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CNAS Event Transcript: Russian Advances in Military Automation and AI

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I. Opening Remarks

Martijn Rasser: Hello everyone. My name's Martijn Rasser. I'm a Senior Fellow in the Technology and National Security Program here at CNAS. It's my pleasure to welcome you to today's discussion on Russian Advances in Military Automation and AI with Sam Bendett.

II. Expert Discussion

Martijn Rasser: It's my pleasure to introduce Sam Bendett. Sam is an advisor with CNA's Adversary Analysis Group where he's a member of the Russian Studies Program. He's also an Adjunct Senior Fellow here at the Center for New American Security. His work involves research on Russian defense and technology developments, such as unmanned systems and artificial intelligence, as well as Russian naval capabilities and decision-making during crises. Sam is widely published and a true expert in the field. Sam, welcome. The floor is yours.

Samuel Bendett: Thank you very much, Martijn. Thank you, CNAS. And it's great to be part of this very timely and very interesting discussion. I am going to bring up the slides that I would like everyone to follow as we talk this through.

Samuel Bendett: In the beginning, just a few words. Thank you, Martijn for covering my experience. If you're interested in a wider conversation on this topic, I invite you to look up some of the analysis that we have published in a variety of publications. This conversation is public, and information taken will be from the public sources. So, everything is on the record and extrapolated from the Russian language media.

Samuel Bendett: So how does the Russian Ministry of Defense or the MOD from now on frame the problem of developing autonomous weapon systems and artificial intelligence? Well, they always reference Russia's vast territory, extreme geographical and weather conditions, very long state border, overcoming demographic issues, and other developments as an impediment for creating technology that can augment existing human capabilities. So, the priorities in the development of robotic combat systems include conducting hostilities against enemy, both in the traditional battlefield with a line of contact between the parties and in an urbanized civilian environment where a chaotically changing environment.

Samuel Bendett: A number of key statements, events, documents, and organizations to date guide Russia's development of military autonomy and AI. General Valery Gerasimov famously spoke with Syria as the contours of future war where unmanned systems and robotics are ubiquitous and commonplace. Vladimir Putin and Defense Minister Shoigu also made a number of statements on the need for Russia to develop unmanned and robotic systems as well as military AI to make the military more effective and to safeguard from civilian casualties.

Samuel Bendett: In 2014, Russian Ministry of Defense released a program, a classified document called "Developing Military Robotics Through the Year 2025." So, this program actually spells out the future development for unmanned aerial vehicles, UAVs, unmanned ground vehicles, UGVs, unmanned underwater and surface vehicles for the next decade, starting with 2014, and I suspect have been some changes to the document given Russia's experience in Syria.

- Samuel Bendett: Starting in 2017, the MOD has also been hosting an annual event called “The Robotics Development in the Armed Forces,” that brings together the MOD, the military industrial complex, and the academia to discuss the ongoing and future research and development of unmanned robotic systems as well as to develop standards.
- Samuel Bendett: There are also a variety of forums where unmanned technology and AI is discussed. The chief of them is the Annual Army Event that takes place in August. It is going to take place in the summer this year, and Russian government hasn't stated that it is going to be rescheduled, so that forum that brings together lots of domestic and international attendees is going to be one of the main platforms for classified and unclassified discussions on that topic.
- Samuel Bendett: And just as important, in 2012, Russia launched its own DARPA or [Фонд перспективных исследований] that's the logo on the bottom left that you're seeing or Advanced Research Foundation, ARF from now on. And ARF has the same mission as the American DARPA to develop breakthrough technologies and to serve as a testing ground for new and exciting tech.
- Samuel Bendett: The Minister of Defense itself also houses the main research center for robotics and the main director for research and technological support of advanced technologies.
- Samuel Bendett: How does the MOD conceptualize the use of unmanned military technologies? So, in 2016, ARF's director, Mr. Grigoriev noted that future wars will actually be fought by robots and drones. He said, "This will be a war of operators and vehicles, soldiers will no longer shoot each other on the battlefield." According to Grigoriev, this future war belongs to the unmanned systems that are multi-functional and capable of operating in any environment. This year, Mr. Vitaly Davydov, ARF's deputy director, noted very famously that the use of such technology is inevitable, if "we do not want people to die on the battlefield." He also said that humans will gradually begin to be replaced by their robotic brothers and sisters who can act faster, more accurately, and more selectively than people.
- Samuel Bendett: It is also important to note that the main MOD requirements for the military robotic research development, testing, and evaluation, or RDT&E as an acronym from now on, is the following: adaptability to external environment in combat missions, multidimensionality, that is the unmanned systems that can function in the air, on land, at sea, and in space. Self-organization in a short time while implementing basic functions, as well as advanced functions. These robotic systems should have combat and functional stability when facing enemy action, such as electronic warfare and other systems. They should include modern systems for collecting, processing, and managing information, and they should be a continuous replenishment of ammo on the battlefield for these robotic systems.
- Samuel Bendett: Now Russian development and use of unmanned systems in general can be divided into two stages. Stage one has to do with before Russia got involved in Syria, prior to 2015, and the second stage in which we're in right now is the post-2015, post-Syria involvement. So, prior to Russia's involvement in Syria, most development took place domestically. And the military industrial organizations actually led the effort. There were a lot of self-initiated projects. After Russia's involvement in Syria and all the lessons gained there with conventional and unmanned and advanced systems, Russia Ministry of Defense and the government is actually dictating to the industry what requirements it needs in the battlefield.

