



# The Rise of Russia's Hi-Tech Military

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## INTRODUCTION

Following the end of the Cold War, the Russian Federation lagged behind the United States in terms of advanced technology in warfighting. However, after substantial spending on modernization starting in 2008, the Russian military and the nation's defense sector have been making great strides at developing remotely operated and autonomous technologies and integrating them in their tactics and combat operations. Russia is also starting to invest in Artificial Intelligence (AI) development with specific military applications. These developments affect the ability of the United States to meet the goals in its new National Security Strategy; in order to meet its stated December 2017 objective of renewing American competitive advantage in key military areas, the United States should be aware of key adversarial developments such as Russia's emerging unmanned, autonomous, and AI capabilities, and prepare itself in terms of appropriate capabilities, tactics, and plans.

## DEFINING THE THREAT...

The Russian military establishment has discussed potential threats over a number of years, seeking to analyze both likely adversary and domestic capabilities. Such deliberations gained greater importance following Russia's own military experience in Syria since 2015, when the Russian government and its generals began noting advanced technology like autonomous and robotics systems as significant mission multipliers. In fact, Russian military experience in Syria has proved crucial in testing out concept of operations (CONOPS) and tactics/techniques/procedures (TTPs) for future conflicts. For example, in 2017, Russian President Vladimir Putin said that autonomous robotic systems can cardinaly change the way Russia's military operates, calling the use of military robotic systems a major pivot in the right direction.[1] In March 2018, General Valery Gerasimov, the chief of the General Staff of the Russian Armed Forces, noted that Syrian conflict represented the "contours of future war." [2] He called the Syrian experience "priceless" for Russia's military, [3] pointing out that the United States and its allies used a wide arsenal of high-tech weapons there, such as drones, satellites, and various robotic systems, alluding that the Russian military was learning from its potential adversary and trying out similar tactics and technologies in combat. [4]

Such tactics and technologies were also reviewed in 2016 by Putin, who said that the operation in Syria had demonstrated "qualitatively increased capabilities" of the Russian army and navy. [5] In December 2018, Gerasimov noted that the main emphasis in the training of his country's military is placed "on the potential opposition to the high-tech enemy," without explicitly naming the American or NATO forces. [6] "...We teach the troops to conduct combat operations with a high-tech adversary equipped with the most modern weapons, under the conditions of conducting all types of reconnaissance and electronic exposure, massive use of aircraft and high-precision weapons," the military commander said. [7]

Today, Moscow firmly understands the need to base the development of its armed forces on the creation of modern weapon systems: advanced complexes ensuring the use of the latest technologies, such as military robotic systems and unmanned aerial and naval autonomous systems. [8] According to Dmitry Rogozin, the former deputy prime minister who currently heads the Russian space agency Roscosmos, the country's State Armament Program for 2018-2025 addresses this need by being "inherently innovative," and by aiming to create "intelligent" weapons, automatic control systems, and new communications and intelligence systems. [9] In particular, the program addresses the development of ground-based automated systems and unmanned aerial vehicles for Russia's armed forces. [10]

## ...AND MEETING THE CHALLENGE

Today, the Russian military's burgeoning fleet of unmanned aerial vehicles (UAVs) provides a key mission multiplier. Currently, the Russian military has more than 2,100 unmanned aerial vehicles throughout its services, according to the Ministry of Defense (MOD). [11] This makes the Russian unmanned aerial fleet one of the largest in the world, behind American (at more than 10,000 UAVs) and possibly larger than the Chinese fleet. [12] Moreover, starting in 2019, under the defense procurement plan, the Russian military will get more than 300 short-range UAVs annually. [13] While until recently Russia lagged behind other powers such as the United States, Israel, and China in developing long range combat unmanned aerial platforms, Moscow has proven very adaptable in using its existing capabilities in its military TTPs.

