RUSSIAN FORCE GENERATION AND TECHNOLOGICAL ADAPTATIONS

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Note: The data cut-off for this product was 12 pm ET on July 24. This report focuses on technological adaptations and the Russian defense industrial base (DIB) and excludes reports on Russian force generation efforts. ISW will cover Russian force generation efforts in the upcoming Russian Force Generation and Technological Adaptations publication.

The Kremlin launched several programs aimed at introducing Russian schoolchildren to Russian combat drone production and operations, setting conditions to incorporate these children as experienced military drone manufacturers or operators in the future. Russian opposition outlet *The Insider* reported that the Russian Agency for Strategic Initiatives (ASI) created a network of clubs and training platforms to introduce schoolchildren to drone technology and operations, setting conditions to train these students to design, manufacture, and operate Russian drones.[1] Russian President Vladimir Putin approved the Berloga training program, which describes itself as a "cyber-physical gaming program," for Russian schoolchildren in July 2022, and the Russian government has supported the program by providing funding and incentives for children to participate in the program.[2] *The Insider* reported that the Berloga program teaches children to operate virtual drones for logistics support and defend against virtual aerial targets — exposing young children to logistics operations and counter-drone warfare that Russian forces currently employ on the battlefield, long before these children could start formal military training.[3] Berloga's developers claimed that the program aims to ensure that participants, of whom the program claims there are over 600,000, will eventually transition into programming and assembling real drones.[4] *The Insider* reported that Berloga program participants move on to the Kremlin-linked Sirius Educational Center, which incentivizes student participation with scholarships and job opportunities.[5] *The Insider* reported that the participants' work directly contributes to solving actual problems of the Sirius Center's partners, over 80 percent of which have direct links to the Russian defense industrial base (DIB) and many of which are drone and space-oriented. *The Insider* reported that the children involved at the Sirius Center are likely aware of their efforts supporting military applications, but that the center has likely forbidden the students from discussing the military affiliations.

The Insider reported that the actors affiliated with the Berloga program also modified the Archipelago intensive program in 2023 to focus on teaching participants — including students over the age of 14 years — drone operations, including racing and launching

drones, striking enemy targets, and conducting reconnaissance.[6] *The Insider* reported that Berloga also cooperates with the Yunarmia-run youth military-patriotic game Zarnitsa 2.0 and created a special drone course for Zarnitsa 2.0 participants aged seven to 21 to learn basic quadcopter piloting skills. Zarnitsa 2.0's organizers claimed in April 2025 that over 240,000 students completed the drone program that Berloga developed for Zarnitsa 2.0.[7]

Russia continues to use child and youth labor to produce drones at the Alabuga Special Economic Zone (SEZ) in the Republic of Tatarstan. Russian Ministry of Defense's (MoD) TV channel *Zvezda* published a 40-minute documentary showcasing the Russian Shahed (Geran) drone production plant in the Republic of Tatarstan.[8] The documentary stated that "boys and girls" from Alabuga Polytech College and ninth graders are actively involved in Shahed drone production at the SEZ. The Republic of Tatarstan government unsuccessfully attempted to change regional legislation to allow schoolchildren starting at age 14 to work at defense enterprises and amend the federal labor code to allow children 16 and over to work in hazardous and dangerous industries.[9] Georgia-based Russian *RZVRT* language YouTube channel and *Protocol* independent outlet reported in July 2023 that the Alabuga Polytech College recruited en masse students ages 15 through 17 to produce Shahed drones.[10] Russia's use of child labor in weapons manufacturing likely helps partially offset Russia's labor shortage.

