The Impact of International Sanctions on Russia's Military Technologies

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The Russian defense sector is encountering significant roadblocks thanks to another round of international sanctions in response to Russia's invasion of Ukraine. A variety of Russia's military projects and existing technologies have been severely affected by the recently introduced sanctions against specific Russian companies or general bans on imports of hardware and raw materials into Russia. The military projects and existing technologies directly impacted by the latest round of sanctions include the following identified Russian technologies and equipment:

- A-100 Premier airplane
- Light helicopters Ansat, Ka-226T, and VRT500
- Airliners Sukhoi Superjet 100 (SSJ-100) and MS-21
- UAVs such as Orlan-10, Forpost, and Granat-2
- Baikal and Elbrus processors
- Ka-52 helicopters
- Su-30 fighter jets
- T-72 tanks, T-90 tanks, and the upgraded T-80BVM tank
- Persona optical surveillance satellites
- Next generation GLONASS K-1 satellites
- Lithium-ion battery production

Aircraft

The Russian A-100 Premier, an Airborne Early Warning and Control System (AWACS) plane, successfully completed its first flight with the complete multifunctional onboard radio-technical complex in February 2022. However, due to a lack of advanced electronic parts, the production of the A-100 Premier will be delayed at least until 2024.[i]

Additionally, Russia's ability to produce Ansat, Ka-226T, and VRT500 light helicopter variants will be significantly degraded by the fact that it can no longer import foreign-produced engines, specifically the Pratt & Whitney PW207V engine, which is currently used on both the Ansat and VRT500 helicopters. To replace the Canadian PW207V, UEC-Klimov Joint Stock Company (JSC) and other UEC enterprises are reportedly working on the creation of a VK-650V engine, which is not expected to be ready for deployment until 2023.[ii]

The basic version of the Ka-226 multi-purpose helicopter was originally equipped with Allison/Rolls-Royce engines, but is now dependent on two Arrius 2G1 gas turbine engines produced by Safran Helicopter Engines.[iii] The multi-purpose version of the airframe, the Ka-226T, is produced by KumAPP in Bashkortostan and is operated by the Armed Forces of the Russian Federation, the Ministry of Emergency Situations, the Federal Security Service, the Russian Guard, the Moscow Police Department, a subsidiary of Gazprom, and various medical

institutions.[iv] Additionally, the Indian Armed Forces have shown particular interest in the Ka-226T model, including establishing a joint venture in India for production purposes, an agreement which will also be put at risk due to the ongoing complications related to the engine export bans.[v] [vi]

While Russia states that, amid sanctions, it will accelerate the manufacturing and deployment of civilian aircraft – including the Sukhoi Superjet 100 (SSJ-100) and MS-21[vii] -- the production process will most likely take years given the high level of dependence on American and European manufacturers who have now banned all exports to Russia. Indeed, aside from other technical elements, both aircraft use imported engines which are no longer being sold to Russia:[viii] The SSJ-100's SaM-146 engines are produced by the Russian-French company PowerJet, while MS-21 aircraft were tested with the Pratt & Whitney PW1400G engine.[ix]

A-100 Premier

KA-226T Helicopter

Weapons Requiring Microchips

A comprehensive ban on exports to Russia by key microchip producers has created a host of problems for the country's defense sector, which largely relies on imported microcircuits.[x] Russian drones, guided missiles, helicopters, fighter jets, vehicles, and electronic warfare equipment all require microchips. Now, under new U.S. sanctions, even some of the most basic chips cannot be shipped to prohibited Russian entities.[xi] The U.S. ban on selling high-tech products (including semiconductors and telecommunications systems) to Russia and its ally Belarus also extends to certain foreign items produced with U.S. equipment, software, or blueprints. South Korea, Taiwan, and Japan followed up with a direct ban of exports of hi-tech products, including semiconductors, censors, and communication equipment. Losing access to top-end chips from these countries undercuts Russia's efforts to develop advanced weaponry, AI, and robotics.[xii]

The importance of Western chips for Russian military equipment is confirmed in a report by the UK organization, Conflict Armament Research, based on the Russian military equipment that has been retrieved from armed formations of the self-declared Donetsk and Luhansk 'People's Republics' (DPR and LPR) in eastern Ukraine since 2018. The investigation discovered that Russian unmanned aerial vehicles, such as Orlan-10, Forpost, and Granat-2, may have used chips from Intel, NXP, Analog Devices, Samsung Electronics, Texas Instruments, and STMicroelectronics.[xiii]