The vast majority of Russian military drones are unarmed, lightweight, short ranged, and relatively inexpensive. The workhorse of the Russian UAV fleet today is a domestically-produced Orlan-10, with a range of up to 120 km, forming nearly half of all UAVs flown by the Russian military.[14] With a range of up to 250 km, medium altitude, long endurance (MALE) drones known as Forposts are Russia's current longest-ranged UAV. The Forpost-class UAV is itself an older Israeli design assembled in Russia under a license agreement.[15]

Although Russian drones have primarily been used to support land-based targeting, the Russian military is developing unmanned aerial systems for use in a number of different missions, such as an intelligence, surveillance, and reconnaissance (ISR) and targeting platform for tanks[16], artillery, and ship-based missiles. Other disparate examples include UAV support to the security of Russia's mobile Strategic Missiles Forces and for monitoring conditions at sea.[17]

The Syrian campaign proved unprecedented for Russia in fielding unmanned aerial platforms. According to the MOD, Russia's drones have flown at least 23,000 sorties and logged 140,000 hours supporting intelligence, surveillance, reconnaissance, and target acquisition missions, far exceeding the number of sorties flown by manned aircraft in that campaign.[18]

### **...ADDRESSING KEY CAPABILITY GAPS IN THE AIR...**

December 2018 was marked by a series of key announcements from the MOD about the country's growing unmanned combat aerial systems capabilities.[19] Going into Syria in 2015, Russia was lacking a key combat element — the ability to hit targets quickly following their identification and confirmation, one of the key functions of unmanned combat aerial vehicles (UCAVs) around the world today. Moscow's experience in Syria underscored that point; despite fielding a large number of ISR drones that enabled Russia to be more precise in combat, the majority of targets were hit by manned aviation or manned artillery forces. Hence the push today to field an entire lineup of strike-capable UAVs for a diverse range of missions. Recently, Putin announced that key propriety areas for Russia's military in 2019 include an emphasis on "robotic systems" development alongside artificial intelligence.[20]

Over the past decade, the lack of key expertise and high-tech components needed to build long-range combat and strike UAVs have challenged the Russian defense industry. Delays in deliverables also plagued the efforts by Russian organizations and enterprises that pioneered work on UAV systems in the country. As a result, the entire schedule of many projects was delayed by several years. A good example is Simonov Design Bureau, the company originally in charge of building a long-range high altitude, long endurance (HALE) UAV known both as Altair and Altius.[21] This was one of the most ambitious UAV projects in Russia - the objective was to build an indigenous drone capable of carrying up to 2.5 tonnes of cargo, equipment, and weapons to a distance of up to 6,000 miles. Earlier estimates that this UAV would be fully operational by 2018 did not prove true. After Simonov depleted its budget allocated for the project and asked MOD for more funding, the defense establishments transferred key parts of the project to UZGA defense enterprise. The new managing company is the same one responsible for assembling Forpost UAVs for the military. In December 2018, MOD promised that the Altius would take to the skies in 2019 - given the fact that Simonov has produced a prototype that has already flown, this promise may indeed materialize.[22] The real issue will be the quality of that test flight — whether Altius will fly as intended and with the right amount of key equipment.

The MOD also mentioned work on a strike version of the Forpost mid-range drone. Capable of distances up to 250 kilometers, it is currently Russia's longest-ranged drone. Under the earlier license agreement with Israel, this UAV could only be assembled as an ISR version. The Russian military values this particular unmanned vehicle and has long wanted to turn it into something more than an extra pair of eyes in the sky. Today, UZGA, the defense enterprise responsible that for assembling it in Russia, claims that the "Russified" version of Forpost is already available and carries Russian-made components so that no further cooperation with and dependence on Israel would be necessary.[23] Adding strike capabilities to Forpost would give Russia an immediate ability to hit targets within a 250 kilometer range — in other words, giving it the ability to strike most adversary targets in Syria where Russian forces are still conducting operations. Given that Forpost itself is an older UAV model, it is likely that the Russian military will use it as a test bed to further refine its UAV manufacturing abilities, as well as to test indigenous munitions.