Key Takeaways:

Russian Defense Industrial Base

- **The Kremlin launched several programs aimed at introducing Russian schoolchildren to Russian combat drone production and operations, setting conditions to incorporate these children as experienced military drone manufacturers or operators in the future.**
- **Russia continues to use child and youth labor to produce drones at the Alabuga Special Economic Zone (SEZ) in the Republic of Tatarstan.**
- **Russia continues to scale up its drone production amid Russia's increasingly large nightly long-range strike packages against Ukraine.**
- **Russia may abolish taxes for some Russian drone manufacturers to incentivize drone production at scale.**

Russian Technological Adaptations

- **The Russian Airborne Forces (VDV) are continuing to introduce new optical navigation systems and machine learning (ML) capabilities to the Chernika-2 drone.**
- **Russian developers recently modernized the Russian Lancet loitering munition and Z-16 reconnaissance drones by integrating ML capabilities and increased flight range, but have yet to scale Lancet use on the battlefield.**
- **Russian forces reportedly tested a new Posokh laser air defense system against drone targets as part of Russia's efforts to develop new**

countermeasures against drones that are not susceptible to EW interference.

- **Russian forces have reportedly been employing a new cluster warhead variant for the Kh-101 cruise missiles to strike Ukrainian cities since June 2024.**
- **Russian developers introduced a new unmanned surface vehicle (USV) for naval logistics named Briz.**

Russian Technological Adaptations (Assessed Russian objective: Introduce technological innovations to optimize systems for use in Ukraine)

Russian forces employed a new reconnaissance and decoy drone similar in appearance to the Shahed-136 (Geran-2) drone and entirely composed of Chinese components.[11] The Ukrainian Main Military Intelligence Directorate's (GUR) *War&Sanctions* project reported on July 22 that the drone can carry a warhead weighing 15 kilograms and has a delta-wing fuselage similar to but much smaller than the Shahed-136 drone. *War&Sanctions* reported that the drone's components are of Chinese origin and noted that some Chinese companies providing these components have previously restricted supplies of their products to Ukraine and Russia. *War&*Sanctions added that the drone is equipped with a Chinese copy of the Australian RFD900c data transmission module that allows Russian forces to organize a data transmission channel from a drone to its ground station or from one drone to another drone. *War&Sanctions* observed that these data transmission modules expand the drone's reconnaissance capabilities. A Kremlin-affiliated milblogger commented on the GUR's report on July 23 and attempted to downplay Russia's reliance on foreign components.[12]

The Russian Airborne Forces (VDV) are continuing to introduce new optical navigation systems and machine learning (ML) capabilities to the Chernika-2 drone. Former Donetsk People's Republic (DNR) Militia Spokesperson Eduard Basurin claimed on July 18 that VDV drone operators are testing a modified Chernika-2 reconnaissance drone with an optical navigation system and that this drone uses machine vision to automatically reach a predetermined target or position using images of the terrain uploaded to the drone.[13] Basurin claimed that machine vision capabilities enable Chernika-2 drones to return to specified points and that Russian forces can use the drone for tactical and operational tasks such as exposing the location of Ukrainian air-defense systems. Kharkiv City Mayor Ihor Terkhov reported that Russian forces struck Kharkiv City with a Chernika drone for the first time on June 30, noting that the drone has a warhead similar to that of the Russian Molniya strike drone but that the warhead has a different construction.[14]

Ukrainian defense outlet *Defense Express* reported on June 30 that Chernika drones have a lighter variant called Chernika-1 and a heavier variant Chernika-2.[15] *Defense Express* reported that Russian forces claimed to have produced 7,500 Chernika-1 drones in March 2024 and over 4,000 Chernika-2 drones in April 2024. *Defense Express* noted that the Chernika-1 drone is made of foam plastic and has a maximum range of 80 kilometers, a cruising speed of 75 kilometers per hour, a maximum flight altitude of up to 1.5 kilometers, and a warhead weighing 0.7 kilograms. Russian forces can launch the drone by hand or catapult it, and primarily use the drone to target vehicles and infantry. *Defense*

Express noted that Chernika-2 is more dangerous than Chernika-1 as the drone has a larger 3.5-kilogram warhead and a 100-kilometer range. *Defense Express* reported that Russian forces designed Chernika-2 to destroy dugouts and heavy military equipment and that Russian sources claim that the drone has homing functions and autopilot capabilities that make it less susceptible to Ukrainian electronic warfare (EW) interference. Russian forces reportedly received modified Chernika-2 drones in late April 2025.[16]