- Samuel Bendett: So, for example, in Syria, a Russian military conducted a very extension, round the clock UAV operations for better ISR, intelligence, surveillance and reconnaissance. Russian forces used short, medium, and long ranged UAVs for the first time in their military history. Also, for the first time the number of sorties flown by unmanned aerial vehicles exceeded the number of manned sorties. These Russian UAV missions in Syria included recon, providing target designation, controlling airstrikes, as well as adjusting artillery fire. That is, the UAVs are now a key part of what the MOD calls the reconnaissance fire and reconnaissance strike contour or military methods designed for the coordinated employment of artillery, aircraft, high precision long-range weapons linked to real-time intelligence data and precise targeting. The UAVs are basically acting as the indispensable eyes and ears for the Russian military. And at this point, the MOD has over 2000 UAVs. That is a lot when compared to the years 2012, 2013 when the Russian military had less than 200.
- Samuel Bendett: Russian demining and engineering forces also used several unmanned ground vehicles in Syria to identify and expose IEDs. Russian Navy tested an unmanned underwater vehicle off the Port of Tarsus, and the Russian military also conducted testing and evaluation of several combat UAVs and UGVs, aerial and ground unmanned systems. Not all of those tests were successful but using such technology in actual combat conditions was essential to determine how battlefield stresses can affect unmanned systems.
- Samuel Bendett: So Russian military officers in their public discussions and writing now point to post-Syria conflicts having several key consequences on how future combat will take place. And these consequences are increasing maneuverability of forces and efficiency of combat, command, and control, increasing the destructive efficiency of the armed forces by combining digital control systems with different types of military units with operational information data that is constantly updated, and of course the increasing use of multi-functional and combat unmanned systems, primarily UAVs.
- Samuel Bendett: So today, the Syrian experience is resulting in structural changes across the Ministry of Defense. So, the MOD currently organizes its growing drone fleet by companies which are divided into platoons based on size and range of the UAVs they operate. Some UAVs are becoming part of Russian artillery brigades and artillery regiments. ISR UAVs, that is UAVs used for intelligence, surveillance and reconnaissance, are used regularly in military drills and exercises for aerial recon and intelligence gather, as well as for electronic warfare and artillery fire correction. They're also becoming an official part of the motorized artillery infantry and other units across the armed services.
- Samuel Bendett: Russia's engineering forces are also taking the delivery of some of the unmanned ground vehicles that were tested in Syria, and the MOD also announced that its Uran-9 combat UGV will also become part of the military. Russian Navy's ongoing research and development today also points to ISR and situational awareness as key criteria for its unmanned maritime use.
- Samuel Bendett: So Syrian combat is influencing Russia's perspective unmanned systems development. Russian developers are working on a variety of projects with ground, aerial, and unmanned systems. And the current MOD unmanned military wish list following its involvement in Syria and following what it has been able to observe includes the unmanned systems should be able to independently recognize targets, use weapons, and interact in groups and swarms. These robots should have the ability to solve tasks in different combat conditions day and