The MOD likewise named Orion UAV as another unmanned vehicle that is set to fully see the light of day in 2019.[24] Orion shares similar characteristics with Forpost, such as a range of 250 kilometers.[25] It is possible that its range could be extended further — current Orion versions are showcased as ISR models, but there have been discussions that an armed version could be offered for export. This particular UAV has similar design features to the ever-growing family of unmanned aerial vehicles all over the world; it bears close resemblance to the American RQ-9 Reaper and Chinese CH-4 and Ch-5 drones, as well as to the Iranian Shahed and Turkish Anka UAVs.

The Russian Ministry of Defense also mentioned Ohotnik UCAV.[26] The Ohotnik is the most intriguing and interesting project of its kind in Russia. Originally started around 2011-2012, this UAV has also been delayed by a number of years. In the fall of 2018, MOD carried out the first "taxiing" test, where an Ohotnik prototype was accelerated on the runway to test its engine. For 2019, the Russian defense establishment has promised a test that will include a short-duration "jump" — the UCAV will rise ever so briefly above the tarmac to test its launching and landing capabilities. It will be Russia's heaviest and fastest UAV when fielded, but additional testing and evaluation needs to take place in order for this unmanned system to be fully functional. Its high speed - up to 1000 km/hr, and heavy weight, projected to be at up to 20 tonnes - means that a host of aerodynamic, electronic, and high-tech issues need to be worked out.[27] Given the delays experienced with the Altius project, the MOD should probably be more conservative with Ohotnik estimates. However, the very appearance[28] of the Ohotnik rising in the air - a stealthy blended-wing design - will be a powerful PR coup for a country that has lagged behind nations such as the United States, Israel, and China in actual UCAV development and combat use.

There are other UAV platforms that the Russian defense establishment has been testing and evaluating. One of such systems is the Korsar MALE UAV, which the Russian military exhibited at the May 9 Victory Parade in Moscow.[29] Today, the Korsar is ranging up to 180 km, and it too could have an extended operational range in the near future. Supposedly, this UAV was actually tested in Syria.[30] The Russian military is also evaluating the Carnivora UAV with the capacity to hunt smaller adversary UAVs and deliver munition strikes.[31] All these UAVs, if and when fielded as planned and as advertised, will give Russia the capability to strike targets at a range anywhere from 250 kilometers up to several thousand kilometers. Moreover, these and other unmanned aerial systems in development are designed with the ability to operate in an environment when radio-electronic signals are suppressed, as well as to navigate without GPS or GLONASS.[32] Such technology capabilities could give the Russian military the flexibility it has long sought – for example, its Syrian actions depended on manned airborne assets conducting deep-strike against designated targets, which in turn depended on an extensive logistics and infrastructure network to support such missions. Launching long-range UCAVs that would take off from Russian (or Russian-allied) territory would exponentially increase MOD's ability to conduct missions in the near abroad and possibly around the world. Of course, that would depend largely on the domestic defense sector actually delivering what was initially promised, something that some UAV projects have so far struggled to accomplish.

Moreover, while the Russian military has gained extensive experience operating a wide range of close and short-range UAVs and has commenced force-wide training and usage of these unmanned systems, operating large and heavy drones would be a different story. This kind of technology requires different training, as well as different logistical and infrastructure support. Getting these UCAVs into the military will require a change to existing CONOPS and TTPs, something that will take time as the Russian military will need to become familiar with a different level of technological sophistication. Still, these UAVs are finally moving past the prototype stage. With the Ministry of Defense paying very close attention to these projects, these designs' announced 2019 debut is likely; however, their eventual acquisition is still years away. Nonetheless, Russia's potential "high-tech adversaries" have been put on notice, and the time when the United States military reigned unchallenged with its MALE and HALE UAVs is nearing its end. Russian UCAV plans will have important implications for the way Moscow thinks about, designs, tests, and eventually conducts warfare.

