs since the 2000s, potentially giving Norinco access to advanced designs that require aerodynamic testing support to mature.²²⁰

The Long Term: Emerging and Disruptive Technologies

Universities and other nonprofit research organizations set the long-term horizons of ACW research and development, supplying the scientific knowledge as well as the human capital behind defense industrial innovation. In China and Russia, state priorities steer this work toward defense ends.²²¹ Although not every engagement is militarily significant, the reputational fallout from the Kremlin's February 2022 invasion of Ukraine has hastened Russian universities' decade-old drift toward China.²²² Beijing and Moscow's support for expanded academic and civilian scientific exchanges since February 2022 portends a widening aperture for prospective ACW-related research between the two countries.²²³

Despite historical counterintelligence concerns, leading Russian defense industry-affiliated research universities have increasingly opened their doors to Chinese counterparts since February 2022, fulfilling a long-running objective for Beijing.²²⁴ These exchanges will likely consolidate institutional linkages between the two defense industries by nourishing informal networking among established and rising researchers. The number of Chinese students pursuing undergraduate and graduate degrees from Russian universities grew by 69% from approximately 29,600 individuals in 2020 to more than 50,000 in 2024.²²⁵

Unmanned Systems Automation

Persons affiliated with Russian universities are likely conducting joint research into automating unmanned systems—notably including combat UAVs—using robotic automation algorithms. Such algorithms could reduce the role of human operators in targeting and make drones harder to jam.²²⁶ The research engagements received support from Chinese defense industry-affiliated funds and were co-authored by algorithm specialists affiliated with Russian universities and researchers affiliated with Chinese SODIEs. The research output in question draws on established robotic automation algorithms and does not appear to have produced any notable technological breakthroughs. Nonetheless, the mere existence of this research output and the professional trajectory of these co-authors together implies the presence of preexisting social contacts and broader cooperation between the researchers involved.

Unmanned systems, or “drones,” have become an increasingly popular subject for joint study between Chinese and Russian researchers; their collaboration on drone-related research is growing. Analysis of Scopus academic journal citation records identified 86 journal articles with titles or keywords explicitly referencing “drones” or similar “unmanned” systems co-authored by persons affiliated with Chinese and Russian institutions between 2022 and 2026. Chinese and Russian researchers co-authored 36 such articles in the 13 years from 2009 to 2021—an average of roughly three per year, against roughly 17 per year since 2022.²²⁷

The earliest exchanges of military dual-use drone technology between Chinese and Russian civilian scientific institutions date back to the 1950s, when Moscow provided primitive UAVs to Beijing for use in target practice.²²⁸ Later, in 1991, the Institute of Marine Technology Problems (IMTP) of the Russian Academy of Sciences signed a contract with the Chinese Academy of Sciences' Shenyang Institute of Automation (SIA).²²⁹ That contract significantly advanced China's AUV development efforts, almost certainly to the benefit of China's naval capabilities, given IMTP's and SIA's ties to their respective countries' defense industries.²³⁰ But IMTP's work in China also exposed it to risks at home: In November 2020, Russian authorities detained then-IMTP director Aleksandr Shcherbatiuk on suspicion of improperly agreeing to supply an AUV to a Chinese company.²³¹

The two case studies in this section illustrate how Chinese-Russian academic contacts might foster joint research into prospective ACW technologies between both countries. The case studies in question show individuals from Russian defense industry-exposed universities and specialists employed by Chinese SODIEs working together on algorithms for automating unmanned systems. These research engagements appear aimed at pooling expertise to verify and cross-validate research results.²³² Indeed, these engagements map closely onto a proposal for Chinese-Russian loitering munition cooperation presented in a leaked November 2023 slide deck reportedly composed by a PLA military scientist.²³³

The interactions detailed in these case studies further suggest that ACW-related academic collaboration between Chinese and Russian research may also have value for the informal networking opportunities they provide, which have the potential to enhance the long-term institutionalization of defense industrial ties.²³⁴ Yet growing academic contacts also risk outflows of Russian scientific expertise and know-how to China's better resourced and more advanced innovation infrastructure.²³⁵ For Moscow, this cooperation carries a potentially self-defeating quality. Beijing's MCF policies can channel civilian research into defense applications, so expertise that Russian institutions contribute to joint programs may reach Chinese weapons developers. Over time, that dynamic could erode Russia's value as a source of legacy expertise and shift Moscow from a provider of military-technical know-how to a junior partner reliant on Chinese innovation.