night, under fire, under electronic and information counteraction, radiation and chemical contamination, and electromagnetic radiation. These robotic systems should theoretically have the ability to independently perform various tasks. That is, they're hinting at artificial intelligence guiding and operating these systems. And in the near future, MOD's planning to actually initiate work aimed at providing technical support for solving these problems.

Samuel Bendett: So, several new unmanned weapon systems are currently in development that combine a practical experience gained over the past five years with a constantly updated MOD technology wish list. Earlier I mentioned the ARF or Russia's DARPA. It is now one of the main focal points for developing breakthrough and testing of unmanned and autonomous technologies. Back in 2014, they tested one specific UGV called Nerehta as a testbed for AI and cooperative work with UAVs. ARF also created a nation center of the development of technologies and basic elements.

Samuel Bendett: So ARF currently works on a flagship project called Marker, and that is the images that you are seeing right now on your screen. Marker UGV is a testbed for command and control, manned/unmanned teaming, and swarm UAV, UGV use, as well as a testbed for testing UGVs with other weapons and equipment. It is also there to test autonomous control and positioning systems, to test technical vision, high precision drives, and sensor systems.

Samuel Bendett: In the near future, the plan is for the Marker to become a fully autonomous weapon and to be able to independently carry out a wide range of combat tasks.

Samuel Bendett: When it comes to the Marker operation, the operator should be able to give only target designation and this robot will decide how to move towards the targeting, taking into account the type of terrain in order to overcome obstacles, encounter in a way forward, as well as select and apply the most optimal user weaponry on the spot.

Samuel Bendett: Marker will also be equipped with a range of ISR and lawyering ammunition UAVs so it can work together with an aerial unmanned component as well as other UGVs.

Samuel Bendett: ARF, for the record, also works with an unmanned underwater vehicle called Sarma, which is supposed to operate autonomously in Russia's north so it can navigate the northern sea route and the arctic littorals.

Samuel Bendett: Since I've already mentioned AI in unmanned military systems, I would like to go over the main AI intelligence principles and efforts across the Russian military. So according to the MOD's own statements, AI research across the enterprise is supposed to be conducted across three main areas: creation of knowledge-based systems to augment existing weapons, the neural net and the neural systems, and the heuristic search systems, meaning a technique for solving a problem more quickly when classical methods are too slow.

Samuel Bendett: MOD thinks that AI should be used to create automated information systems. That is decision support systems for weapons as well as for onboard computers in a variety of Russian manned and unmanned weapons. AI is also supposed to augment the so-called expert systems as the Russians call them, knowledge-based AI methods to solve intellectual, practical problems. And more specifically, the Advanced Research Foundation actually submitted its own plan for AI development across the military back in 2018. And this plan

included image recognition, speech recognition, control of autonomous military systems and weapons and support for the weapons life cycle.