Russian developers recently modernized the Russian Lancet loitering munition and Z-16 reconnaissance drones by integrating ML capabilities and increased flight range, but have yet to scale Lancet use on the battlefield. Russian UAV producer ZALA conducted a demonstration of newly modified Z-16 reconnaissance drones and Izdeliye 51 and Izdeliye 52 variants of the Lancet loitering munition to Rosgvardia on July 7.[17] ZALA claimed that modified drones have increased resistance to EW due to new communication channels and autonomous navigation capabilities.[18] ZALA later published footage on July 15, reportedly showing Z-16 drones operating near Borzna, Chernihiv Oblast — over 100 kilometers from the frontline.[19] Ukraine's Kharkiv Operational Tactical Group reported on July 17 that Ukrainian forces destroyed two loitering munitions on July 16, similar to Lancet drones featuring integrated V2U artificial intelligence (AI) capabilities.[20] The Kharkiv Operational Tactical Group reported that the loitering munition has electronic engines, a flight time of an hour, a 3.5-kilogram warhead, and the ability to autonomously select targets.

A Ukrainian military expert reported on July 9 that Russian forces extended the Lancet's range from 35-40 kilometers to 80-110 kilometers in 2025 and are using these drones in limited strikes against Chernihiv Oblast.[21] The expert added that Russian forces practically stopped using Lancets in 2023 and instead employed cheaper Molniya strike drones, likely because it costs Russia $35,000 to produce Lancet drones. The expert noted that Russian forces are not using Lancet drones at scale because Russia needs highly specialized drone operators to operate these drones. The expert added that it is challenging for Ukrainian forces to counter Lancet drones because Lancet drones' electric motors are significantly quieter than the gas engines used in Shahed and Gerbera drones. The expert noted that Lancets also have optical navigation systems that improve their strike precision; are faster than Shahed drones; do not require complex launching platforms; and are fitted with a warhead of up to five kilograms. The expert noted that Russian forces tend to use Lancets for specialized tasks such as destroying armored equipment, whereas Russian forces used Shahed drones to strike targets with static coordinates. The expert observed that Russian forces typically launch two Lancet drones alongside one Orlan or Zala reconnaissance drone.

Russian forces reportedly deployed new EW and anti-drone systems to protect against Ukrainian drone strikes on the battlefield and Russian critical infrastructure. Ukraine's Unmanned Systems Forces (USF) reported on July 20 that Ukrainian forces destroyed a Russian experimental KOP-2 (Detection and Suppression Complex-2) EW system on an unspecified part of the frontline and noted that the system is another Russian attempt at developing countermeasures against Ukrainian drones.[22] The Ukrainian USF reported that the KOP-2 system scans a wide range of frequencies, detects the frequency at which a drone operates, and jams the drone with a powerful signal. The USF noted that the KOP-2 system is expensive and rare, and that Russian forces use the system to protect important targets such as air defense

systems from Ukrainian drones. Russian state-owned defense conglomerate Rostec reported on July 1 that Rostec's subsidiary Rosel presented the Radion-O anti-drone system, which aims to defend Russian critical infrastructure from drone strikes.[23] Rostec added that Russian law enforcement has already deployed the Radion-O systems to defend Russian gas and machine-building enterprises and that the system is composed of several modules that detect, track, and suppress drones.[24] Rostec announced on July 21 that Rosel tested the modernized Solaris-NS EW systems against first-person-view (FPV) and Mavik drones.[25] Rostec reported that Solaris-NS is a modernized version of the Solyaris-O for drone detection and the Solyaris-N for drone suppression, and can operate on ground, roofs, and stationary towers.

Russian developers have introduced new Kinzhal and Raketa drone interceptors. Russian sources published footage on July 7 showing the Russian ACF-Innovatsiyi drone development company presenting the Kinzhal drone interceptor, which reportedly has a speed of 300 kilometers per hour.[26] Ukrainian analysts observed that the Kinzhal interceptor drone is similar to the Yolochka drone interceptor that Russian forces already deployed to Ukraine and noted that no Russian drone interceptors have undergone a large-scale combat deployment yet.[27] A Russian milblogger also claimed that his team developed and tested a Raketa drone that targets larger Ukrainian aircraft and large drones.[28] The milblogger claimed that his team distributed 35 Raketa drone interceptors to Russian combat units and that his team created the interceptor amidst increasing Ukrainian use of large strike drones.