Forpost UAV

Orlan-10 UAV

Microchips manufactured in Russia are insufficient to ensure domestic production of Russian microcircuits for large-scale computing or portable devices. Chips of the required size are not available due to sanctions, and this could put an end to the production of the domestic Baikal processor and the latest models of the Elbrus processor within the old technological chain.[xiv] "The Russian government has been encouraging large domestic companies and banks to use Elbrus chips in their computers because the components are designed in Russia, but they have received a failing grade from all institutions in trials."[xv]

Optical Reconnaissance and Communications Satellites

In 2020, the head of Roscosmos (Dmitry Rogozin) stated that Russian GLONASS satellites reportedly contain ~20% of imported equipment,[xvi] while other experts suggest that up to 90% of the electronics used in the next generation GLONASS K-1 satellites are imported.[xvii] If Roscosmos has partly managed to adapt to the sanctions of 2014-2015, in 2022 new restrictions appear to be much more extensive. Suspension of the supply of Taiwanese microchips alone has had a severe effect on satellite manufacturing in Russia and the restructuring of new supply chains will take several more years.[xviii] Technical difficulties are also expected to affect satellite-based military communication systems, forcing them to function without adequate updates.[xix]

During the 2022 invasion of Ukraine, Russia was already reportedly having problems with target designation and ground-orientation due to the lack of up-to-date high-resolution satellite images. According to a database maintained by the Union of Concerned Scientists, a U.S. nongovernmental organization, Russia currently has ~100 military or dual-purpose satellites. 19 of them are classified as remote sensing satellites, with technology allowing either optical photography or radio signal surveillance.[xx]

Russia has few optical surveillance satellites remaining, including 2 units of the Persona model, Persona-2 or Cosmos 2486, and Persona-3 or Cosmos 2506, and they are close to the end of their service life (having been launched between 7-9 years ago). The creation and launch of new satellites is also hampered by sanctions imposed on Russian companies since the annexation of Crimea and the 2014 war in the Donbass.[xxi]

It is also becoming increasingly difficult for Moscow to maintain and operate a sufficient number of GLONASS satellites (GPS equivalent) to ensure accurate and uninterrupted system operations. Russia appears to be experiencing problems in satellite communications: As military communications intercepted by Ukrainian special services and volunteers show that modern portable satellite communications systems, such as Auriga 1.2V[xxii] work intermittently, soldiers and officers are forced to switch to unsecured communication channels and unwittingly reveal the content of their communications to the enemy.

GLONASS-K1 Model

Persona Satellite Model

Night Vision Devices

Despite the EU sanctions following Russia's 2014 annexation of Crimea and occupation of the Donetsk and Luhansk oblasts, two French companies, Thales and Safran, continued to supply night vision devices for Russian military vehicles and troops until as late as 2020. This equipment has enabled Vladimir Putin to modernize 1,000 Russian tanks, navigation systems, and infrared detectors for fighter jets.[xxiii] Special Matis STD cameras made by Safran were meant for T-72 tanks as well as for T-90 tanks and the new T-80BVM tank. Thales equipped 60, two-seat multipurpose Su-30 fighter jets with TACAN navigation systems. Russian jets also received Safran-manufactured Sigma 95N systems, which provide autonomous navigation even in Global Navigation Satellite System (GNSS)-denied environments. The French companies also supplied target sight systems for Ka-52 helicopters."[xxiv] Today, Russians can no longer hope to conclude new deals with Western firms and must rely solely on domestic production of night vision equipment.

T-80BVM Equipped with Night Vision

Su-30SM Fighter Jet

Lithium-Ion Batteries

On April 12, 2022, Argentina and Chile announced the suspension of lithium shipments to Russia.[xxv] The halt of such imports poses a major threat to the manufacturing of lithium-ion batteries, which are essential for the defense sector as they are used in communication tools, weapons systems, portable devices, military vehicles, surveillance, etc. According to the Deputy Department Director of the Russian Ministry of Industry and Trade (Vladislav Demidov), Bolivia remains the only key supplier of raw lithium to Russia, and Russian companies are preparing to start lithium feedstock mining in Russia. However, within the country, the extraction of lithium compounds comes from spodumene ores with a very high cost. Satisfying the demand of the Russian battery industry with such products is not feasible according to Russian economists.[xxvi]

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