- Samuel Bendett: There are many examples of AI-enabled Russian weapons undergoing testing and evaluation that have been announced for the past six or seven years. Several more prominent recent examples include the Vityaz unmanned underwater vehicle that is recently descended to the bottom of the Mariana Trench. This deep diving submersible had an onboard AI as announced by the MOD for navigation and independent problem solving, and this particular unmanned underwater vehicle was a design where Advanced Research Foundation made Russian's design bureaus as well as the fleet all had input in what this UUV was supposed to be doing.
- Samuel Bendett: Russian military announced that its new heavy unmanned combat UAVs, like the Okhotnik and the Altius will have an onboard AI for decision making in order to avoid enemy air defenses, as well as for independent navigation.
- Samuel Bendett: Another often cited AI enabled weapon is the electronic warfare system that is supposed to be able to analyze signals and intel intelligence and data for a faster decision-making tool for the human operator.
- Samuel Bendett: So, the MOD debates on the safety of AI-enabled weapons include the discussion that AI-enabled systems maybe actually safe from hackers since AI generates behavioral algorithms on its own instead of using a constant physical memory. If this memory consists of new and immediately decaying chains of neuro-connections that are difficult to trace, therefore this weapon and its electronic brain would be difficult to hack.
- Samuel Bendett: Another important AI use is the information space in cyber warfare. In 2018, the MOD actually remarked that in today's combat, the advantage belongs not just to physical weapons but also information weapons. So, AI should be able to help Russia win in information space and cyberspace. Whoever controls it, "who can organize our position in the right way is the winner today." So therefore for the Russian military general staff and for its military establishment, the emergence of the future in autonomous tactical weapons and colossal computing power for intelligent reconnaissance, analysis of weapons of Russia's forces and fighting optimal solutions means that the strategies and methods for deploying and commanding troops will probably have to change.
- Samuel Bendett: The MOD will also have a central research development center on AI that is housed at the ERA Technopolis or Air Technopolis, a new physical center that opened in late 2018. This technology city is located in Russia's Black Sea coast and is designed for the young, promising Russian SMT officials to work and soldiers as well as those from across the forces to work with the private sector and the public sector to develop breakthrough solutions. But the ERA Technopolis is actually under the auspices of the MOD so that the solutions will belong to the military in the long run.
- Samuel Bendett: So, ERA's key mission will be AI development, artificial neuro-network technologies for defense and security. ERA's research development testing and evaluation will find applications and reconnaissance, control systems, and precision weapons according to the MOD. ERA will also house a supercomputer and a data center that will be used for defense

and industrial enterprises. So, this is the overall view of where Russian autonomy and AI stands today. I look forward to your questions and comments.

III. Audience Q&A

- Martijn Rasser: Excellent. Thank you so much, Sam. Well, we already have several questions lined up. So, let's dive straight into those. First one is from Charles Delap, this is an important question. I'll just paraphrase here. But essentially what Charles would like to know is how Russia views the use of unmanned weapon systems. Is it different from the West? In particular, Charles has heard that Russia's more likely to use AI and automation to include weapons of employment decisions. So, what, Sam, are Russia's views on the necessity of human in the loop or human on the loop versus fully autonomous decision making when it comes to lethal automation?
- Samuel Bendett: It's a great question. So, at this point, the official Russian military stance is that the human will always be a part of the decision-making cycle, even as the Russian MOD plans future fully autonomous weapons development. For example, Russian position on LAWS or lethal autonomous weapon systems debates at the United Nations always highlight the human in the loop. And today, in testing and evaluation in manned, unmanned teaming tests, the human should be able to control the weapon. So when it comes to the AI sort of onboard, which is often what the Russians are describing how AI will augment existing in future aircraft or helicopters or tanks, the AI is supposed to analyze the situation and give the most optimal result so that the human in the end can push the red button. Now we don't know how those debates will change in the long run as the battlefield situation changes across all domains when Russian soldiers and UAV or unmanned systems operators will have to face simultaneous threats both in the physical space, air, land, sea or above and below water, as well as in cyberspace and in space proper.
- Martijn Rasser: Excellent. Okay. Sam, we'll go to Justin Sherman. He has a raised hand. Go ahead please, Justin, with your question.
- Justin Sherman: Hey, Sam. Justin Sherman from Atlantic Council here. You spoke a little bit briefly about the belief that some of these AI systems for various reasons might not be hackable or might be more hack proof. Can you speak a little bit more sort of the cyber security concerns on the part of MOD as they increasingly deploy these systems?
- Samuel Bendett: So, there are a lot of testing and evaluations actually taking place within the ERA Technopolis that deals with cyber security for AI. I don't have a lot of details, but what we can glean from their discussions and debates is we see repeated statements that AI systems, the neural networks are going to be safer simply because of the way they're constructed. So, the Russians want to move away from the physical memory and the physical operating plain for these unmanned systems. As they move on to the next level, to the AI-enabled systems. These statements are, some are detailed, some are a little bit more vague. But the MOD is convinced that in order for them to successfully field autonomous and AI weapons, they will have to be completely secure. Of course, the possibility of a hack by the enemies always in the back of their minds. But the public statements today point to Russia's working through the cyber security problems in order to make the system hack proof.