Russian forces reportedly tested a new Posokh laser air defense system against drone targets as part of Russia's efforts to develop new countermeasures against drones that are not susceptible to EW interference. Russian news outlet *Octagon* claimed on July 18 that Russian forces tested the static model of the Posokh air defense system against drones and that the system successfully hit imitation decoy drones at a distance of 500 meters in 0.2 seconds.[29] *Octagon* claimed that Russian developers will soon test the Posokh system at a distance of 1.5 kilometers and using drones imitating Ukrainian Lyutyi drones. *Octagon* reported that Russian forces are overwhelmingly relying on EW systems to counter Ukrainian drones and noted that modern drones are increasingly less vulnerable to EW interference as they do not rely on drone operators for optics and navigation. *Octagon* implied that Russian developers are rushing to develop laser systems to suppress autonomous drones, noting that the available Russian Zadira laser system is ineffective against the threat of a large number of AI/ML-powered drones because Russia designed Zadira to destroy individual UAVs. *Octagon* noted that Zadira can strike a moving target at a distance of five kilometers in five seconds and is highly mobile due to its autonomous power source, but cannot be used in rainy, snowy, or cloudy weather. Zadira reportedly engages one high-energy target, making it ineffective against a large group of drones. *Octagon* claimed that only the Russian Peresvet laser system can effectively combat a group of drones, but Russia does not have enough Peresvet systems to protect all critical infrastructure because this system is expensive and requires a complex installation process. Peresvet systems also have large energy requirements to create a high-power electromagnetic field that can destroy aerial targets at an altitude of 200 to 1,100 kilometers and a diameter of 130 to 180 kilometers.

Russian developers continued to develop new unmanned ground vehicles (UGVs) with integrated AI/ML capabilities. Russian sources claimed on July 14 that Russian developers created the Impulse-M ground robotic platform, which reportedly used AI/ML to autonomously determine the direction and the speed of the UGV's movement in the event of the UGV losing connection with the operator.[30] Russian sources claimed that Impulse-M's AI/ML capabilities are similar to those of Shahed (Geran) drones and that Impulse-M has a load capacity of up to 1,500 kilograms. Russian sources claimed that Russian forces can use Impulse-M systems to evacuate the wounded, deliver supplies, and inflict fire. Russian forces are reportedly testing Impulse-M systems in Ukraine. Engineers of the Kremlin's All-Russia People's Front coalition reportedly developed the Omich UGV, which is reportedly operating in Ukraine and can transport up to 500 kilograms and tow cargo weighing up to 1,000 kilograms.[31]

Russian developers introduced a new unmanned surface vehicle (USV) for naval logistics named Briz. A Russian Telegram channel posted footage on July 9 reportedly showing the Briz USV.[32] Ukrainian defense outlet *Militarnyi* reported that the Briz USV resembles a rigid inflatable boat with cargo and equipment superstructures, and observed.[33] The Telegram channel claimed that Russian developers plan to start serial production of the Briz USV in Arkhangelsk Oblast for civilian purposes, but *Militarnyi* assessed that the USV will likely serve a dual purpose and will support the Russian Navy.

Russian forces reportedly began using FPV drones with solar panels in Ukraine. Ukrainian electronic and radio warfare expert Serhiy "Flash" Beskrestnov reported on July 1 that Ukrainian forces observed Russian forces using FPV drones with solar panels, which enable the drone to wait on the ground for a long time before striking a target.[34] Beskrestnov specified that FPV drones cannot use solar panels to generate power while in flight.