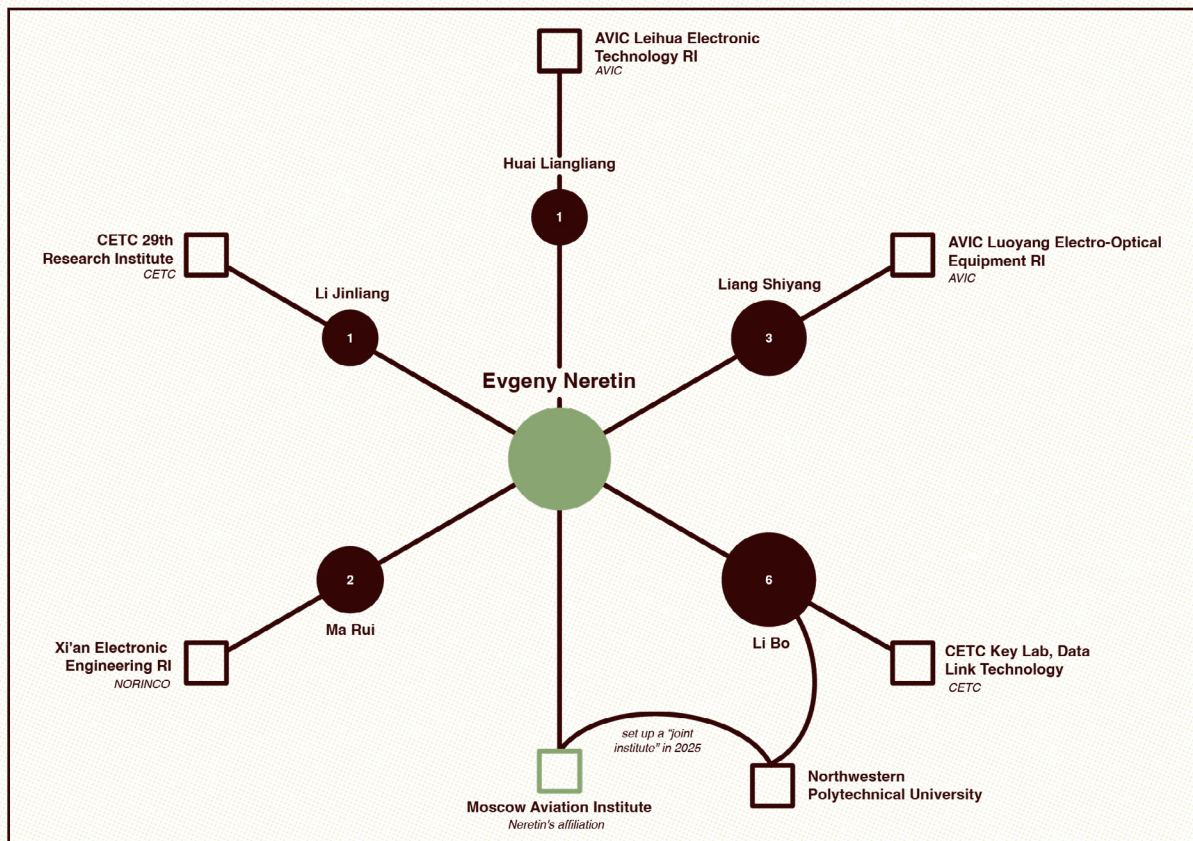
A - 12

Case Study: Evgeny Neretin

Analysis of academic citation data indicates that researchers at Moscow Aviation Institute (MAI) and Chinese "Seven Sons" member institution NWPU are actively studying Autonomous Decision-Making (ADM) applications for combat UAVs. Much of MAI's joint ADM research with Chinese partners appears to involve Evgeny Sergeyevich Neretin, who heads MAI's Department for Systems Design of Aviation Complexes.²³⁶ In addition to his work for MAI, Neretin also appears to have worked for civilian and military aircraft designer PJSC Yakovlev²³⁷ since at least 2016.²³⁸ Neretin's MAI profile indicates that he has previously published research on algorithms for flight path control and synthetic vision.²³⁹ MAI is subject to U.S. and EU sanctions and to U.S., Japanese, and Taiwanese export controls.²⁴⁰ NWPU is subject to U.S. and Japanese export controls.²⁴¹ The Chinese government approved the creation of a joint educational institute between NWPU and MAI in June 2025.²⁴²

Neretin has co-authored multiple papers on ADM algorithms for UAV autonomous combat decision-making with funding and research support from Chinese defense industry-affiliated institutions. Neretin's co-authors for several of these papers include Bo Li (hereafter Li), who is affiliated with the "Seven Sons of National Defense" member institution NWPU and CETC's Key Laboratory of Data Link Technology.²⁴³ Neretin visited NWPU in September 2023 with other MAI principals to sign a framework agreement aimed at promoting academic and research ties between the two schools.²⁴⁴

Graphic 7: Neretin's Chinese co-authors and their academic affiliations.²⁴⁵ The numbers in circles indicate the number of joint publications with each researcher.