- Martijn Rasser: Right. Excellent. Next question is from Mathieu Boulegue. Mathieu wants to know, what do you make of the current development of UUVs? Is this a credible challenge for the West, and where's Russia compared to peer and new-peer competitors? I would like to add on as a corollary. So, the Advanced Research Foundation that you mentioned earlier is doing a competition for marine robotics. How effective are these types of competitions that struck me as something similar to the DARPA challenges? Do you see breakthroughs in marine robotics coming out of a competition like that?
- Samuel Bendett: It is actually very similar to the robotics challenges, and the ARF as well as the MOD wants to engage Russia's vast academia and as well as younger kids in order to first of all familiarize them with the unmanned underwater and surface vehicles development in order to familiarize them with robotics in general, and for a more advanced stage of these competitions that involve Russia's universities as well as design bureaus to actually develop breakthrough solutions. So, at this point, there's a lot of unmanned underwater vehicle development taking place because Russia sees its inability to hear or see what is happening in the global ocean as a threat. Obviously, it's a problem that is faced by all navies and all militaries because the global ocean is so vast. But Russians want to field unmanned underwater vehicles to be the eyes and the ears below water to help the submarines and the surface and aerial and ground based assets develop a better situational awareness of what is actually taking place.
- Samuel Bendett: So, there are a lot of projects happening for both deep diving and surface vehicles. There are a lot of projects taking place with smaller unmanned underwater vehicles which are tethered, as well as with those who can dive to the depths of several thousand feet. Again, the issue here is whether they can field a network of these UUVs that can coordinate with surface and other manned underwater assets for a better picture of what is taking place.
- Martijn Rasser: How do capabilities such as seabed cable attacks factor into UUV development? Do you see a distinct effort to pursue greater capabilities on that front?
- Samuel Bendett: Well from the open media, it's difficult to discern exactly what the goal is. But we can also discern that if Russia's developing deep diving submersibles that can function autonomously and coordinate their actions on their own, then they're probably going to go after specific targets that are below water, whether that be cables, submarines, or other assets. So possibly the threat is there. Russians are rather mute about that right now as they're testing these systems. But we have to understand that if a range of unmanned underwater vehicles is fielding that can descend up to 5- or 6000 feet below surface, then those vehicles are probably going after certain threats.
- Martijn Rasser: Great. Well, let's pivot a little bit. So, we've talked a lot about specific military systems. But as Steven Beekman points out, every military organization encompasses a bureaucracy, and that necessitates a lot of manpower as well. So, is Russia looking into applying AI to lessen the need for manpower in this bureaucracy?
- Samuel Bendett: Well, at this point, when we look at the MOD statements, they are talking about AI as an assistant in decision making. So, for example, Russian's National Defense Coordination Center that opened recently, which is supposed to be the nerve center for all the information collected on the MOD domestic and international activities, will soon have an AI assistant. And that AI assistant will help this center analyze vast text and imagery in order to arrive at

the best decision, and that is what the Russian government and the MOD are discussing when they're mentioning AI. So, this is something that will assist in decision making, assist in gathering and analyzing data.

Martijn Rasser: So, here's a question on cost. What's the affordability of these types of systems? The State Armament's Program, it's quite ambitious but compared to, for example, what the United States or China spends on defense, it's relatively modest. So how is Russia allocating its resources because what are the tradeoffs between maintaining legacy systems, building new capabilities and AI and automation, maintaining the force generally? How do you see this playing out?