Russian forces have reportedly been employing a new cluster warhead variant for the Kh-101 cruise missiles to strike Ukrainian cities since June 2024. OSINT analysts observed that social media footage published on July 12 suggests that Russian forces may have targeted Chernivtsi City with a Kh-101 missile armed with a cluster warhead.[35] The footage shows a string of detonations upon impact, which are reportedly consistent with detonations triggered by cluster warheads. Military outlet *The War Zone,* citing Russian milblogger and Ukrainian reports, assessed that Russian forces may have first used a Kh-101 missile with a cluster warhead in June 2024.[36] *The War Zone* added that Russian forces adapted and employed other Kh-101 modifications such as decoy capabilities, a fragmentation charge, dual-warhead capacity, and EW countermeasures to jam anti-aircraft missiles.[37]

Russian Defense Industrial Base (Assessed Russian objective: Increase Russia's defense industrial base production to support Russian war efforts)

Russia continues to scale up its drone production amid Russia's increasingly large nightly long-range strike packages against Ukraine. Russian Prime Minister Mikhail Mishustin claimed on July 8 that Russian state assistance for drone producers and innovators, including civilian producers, has allowed Russia to increase its production of aerial drones three times compared to the original planned volume, which Mishustin did not specify.[38] A Russian milblogger claimed on July 17 that a photo

fragment of a Russian-made Geran-2 (Shahed-136) drone with the serial number Y3000 indicates a significant increase in Russian domestic drone production and concluded that Russia has boosted its Geran-2 production by 7,000 drones since late May 2025.[39] Russia reportedly intends to increase its strike packages to include over 1,000 drones per day by Fall 2025.[40]

Russia has been working to scale up its drone production, especially its production of the long-range Shahed-type drones that Russian forces launch against Ukraine every night.[41] This production increase is reflected in how Russia has grown the size of its strike packages against Ukraine, having conducted over 10 of its largest strikes since January 2025. Ukrainian Commander-in-Chief General Oleksandr Syrskyi reported on July 8 that Russian forces have increased the number of missiles and drones launched against Ukraine by 1.6 times since about June 8. Russian federal subjects continue to ramp up regional drone production in support of Russia's war effort and long-term effort to revitalize the DIB. Beskrestnov reported on July 2 that it will take Russia over a year to increase its production by five times to launch 700 to 800 Shahed strikes per night.[42] Beskrestnov added that Russia is building another factory to produce Shaheds and has been able to intensify Shahed strikes by launching a new production line in Izhevsk and expanding production at the Alabuga Special Economic Zone. Rostov Oblast Governor Yury Slyusar claimed on July 22 that Rostov Oblast authorities plan to increase drone production by 10 times by 2030 and intend to become the leader in drone production in Russia, including through research, development, and production centers. ISW continues to assess that Russian drone production efforts are indicative of both Russia’s immediate goals on the battlefield in Ukraine and Russia’s long-term plans to increase drone and missile capabilities for any future conflict.

Russian sources continue to indicate that Russia's efforts to expand and centralize drone production are overlooking problems impeding Russian frontline drone operations. A Russian milblogger claimed on July 9 that Russian reports of increasing drone production overlook the battlefield ineffectiveness of FPV drones mass-produced in Russia and questioned how many of the drones that Russia produces hit their intended targets.[43] The milblogger claimed that Russian drones lack air repeaters that boost the signal of Russian FPV drones, impeding their range and ability to operate under EW jamming. The milblogger claimed that Russian FPV drone operators attempt to strike targets head-on while Ukrainian drones with repeaters take time to identify and attempt to strike the most vulnerable targets, allowing Ukrainian forces to establish tactical drone superiority on the frontline. The milblogger criticized the Russian military command for failing to provide repeaters for Russian brigade-level units, with the exception of the Rubikon Center for Unmanned Technologies units. Russian milbloggers have previously criticized the Russian military command's decision to allocate resources and staffing to its centralized drone units, including Rubikon, over drone units subordinate to or embedded within all regiments and brigades.[44] Russian occupation officials and milbloggers have also previously complained that the Kremlin's efforts to centralize Russian drone production are hindering Russia's ability to adequately scale up drone production and development.[45] ISW previously assessed that Russia's efforts to centralize drone operations under the Russian Ministry of Defense (MoD) would likely degrade the effectiveness of Russian drone operations, and Russian sources indicate

that Russia's efforts to also centralize drone production generate a similar and compounding effect on Russian drone effectiveness.[46]