Neretin's and Li's documented research spans from at least December 2021 through July 2025, and initially focused on algorithms for automating individual UAV maneuvers in one-on-one combat scenarios before moving on to algorithms for ensuring that multiple UAVs maintain formation and avoid collision while tracking targets in a complex environment.²⁴⁶ These latter research engagements are very likely relevant to the development of autonomous drone swarm capabilities, though additional research is required to ascertain whether and how Chinese and Russian defense industry entities uptake Neretin's and Li's findings.²⁴⁷ Neretin's published combat UAV algorithm research output with Li received funding from Chinese SODIE-affiliated laboratories;²⁴⁸ their co-authors on this output also included several persons affiliated with Chinese SODIEs, some of which are subject to U.S. and Japanese export controls.²⁴⁹

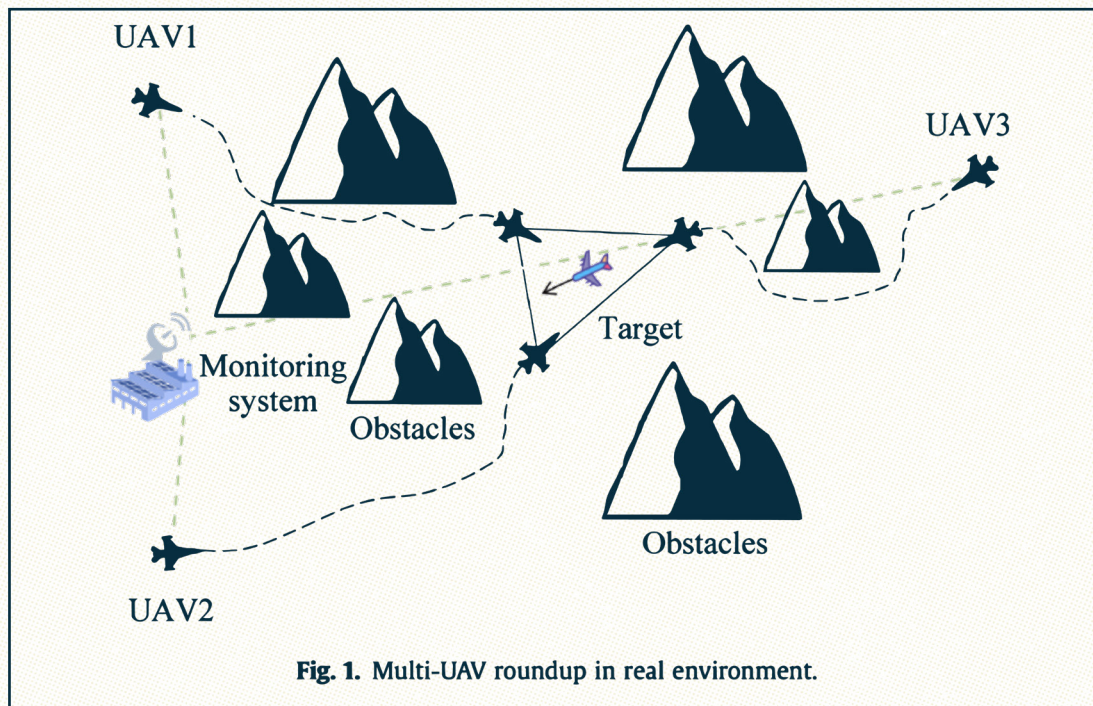
Neretin's and Li's work likely reflects an ongoing effort to develop practical battlefield applications rather than an attempt at achieving a qualitatively new technological breakthrough.

Experts consulted for this report assess that Neretin's and Li's published drone ADM research elaborates on algorithms already widely used for robotic automation.²⁵⁰ Yet while not technically advanced, their output reflects a research trajectory of applying algorithms toward increasingly complex combat UAV automation scenarios. The involvement of Chinese defense industry personnel in their research further suggests that Neretin's partnership with Li—who is himself affiliated with NWPU and CETC²⁵¹—falls within an MCF framework serving China's defense industrial interests.

Graphic 8: Neretin (second from left) photographed during a visit by MAI principals to “Seven Sons” member institution NWPU in September 2023.²⁵² Neretin and NWPU-affiliated peer Li co-authored several research papers concerning military-use UAV automation algorithms.