Samuel Bendett: So, there's several issues in your question. So, issue number one, all spending for unmanned systems or AI and for that matter conventional systems have already been allocated within the State Armament's Program that is Russians aren't going to go outside of the boundary set by that specific document. Second of all, Russians have been modernizing some of their older equipment, but they're also moving to the production and the evaluation of new equipment. We see and hear statements from the MOD that point to specific services having 60% or 65% or 70% modern or modernized equipment going forward. So, the cost for the unmanned military systems are actually built into that State Armament's Program. And of course, the cost varies. So today Russian media released a figure of one billion ruble as a cost for the large heavy, stealthy Okhotnik unmanned combat aerial vehicle, the UCAV, as well as the cost for insuring that vehicle for 1.3 billion rubles. Again, Russian program and the cost and the spending is done in rubles. They're buying things in rubles. So, converting them to dollars isn't necessarily helpful because Russians aren't spending dollars for manpower or for development or for manufacturing those weapons. They're spending rubles.

Samuel Bendett: Other costs that have become public, for example, include the fact that the Orlan-10 UAV, which is the workhorse of the Russian's 2000 plus UAV fleet, costs around 100,000 each. Smaller UAV like Eleron costs around \$80,000 in 2013. In late 2019, for example, I'm going to read this off, MOD contracted for a total of 84 for post medium altitude long endurance UAVs. That is Russia's longest ranged UAV right now, along with ground control stations for around 30 billion rubles. So, the cost definitely varies, and some weapons are more expensive than others. But it is all built into the State Armament's Program for specific time periods. Through '25 or past 2025.

Martijn Rasser: Excellent. Great insight. So, Byron Callan, he asked the big question. It's a simple question but extremely difficult to answer. Are Russian systems good? And so, Byron raises the point Syria seems like a fairly permissive environment to test equipment. So ultimately what lessons learned from the Syria conflict is Russia applying to its currently fielded systems but also what are they applying to research and development for future systems?

Samuel Bendett: For Russian forces in Syria, UAVs were a big tactical success. That is they were able to fly several UAV models in gaining situational awareness up to 10 kilometers or several miles out, up to 10 to 15 miles out, up to about 60 to 70 miles out with the help of Orlan UAV as well as up to 250 kilometers out or roughly 140 to 150 miles. And yes, Syria was a permissive environment, but for the record, it was also a permissive... The Middle East at large and the conflict with United States was involved, Iraq, Afghanistan where a lot of UAVs flew, was also permissive environment. That is, it wasn't a lot of counter UAV activity taking place.

- Samuel Bendett: So, the lessons learned right now from Syria and other conflicts, for example, like Libya where there's a lot of counter UAV activity taking place has now pushed Russian military to incorporate counter UAV defenses into their con ops or concept of operations and tactics, techniques, and procedures. Right now, Russian military's pushing UAV use down to pretty much every company across the forces. That is all Russian forces, whether they're active combat or supporting, like comms or medics or other services, have to be familiar with how to fly and operate a UAV, a smaller UAV, not a sophisticated one, as well as how to defend themselves against such UAVs. So, while Syria was a permissive environment for flying Russian hardware, it also served as a very harsh lesson for what happens when the opposing side uses less sophisticated UAVs to essentially rain bombs on Russian helmets from the sky.
- Martijn Rasser: That actually makes for a great segue to our next question from Larry Lewis. Do you see signs that Russia's also developing new concepts of operations, changing their training, and making other institutional changes to accompany the new capabilities?
- Samuel Bendett: Yes, absolutely so. Like I just mentioned, counter UAV training is going to become commonplace across all Russian services, as well as UAV operation for required companies and battalions will also become commonplace. Every Russian military branch, every Russian military fleet has UAVs and is learning how to fly UAVs, both short range as well as longer range, using the four post after 250 kilometers out.
- Martijn Rasser: Excellent. Here's a big question from Andrea Kendall-Taylor. How much collaboration do you see between Russia and China on this technology and innovation? There's some cooperation in the technology domain through technology parks, joint workshops and centers of excellence, but are they willing to work together on these more sensitive technologies with military applications?
- Samuel Bendett: That's a great question. I'll answer with several caveats. Andrea's right that there's a lot of civilian developments taking place. There have been a lot of announcements. There have been a lot of cooperative work at the academic level between the Russian and Chinese institutions. We haven't seen a lot of AI or high tech or unmanned military developments taking place. For example, Russia has announced that it is going to cooperate with China as well as other countries within the BRICS organization that is the international organization that includes Russia, China, as well as Brazil, India and South Korea. So, there's a lot of science and technology, research and development or S&T and R&D work that is going to take place within that organizational framework. There's also a lot of other bilateral efforts that are taking place, more on the civilian side. But when it comes to the military, we're probably going to see some kind of high-tech cooperation that will take place in the near term.
- Samuel Bendett: So, two years ago Russia and China cooperated together at the Vostok 2018 military exercise, and so they were combining their ground forces as well as some of their command and control elements. I think with the ubiquitousness and the commonplace of unmanned systems in the military today, we're probably going to see downrange some kind of cooperative arrangements, for example, in bilateral training, military training between the Russians and the Chinese as they conduct these large-scale exercises. Where Russian unmanned assets and the Chinese unmanned assets will have some kind of cooperate via a common command and control center.