**...ON LAND AND AT SEA...**

When it comes to Russia's unmanned ground systems (UGVs), the country is developing an entire lineup to meet various combat needs.[33] These include small systems for better ISR to large, tank-sized vehicles loaded with long-range, anti-tank and anti-aircraft weapons. While most of them are still undergoing testing and evaluation, some have already undergone a trial by fire. Russia took its heaviest UGV, Uran-9, to Syria for "near-combat testing", where the users and developers discovered that it failed along all major criteria – from engine to targeting to firing to communications to other key systems.[34] This rather unexpected problem nonetheless resulted in the emergence of a possible UGV CONOPS for the Russian military – the use of such system in an one-off attack role, a possible "kamikaze" strike squad that identifies and targets adversary positions, weapons, and personnel. How that will actually play out is unclear given the rather expensive price tag for such weapons in terms of material and man-hours needed to build it, but the Russian military is keen to explore this in the coming years and has already announced that this UGV will be officially acquired by the armed forces.[35] While another combat UGV, Soratnik, may have also been tested in Syria,[36] the military will soon start acquiring non-combat demining UGVs – Uran-6, Scarab and Sphere – that have served with the country's military in Syrian combat.[37]

At sea, the Russian military-industrial complex is likewise developing a range of unmanned underwater/surface vehicles (UUV/USV) for the navy. Official announcements state that no fewer than 17 designs are currently in development[38], while some UUVs like Galtel were already used in Syria for sea-floor mapping and monitoring.[39] The Russian Navy is keen on using UUV and USV in ISR, monitoring, demining, anti-submarine, and target acquisition roles[40], while such vehicles will also help in exploring and guarding the country's Arctic domain[41]. While the Western media picks up on "big-ticket" items like Poseidon nuclear-powered and nuclear-equipped UUV[42], the rest of the country's UUV/USV work that does not get much attention overseas is marked by "import-substitution" drive, referring to replacing imported technology with domestic technology. While government claims that such "substitution" is well on its way, much remains to be seen in terms of the Russian technological potential actually stepping up to deliver promised results. As with some UAV projects, certain delays and schedule adjustment would be inevitable, but given Moscow's desire to once again be a peer competitor in the maritime domain, the pressure from the Kremlin and the MOD may yield desired outcomes.

**...AND GETTING SMART WITH AI.**

The overall AI development in the Russian Federation is rapidly growing, both across the private sector as well as the government and the country's military. Just recently, Putin remarked that, to him, the most interesting area of national research involves AI, along with genetics.<sup>[43]</sup> Today, a lot of AI-related research takes place at the Russian Ministry of Defense, which is dedicating financial, human, and material resources across its vast technical, academic, and industrial infrastructure. Russia's private-sector AI development is also enjoying a revival, due in large part to the nation's overall strong STEM academic background that is so conducive to high-tech development.

The most significant defense-oriented effort is taking shape at the Advanced Research Foundation (ARF - ?????????????????????????????????????????). The Russian government established ARF as an analogous to the United States' DARPA (Defense Advanced Research Project Agency) in October 2012[44]. Today, ARF encompasses 46 research laboratories.[45] On March 20, 2018, ARF announced that it had prepared proposals for the MOD on the standardization of AI development, which includes the following key areas[46]: image recognition, speech recognition, enabling control of autonomous military systems, as well as AI's support for weapons life-cycle.

ARF announced these principles in March 2018 at a major forum titled “AI: Problems and Solutions.”[47] This event was organized by the MOD, Ministry of Education, and the Russian Academy of Sciences in order to advance proposals aimed at the mobilization of the state and the scientific community toward AI work.[48] In his address to the conference participants, Russian Defense Minister Sergei Shoigu specifically called for the country’s civilian and military designers to join efforts to develop artificial intelligence for the nation’s technological and economic security.”[49] This international symposium’s key result was the publication of the 10-step recommendation “roadmap” for AI development in Russia.[50] This roadmap outlined proposed public-private partnerships and short to medium-term developments that should be undertaken. It called for multiple initiatives that included: an AI and Big Data consortium, building out the national automation expertise and creating a state system for AI training and education, and running military games that will determine the impact of artificial intelligence on military operations at the tactical, operational, and strategic levels.