Graphic 9: Graphic from a 2026 paper co-authored by Neretin, Li, and other Chinese researchers. The paper in question details research into algorithms for ensuring that multiple UAVs engaged in tracking a target maintain formation and avoid collision while navigating a complex three-dimensional environment (reproduced under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (CC BY-NC-ND 4.0)).²⁵³



A - 13

Case Study: Ning Tang

The defense industrial networking potential offered by expanded Chinese-Russian academic exchanges is exemplified by Ning Tang (hereafter Tang). A graduate of a Chinese “Seven Sons” member institution, Beihang University (Beihang), Tang subsequently obtained a master’s degree in nanoengineering and a doctoral degree in technical science from N.E. Bauman Moscow State Technical University (Bauman) in 2024.²⁵⁴ A review of academic materials indicates that Tang was pursuing a joint doctorate in control science and engineering from Beihang and Bauman as recently as December 2025, though he appears to have also become affiliated with the Saint Petersburg-based Information Technologies, Mechanics and Optics University (ITMO) sometime before May 2026.²⁵⁵ Bauman is subject to U.S. sanctions, while Beihang is subject to U.S. and Japanese export controls.²⁵⁶

Graphic 10: Graphics from a May 2022 article on micro-UAV adaptive navigation algorithms co-authored by Tang while affiliated with Bauman and Yaning Wang of Norinco subsidiary, North Automatic Control Technology Institute (reproduced under a Creative Commons Attribution 4.0 International License (CC BY 4.0)).²⁵⁷

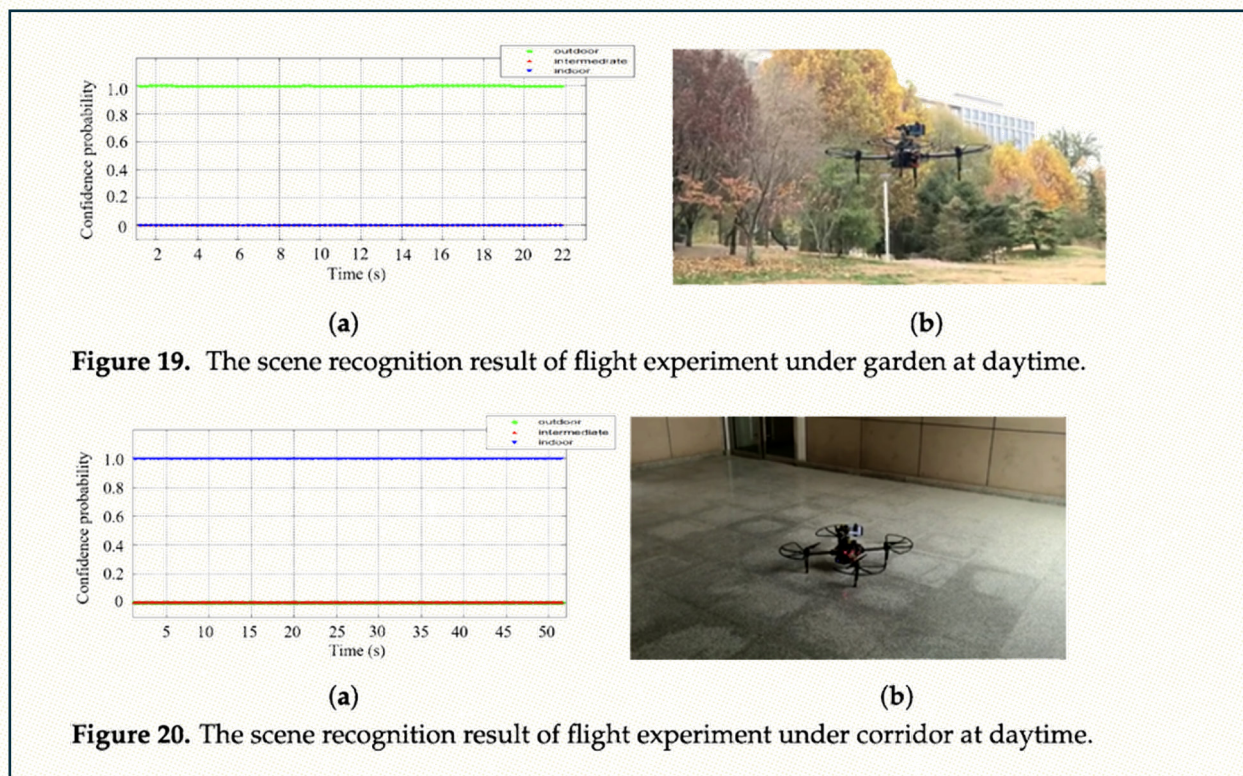


Figure 19. The scene recognition result of flight experiment under garden at daytime.