- Samuel Bendett: We haven't seen specifically any announcements, and again this presentation is drawn from public sources. We haven't seen any announcements on Russian military AI cooperation with China or any specific unmanned military project that will involve Russia's Chinese counterparts. But I think downrange if the nations are going to become closer when it comes to their military cooperation, we'll probably see some of that work become more public.
- Martijn Rasser: Now is there also this type of cooperation potentially in the works in the private sector as well? So, companies developing dual-use capabilities that could ultimately be applied in a military setting as well.
- Samuel Bendett: I think so. And again, judging from the public statements, there are a lot of announcements about joint work to develop specific systems, specific high-tech efforts. For example, Russia and China have announced that they are going to explore the arctic together and chances are that exploration won't just involve manned surface vessels, like regular ships. It will probably involve some kind of civilian USV unmanned surface vehicle and unmanned underwater vehicle project. So, we are seeing hints that this cooperation is increasing. But we mostly see that on the civilian side.
- Martijn Rasser: So, we talked about the State Armament's Program a little bit earlier, and so one of the big issues that the Russian defense industry has had, particularly since the collapse of the Soviet Union, is just a lack of funds. And a lot of the funding for Russian defense companies, particularly for R&D comes from foreign sales. So, Byron Callan wants to know is Russia exporting its unmanned or AI systems similar to what China has been doing with its UAVs?
- Samuel Bendett: That's a great question. So, the short answer is no. I think Russia wants to be where China is today. But at this point, we haven't seen any specific results. We have seen announcements, and Russians have hinted at various military expos that took place both in Russia and overseas that there are a lot of foreign customers interested in Russian UAV and UGV samples. There have been hints that some of those customers will come from Middle East. There was also an announcement last year that, for example, Russia and Brazil were supposed to cooperate on developing Russia's Orlan UAV in Brazil for the Brazilian military. And of course, the best example of how those systems work is in combat. So, Russia can claim effectiveness over its UAVs, for example, in Middle Eastern conflicts. But we haven't actually seen a contract inked for a UAV or UGV or for that matter unmanned maritime system quite yet, and I think that has a lot to do with the fact that the market is currently saturated. But they are market leaders, and China is amongst them. And now nations that want to cooperate with another country in importing that country's unmanned military solutions probably has a lot of choices. But I think with Russia's push to make its military unmanned systems success known, we're probably going to see some of those contracts materialize.
- Martijn Rasser: Let's pivot. There's an important question from Douglas Williams. How do we think Russia is contemplating the ethical and legal use of autonomy and AI in military systems? Will systems that begin to think and make decisions on their own be subject to the usual laws and rules of war?
- Samuel Bendett: I think Russian military's working through that problem set. I read you out a wish list for the MOD unmanned systems development, and that wish list definitely includes unmanned

military vehicles that think on their own in an uncertain environment. But that will probably be on a limited scale. That is, for example, in a given conflict, the unmanned ground or aerial vehicle will be assigned a very specific mission set so that it will not deviate from that mission set if it functions autonomously. But again, within the same breath, Russian military advisors and Russian military officials are talking about this inadmissibility of the loss of human control. That humans will always be in the loop and will make the final decision. And again, it's not clear, as I mentioned earlier, how that will be reconciled with a potential conflict where threats that face unmanned systems operators will have to be calculated in nanoseconds and a decision will have to be calculated within a nanosecond as well.