One of the roadmap's most important proposals came from the Russian Academy of Sciences and the ARF. It called for the establishment of a National Center for Artificial Intelligence (NC AI).<sup>[51]</sup> The MOD, as one of the driving forces behind such proposals, claimed to have enough academic know-how to start building out realistic AI capabilities. During the March 2018 conference, Russian Deputy Minister of Defense Nikolai Pankov stated that, "of the 388 scientific research institutions (in the Ministry of Defense of Russia), 279 are concentrated in military schools, and most of them are actively engaged in research in the field of artificial intelligence, robotics, military cybernetics, and other promising areas."<sup>[52]</sup> To underscore an emerging systemic approach towards artificial intelligence development in the country, Russian civilian organizations and technical centers are expected to release an AI roadmap in mid-2019 in order to accelerate and "digitize" the domestic economy.<sup>[53]</sup> Two key organizations involved in the March 2018 efforts are part of this new plan: the military-affiliated ARF and the Russian Academy of Sciences. Moreover, Russian President Putin is pushing his government to come up with a national AI roadmap this year that would presumably draw on previous efforts to develop an overarching national strategy for artificial intelligence development.<sup>[54]</sup>

The MOD's efforts to build out infrastructure enabling AI development are also exemplified by the creation of a military innovation "technopolis" in Anapa, on the Black Sea Coast, called "ERA"<sup>[55]</sup>. This high-tech city will consist of a science, technology, and research development campus, where the military and the private sector can work together. The ERA will host an "AI Lab" – another major item in the 2018 "roadmap" that will be supported by the MOD, Federal Agency for Scientific Organizations, Moscow State University, and the Russian Academy of Sciences, and will be staffed by soldiers from the scientific companies and regiments.<sup>[56]</sup> Work on ERA began in 2018 and is projected to be completed by 2020, when it will be staffed by around 2,000 researchers. Russian military is already sending soldiers from its science and technology detachments to start work there.<sup>[57]</sup>

Currently, the Russian military is working on incorporating elements of AI in its various weapons systems.<sup>[58]</sup> The Russian military has also highlighted the importance of AI in data collection and analysis in order to facilitate information processing. Specifically, in March 2018, then-Deputy Defense Minister Borisov stated that AI development is necessary to effectively counter opponents in the information space and to win in cyberwars.<sup>[59]</sup> Given Russia's ongoing and robust efforts in information warfare, it is expected that AI would play a more prominent role in the coming years. Russia's civilian AI developments in image and speech recognition may also be incorporated into defense and security applications down the line. It is also important to note that at this point, there have been no official statements that alluded to any dissent in the Russian AI community against the use of its technologies for military purposes, in contrast to the ongoing dispute at Google on its role in the American defense sector.<sup>[60]</sup>

## CONCLUSION

The Russian defense sector is gearing up for a long-term high-tech competition with its perceived adversaries – namely, the United States and NATO. In Moscow's viewpoint, gone are the days when the country's military looked with envy at the latest Western military actions around the world. While certain issues remain, the Russian MOD and its military-industrial sector are more in sync than at any point since 1991. Beginning in 2012, the MOD established departments<sup>[61]</sup> and centers<sup>[62]</sup> dedicated to developing unmanned and robotic technologies and creating a systemic approach that aims to streamline and facilitate these weapons from their initial development to the eventual (or potential) acquisition. This development of new weapons is well underway – technologies capable of extending Russian military's reach in combat, give it a better situational awareness and save soldiers' lives. Unmanned aerial, ground, and sea-based systems are key in this process. Moreover, Moscow wants to eventually endow such systems with some form of AI for more effective combat roles. Still – while the Russian defense sector has proven capable in designing a diverse suite of unmanned systems, the government will have to reconcile the budgetary issues and combat realities against the military's acquisition wish lists, which will affect what "robotic complexes" are ultimately purchased and fielded. Nonetheless, the past seven years of developments across the Russian defense sector indicate that as the Russian military matures to more advanced tech levels, the United States would have to eventually face a more effective and capable adversary. This will challenge the U.S. military to develop new CONOPS in countering what it has not done for many years – a peer adversary eager to field breakthrough and advanced military technology in combat.

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