Figure 20. The scene recognition result of flight experiment under corridor at daytime.

Tang’s academic and professional trajectory has uniquely positioned him to build personal and professional networks between the Chinese and Russian defense industries. Tang co-authored at least two academic articles with researchers affiliated with Chinese defense industry entities while enrolled at Bauman, including:

- A 2023 conference paper on the use of computer simulations in testing a pathfinding algorithm, which Tang co-authored with two Beihang students and Jiajun Leng, a researcher affiliated with the Tianjin Navigation Instruments Institute that reportedly produces military-grade control and navigation systems for Chinese state-owned shipbuilding conglomerate CSSC.²⁵⁸
- A 2022 journal article on ADM algorithms based on neural networks and machine vision for improving the navigational capabilities of “micro aerial vehicles,” co-authored with researchers from Beihang and Yaning Wang, a researcher affiliated with Norinco-controlled autonomous weapons and “intelligent munitions” developer North Automatic Control Technology Institute.²⁵⁹

Tang has received at least one research grant from the Chinese national security-critical science funder National Natural Science Foundation of China.²⁶⁰

Russian-language sources from late 2025 and early 2026 link Tang to JSC Concern Central Research Institute Elektropribor (hereafter, TsNII Elektropribor),²⁶¹ a Saint Petersburg-based naval navigation systems developer subject to U.S., EU, and Japanese sanctions and export controls.²⁶² Abstracts for a May 2026 Saint Petersburg conference on integrated navigation systems associate a person using the Cyrillicized form of Tang’s name with TsNII Elektropribor and ITMO via a paper on Kalman filters, a widely studied class of algorithms used in numerous military applications.²⁶³ Though additional analysis identified limited information regarding the nature of Tang’s apparent ties to TsNII Elektropribor and ITMO, the available information indicates that Tang may have interned with TsNII Elektropribor as part of his apparent studies at ITMO.²⁶⁴

Expanded academic exchanges between Chinese and Russian universities will likely increase the number of informal contacts between current and rising generations of SODIE-affiliated researchers from both countries. These exchanges promise to enrich ACW development programs and cultivate durable institutional ties between the Chinese and Russian defense industries. The potential benefits of these exchanges are probably weighted toward China, however, as the number of graduate and post-graduate Chinese students attending Russian universities outstrips the volume of Russians studying in China.²⁶⁵

CONCLUSION

The engagements examined in this report vary in duration but reflect a common strategic logic aimed at boosting China and Russia's ability to research, develop, produce, and deploy ACW systems and their underlying technologies. These engagements collectively aim to reduce the two countries' dependence on Western technology, and thus minimize their vulnerability to Western economic and technological restrictions, in the near, medium, and long term. In the near term, private Chinese and Russian companies are integrating production and supply chains to feed the Russian defense industry's wartime demand for dual-use goods in circumvention of Western sanctions and export controls. In the medium term, China and Russia are aligning their defense industries and state-owned enterprises to support expanded joint ACW research and strategic capabilities development and integration. In doing so, Beijing and Moscow are racing to close technological gaps with rival militaries while reducing dependency on Western technology and building trust with each other in anticipation of potential armed conflicts with strategic rivals in the coming years. Isolated to varying degrees from Western peers, teachers and students at Russian universities are expanding research partnerships with Chinese SODIE-affiliated specialists to develop disruptive technologies that can degrade Western military-technical comparative advantage and promise to shape the long-term future of warfare.

The case studies presented in this report reflect broad dynamics, many of which predate Russia's February 2022 invasion of Ukraine but appear to have since accelerated as increasing economic and technological isolation deepens Russia's reliance on China. Two trends in particular drove Russia's shift toward greater transfers of ACW-related technologies and expertise and away from off-the-shelf sales of final ACW systems, which was never a strong interest for Beijing. These were: China's maturing industrial base, which diminished its demand for finished Russian platforms; and post-2014 sanctions against Russia, which narrowed Moscow's alternatives and left it more willing to part with previously withheld designs and technological expertise.²⁶⁶ Many of the joint ACW R&D engagements between Chinese and Russian SODIEs identified in this report date to this post-2014 period, and Russia's already growing economic dependence on China arguably set the stage for the latter's centrality to Russian defense industrial production and technology supply chains from 2022 onward.²⁶⁷ Similarly, research between Chinese and Russian universities into defense-relevant technologies was already growing in the years leading up to February 2022 and appears to have accelerated since then.²⁶⁸