Russia continues efforts to mitigate the effects of Western sanctions on machinery and components, which it needs to scale up its weapons and ammunition production. Russian President Vladimir Putin attended the launch of a new production line at the Magnitogorsk Iron and Steel Works in Chelyabinsk Oblast on July 16.[47] The Kremlin stated that the new production line intends to allow Russia to ensure import substitution of equipment necessary for the mining and metallurgy industries, likely to mine and refine raw materials that will support Russian weapons and ammunition production.[48] Putin also visited the Magnitogorsk Iron and Steel Works' new Coke Battery No. 12, a series of ovens that produce coke, a component in steel production.[49]

The Russian Government plans to allocate at least 765 billion rubles ($9.6 billion) for aircraft and helicopter production over six years.[50] Mishustin stated on July 15 that the funds will support the creation of aircraft, engines, electronic equipment, and various technical systems.

The Russian Government continues efforts to centralize control over small technology companies through state-funded economic benefits. The Russian Government's official newspaper *Rossiskaya Gazeta* reported on July 8 that the Russian Government plans to increase the number of legally-designated small technology companies in Russia to 11,000 and small technology companies' revenue by seven times by 2030.***[51]*** Russian State Duma Committee on Small and Medium-Sized Entrepreneurship member Alexey Govyrin stated that the Russian State Duma plans to reduce tax rates for legally-designated small technology companies in 2025 and increase benefits, including three percent interest rates on investment loans. *Rossiskaya Gazeta* reported that small technology companies are focused on developing advanced technologies and software and claimed that the “small technology company” designation allows the businesses to apply for grants, preferential lending, simplified accreditation, and other benefits. State Duma Defense Committee First Deputy Chairperson Alexey Zhuravlev stated that it is important for Russia to increase benefits for these small technology companies, as Russia has various military equipment and is looking to encourage younger entrepreneurs to innovate military-applicable technologies.

Russia may abolish taxes for some Russian drone manufacturers to incentivize drone production at scale. The Russian State Duma adopted a bill in first reading on July 17 that establishes a zero value-added (VAT) rate for manufacturers of light dual-use aerial drones that weigh between 0.15 kilograms and 30 kilograms.[52] The bill also established a zero VAT rate for imported engines, spare parts, and components for drone assembly, repair, and modernization. The bill specified that this VAT rate will be valid through December 2027. United Russia Central Executive Committee Head Alexander Sidyankin stated that the bill aims to reduce the cost of these light dual-use drones and drone components.[53] Sidyankin stated that Russia only “maintain[s] an advantage through the development of domestic technologies” and that this bill is in accordance with Russian Security Council Deputy Chairperson Dmitry Medvedev's prior instruction to the ruling United Russia Party to collaborate with Russia's Center for Unmanned Systems and Technologies to increase drone production.

The Russian MoD reportedly cancelled its Army-2025 international military technical forum scheduled to take place from August 11 through August 14. Sources in the Russian defense industrial base (DIB) told Russian state business outlet *Kommersant* on July 16 that the Russian MoD will not host the Army-2025 forum in Patriot Park, Moscow Oblast.[54] *Kommersant* observed that the official Army-2025 website still mentions that the forum will take place on the previously scheduled days and that the forum will be closed to the public. A Russian Telegram channel focusing on UAV development claimed that there were rumors for weeks among Russian milbloggers that the Russian MoD cancelled the Army-2025 forum and speculated that the July 1 Ukrainian drone strikes against Moscow City further indicated that Russia would not be able to effectively protect this event from drone threats.[55]

Note: ISW does not receive any classified material from any source, uses only publicly available information, and draws extensively on Russian, Ukrainian, and Western reporting and social media as well as commercially available satellite imagery and other geospatial data as the basis for these reports. References to all sources used are provided in the endnotes of each update.

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