But ultimately, Chinese-Russian ACW collaboration will likely prove self-limiting, especially where engagement might contradict Beijing's techno-nationalist priorities.²⁶⁹ This does not rule out Chinese-Russian cooperation in all realms of ACW R&D and production, especially given the institutional accretion of Beijing and Moscow's strategic partnership over the past two decades.²⁷⁰ Russia's economic elite appears to have resigned itself to mortgaging the Kremlin's techno-nationalist ambitions with Chinese financing.²⁷¹ Yet the durability of Chinese-Russian ACW cooperation appears tenuous, as a sustained engagement could eventually diminish Beijing's need for Moscow's best source of leverage: ACW-related technical expertise.²⁷² These dynamics tilt the gravity of ACW cooperation toward China as Russia trades long-term technological independence and technical indispensability for short-term gain.

Finally, this report demonstrates the utility of publicly available information for investigating Chinese-Russian ACW cooperation and exchanges. Government and SODIE press releases, trade records, aggregated corporate filings, media reports, leaks—whether currently accessible or removed from public

view but archived—can facilitate context-driven analysis of the short-term, medium-term, and long-term trajectories of this collaboration. Though publicly available information has limits, these limits are not so narrow as to prevent reasoned analysis of the technical salience and strategic value of the cooperation and exchanges at issue.

RECOMMENDATIONS

Washington, its allies, and its partners face a narrowing opportunity to act against Chinese-Russian ACW cooperation. This cooperation is deep but not fully locked in,²⁷³ leaving room for well-timed pressure to reduce momentum, raise costs, and outmaneuver China and Russia. Targeted strategies can still exploit unresolved economic and technological asymmetries, as well as divergences in national policy and strategic imperatives, between both countries. Successfully competing against this collaboration will require the United States and like-minded jurisdictions to prioritize dynamics under their influence, including scientific and technological innovation policies, allied relationships, and export controls, and adopt a shrewd approach in diplomatic engagements with Beijing and Moscow.

Competing against Chinese-Russian ACW cooperation requires commensurate investment in domestic scientific and technological innovation efforts. The White House's 2026 National Security Science and Technology Strategy is a strong step in that direction, though its prescriptions will likely fall short in the absence of a consistent, concerted approach to export controls on AI and other emerging technologies.²⁷⁴ Even so, the White House's current strategy helpfully recognizes that attaining U.S. technological leadership requires more, rather than less, engagement with U.S. allies and partners.²⁷⁵

Allied diplomacy will be critical to offsetting Chinese-Russian ACW cooperation. Cultivating greater scientific and technological cooperation through long-standing U.S. ally and partner networks, along with their respective academic and business communities, will position Washington to outcompete Beijing and Moscow's military-technical integration while maintaining Western comparative advantage. Allies can, and should, work together to develop a coalition designed to accelerate scientific progress and technological innovation at scale, including in ways that anticipate and counter the military-technical advancements of China and Russia.²⁷⁶ Such a coalition could also enable greater policy coordination and more effective containment activities, like sanctions and export control enforcement, as well as facilitate intelligence sharing.²⁷⁷ Strategic coherence in allied diplomacy will determine whether this pressure translates into results.

Diplomatic engagement with Moscow and Beijing must be targeted and astute. The United States, along with its allies and partners, should also pursue dialogue with Beijing and Moscow, separately, regarding ACW exchanges between their two countries. This dialogue, including efforts led by the United States, requires prior consultation among allies and partners to maintain trust and confidence. The aim should be to introduce friction into Chinese-Russian ACW cooperation, reducing momentum, raising costs, and exploiting vulnerabilities, rather than to provoke a rupture between Beijing and Moscow.

U.S., allied, and partner-country diplomats can work in concert to persuade Beijing that facilitating the Russian military's sustainment and eventual reconstitution will not serve China's long-term techno-nationalist objectives, which depend on access to Western markets, capital, and technology.²⁷⁸ Washington, its allies, and their partners can exploit this dependency by cautioning Beijing that continued collaboration with Russian counterparts exposes Chinese entities to sanctions and export controls, thus putting Beijing's own technological innovation efforts at risk. Diplomats should notify their Chinese counterparts of this prospect in advance to signal an opportunity to discuss off-ramps. In the meantime, expanding and enforcing existing sanctions and export controls against Russia will not only serve to maintain the credibility of these threats but will also force Moscow deeper into reliance on China, making it even more politically and economically vulnerable.

In consultation with partners, the United States should also engage Russia in backchannel dialogue concerning its ACW cooperation with China. These informal consultations must strive to avoid the appearance of confrontational demarche that would strengthen Moscow's preference for Beijing,²⁷⁹ though this may be unavoidable under the present circumstances. Nonetheless, U.S. interlocutors should present their Russian counterparts with publicly available information concerning specific ACW-related exchanges that appear to favor China at Russia's expense. Washington should also target Russian nationalist audiences with information regarding instances where China has successfully exported ACW systems based on Russian designs or otherwise benefited from Russian technology or expertise at the Russian defense industry's expense.

Exposing Chinese and Russian techno-nationalist tensions is unlikely to make Moscow reject Beijing's support for its military ambitions in Ukraine.²⁸⁰ But pointing out these tensions may prompt the Kremlin to adopt a more aggressive stance in policing Russian ACW-related cooperation with Chinese entities. Most importantly, Western allies should not offer Moscow sanctions relief in exchange for reduced ACW-related cooperation with Beijing until the Kremlin makes verifiable, good-faith progress toward ending its war against Ukraine.

Better resourcing and improved coordination will close export control enforcement gaps. Washington must do more to ensure that the U.S. Department of Commerce's Bureau of Industry and Security (BIS) has sufficient resources and information to restrict China's and Russia's access to U.S. cutting-edge technology,²⁸¹ and to shore up existing mechanisms designed to mitigate export control evasion and close enforcement gaps. Reinvigorated support for successful programs, such as the Disruptive Technology Strike Force, provides a concrete means to cut off adversaries from obtaining advanced technologies through direct enforcement action and private-sector engagement.²⁸² BIS and other export control enforcement agencies should also update key terms, relevant dual-use materials lists, and red flags for suppliers, logistics companies, and financial institutions to identify transactions and shipments that may involve illicit actors acquiring dual-use goods for the benefit of Chinese and Russian ACW-related R&D and production.

While Russia and China appear to be developing a military-industrial base designed to withstand sanctions and export controls, they still depend on critical foreign components and technology, which makes enforcement an ongoing pressure point.²⁸³ Enforcement varies by jurisdiction, but improved intergovernmental coordination can compensate for those differences. Effective enforcement hinges on consistency and coordination in action. Policymakers should track and, where possible, coordinate and amplify one another's measures. The aforementioned coalition could serve as the forum for doing so. Innovative instruments also warrant particular attention, such as the European Union's (EU) recent anti-circumvention tool to restrict specialized goods traveling to Kyrgyzstan that are at heightened risk of diversion to Russian military production.²⁸⁴ Additionally, the continuation of capacity-building security assistance, such as that conducted by the Department of State's Office of Export Controls and Border Security, can provide like-minded countries with the data, skills, capabilities, and other resources to better enforce their own customs and export controls.

Open-source investigations can complement government investigations, enable coordination, and support effective action. Investigations based on open-source information can illuminate key nodes and critical vulnerabilities where the impact potential for injecting friction and exploiting differences is greatest. Open-source investigations like those conducted by nongovernmental organizations, academia,

and journalists dramatically lower the threshold for information sharing and coordination between key stakeholder sectors and among allied governments and their respective enforcement agencies. A robust, well-resourced civil society can play a critical role in strengthening integrity and transparency in global commerce and finance, protecting critical industries from abuse, and promoting accountable, rules-based competition. However, sustaining such investigations requires significant investment. Governments and other bodies seeking to counter Chinese-Russian ACW collaboration should support NGOs active in conducting open-source investigations, and build programs to overcome the financial, technical, organizational, and jurisdictional barriers to coordination with enforcement bodies. NGOs themselves need to avoid retreating into institutional silos but instead partner with each other to produce nuanced, impact-oriented analysis that demonstrates the value of their combined knowledge and resources. It takes a network to defeat a network, and more collaboration—not less—is required to disrupt Chinese-Russian ACW cooperation.

APPENDIX 1: TABLE OF RELEVANT SANCTIONS AND EXPORT CONTROL MEASURES

This table provides a non-exhaustive list of relevant sanctions and export control measures.

Jurisdiction	Instrument/ Mechanism	Statutory Basis	Type of Measure	Application Against Russian Defense Industry Actors and Enablers
United States	Executive Order 14024 of April 15, 2021	International Emergency Economic Powers Act (IEEPA) of 1977	Blocking sanctions	Blocking sanctions on persons operating in Russia’s defense industrial sector, including third-country entities providing material support to entities in Russia’s defense industrial base.
United States	Executive Order 14114 of December 22, 2023	IEEPA	Secondary sanctions	Authority to sanction foreign financial institutions that facilitate transactions supporting persons operating in Russia’s defense industrial sector, including transactions involving the transfer to Russia of specified items such as machine tools, electronics, and other dual-use goods.

Jurisdiction	Instrument/ Mechanism	Statutory Basis	Type of Measure	Application Against Russian Defense Industry Actors and Enablers
United States	Lindsey O. Graham Sanctioning Russia and Iran Act of 2026 (H.R. 5334)	Self-executing statute	Blocking sanctions, travel restrictions, primary and secondary tariffs.	Requires blocking and visa sanctions on foreign entities or persons that knowingly sell, lease, or provide goods or services relating to the Russian defense industrial base, including CNC tools and associated machinery, software, and maintenance services. Further authorizes secondary tariffs on countries that purchase Russian energy products.
United States	Export Administration Regulations (EAR)	Export Control Reform Act of 2018	Export controls	Requires licenses for exports of dual-use goods, with a policy of denial for most license applications for Russia and additional restrictions on Russian military and defense industry end-users. Also grants extraterritorial reach over foreign-produced items based on U.S. technology or derived from U.S. tooling.
European Union	Council Regulation (EU) 833/2014 of July 31, 2014	Treaty on the Functioning of the European Union (TFEU) Article 215; Council Decision 2014/512/CFSP (Treaty on European Union [TEU] Article 29)	Export controls	Extensively prohibits EU persons from the sale, supply, transfer, or export of dual-use goods to Russia, or provision of military-technical assistance, with stricter restrictions on listed Russian defense industry entities. Requires EU parent companies to use best efforts to prevent their overseas subsidiaries from undermining these prohibitions.

Jurisdiction	Instrument/ Mechanism	Statutory Basis	Type of Measure	Application Against Russian Defense Industry Actors and Enablers
European Union	Council Regulation (EU) No 269/2014 of March 17, 2014	TFEU Article 215; Council Decision 2014/145/CFSP (TEU Article 29)	Blocking sanctions	Authorizes blocking sanctions on any entities and individuals responsible for or involved in supporting Russian aggression against Ukraine — including principals of Russian defense industry entities and foreign nationals involved in providing material support to the Russian defense industry.
European Union	Council Regulation (EC) No 765/2006 of May 18, 2006	TFEU Article 215; Council Decision 2012/642/CFSP (TEU Article 29)	Blocking sanctions and export controls	Authorizes blocking sanctions on Belarusian entities and persons involved in supporting Russian aggression against Ukraine and restricts exports to Belarus of military dual-use goods.
United Kingdom	Russia (Sanctions) (EU Exit) Regulations 2019 (SI 2019/855)	Sanctions and Anti-Money Laundering Act 2018, section 1	Blocking sanctions, export controls, and travel restrictions	Authorizes blocking sanctions, export controls, and travel restrictions on any entities or individuals involved in supporting Russian aggression against Ukraine.
Switzerland	Ordinance of March 4, 2022 on Measures in Connection with the Situation in Ukraine (SR 946.231.176.72)	Embargo Act of March 22, 2002 (SR 946.231)	Blocking sanctions, export controls, and travel restrictions	Largely follows EU blocking sanctions, export controls, and travel restrictions pertaining to the Russian defense industry.

Jurisdiction	Instrument/ Mechanism	Statutory Basis	Type of Measure	Application Against Russian Defense Industry Actors and Enablers
Japan	Foreign Exchange Order	Foreign Exchange and Foreign Trade Act (1949), Articles 16 and 21	Blocking sanctions	Authorizes blocking sanctions against Russian defense industry entities and their principals, as well as third-country enablers, designated through Japanese Ministry of Foreign Affairs and Ministry of Finance public notices.
Japan	Export Trade Control Order	Foreign Exchange and Foreign Trade Act (1949), Article 48	Export controls	Bans exports of military dual-use goods to Russia and Belarus, Russian and Belarusian defense industry entities, and third-country enablers.
South Korea	Public Notice on Export and Import of Strategic Items	Foreign Trade Act (1986), Articles 19 and 19-3	Export controls	Requires licenses for exports of dual-use goods and listed non-strategic goods with military-diversion risk to Russia and Belarus, which are denied in principle.
Taiwan	List of High-Tech Commodities for Exportation to Russia and Belarus	Foreign Trade Act (1993), Article 13	Export controls	List of high-tech commodities, including dual-use goods, machine tools, and drone components, requiring export licenses for Russia and Belarus, which are generally denied.

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