- Martijn Rasser: One of the long-standing structural weaknesses of the Russian military is its reliance on conscript forces. So Rich H would like to know what your thoughts are on how Russia's contract system of personnel will adapt its structure or ratio to an increasingly high tech and unmanned force? How do you see that playing out as Russian autonomy and AI capabilities mature over time?
- Samuel Bendett: We know that the general trend across the Russian military is the use of more contract force, and as contract, military resigns for more years to serve. Those people will actually gain very key expertise in both in conflict and in peace time. So Russian military would like to move from the full conscript model down range. Conscripts are still an important part of the Russian military enlistment, but it has becoming a smaller part as far as Russian military stance. And as I mentioned earlier, the military has been successful in pushing the unmanned solutions down to the very tactical level. So, there are at least 40 UAV companies across the Russian military, and that number is probably going to grow. And as I also mentioned, as every fleet, every military formation, every military service will become familiar with UAVs or unmanned ground vehicles for situational awareness, for protections, or for storming enemy hard points, for example. Those tactics and those con ops, concept of operations, are going to become widespread and again, push down to the very tactical level. So, I think there is no resistance within the Russian military to incorporating these solutions, but Russians are seeing what works for them in Syria and which specific lessons with using unmanned systems should be incorporated.
- Martijn Rasser: A lot of the talk about Russian military modernization over the past decade. It's always been a lot of ambitions, high aspirations. So, Dave Majumdar would like to know what's your assessment of their actual ability to develop, build, and field these systems given some of the technological limitations that Russia faced?
- Samuel Bendett: That's a great question. In 2012, Russia had about 140 UAVs. In 2020, Russia has over 2000 UAVs and the MOD promised to acquire 300 UAV systems annually. So clearly Russia can ramp up the production, the testing, and the evaluation and actual use of these systems. And of course, again objectively speaking, Syria for them was an unprecedented example where they could use these advanced systems in actual combat. Most importantly for the Russian military in Syria, the representatives of military industrial enterprises that supplied weapons used in Syria were actually onsite and present in Syria. So that if something had to be tweaked, something had to be repaired, changed, or if the military had an advice for these military production facilities and what should work better in a particular system. That advice was incorporated essentially right there on the spot.

- Samuel Bendett: So, we know with a UAV used that Russian military can actually step up when it comes to their tactical systems. When it comes to more sophisticated long-range combat UAVs, for example, which are currently in testing, the situation is a little more difficult for the Russians. But it doesn't mean it will not eventually field something. It just means that the schedule will be pushed to the right, maybe by a few years, maybe even longer. The same goes for the unmanned underwater vehicles and unmanned ground combat vehicles.
- Samuel Bendett: Russia has been reliant on imported high tech components, and those important high-tech components are still used in the Russian military. And the sanctions imposed on Russia after 2014 to 2015 actually exposed the degree to which the Russians were reliant on that imported high tech. So today, MOD is marshaling a significant drive to develop domestic equivalents of those systems so that in the near future all, for example, unmanned military systems will be built with domestic parts. That is actually becoming an official requirement. So yeah, Russia faced a couple of difficulties early on. But it has been able to, again objectively speaking, be fairly successful in ramping up certain activities and using them with relative military success in Syria.
- Martijn Rasser: We've discussed a lot of systems for land, air, and sea. How about space? What do you see taking place in terms of space capabilities and particularly ASAT capabilities? That's a question from Tyler Robinson.
- Samuel Bendett: That's a great question. We know that Russians have announced that their UAVs or their unmanned military systems should function in space hinting that Russians will perhaps be developing certain technologies that would be operational in space. We haven't seen any specific, for example, unmanned military system actually tested in space quite yet. But that capability is discussed as a key capability, especially when it comes to, as you mentioned, the ASAT. So sound long-range UAVs that are supposed to fly at high altitudes and for days at a time will probably be equipped with weapons that can themselves try to target adversarial satellites. Again, we haven't seen the tests of those systems quite yet.
- Samuel Bendett: But the way Russians are going is they're going through stages. So, the first stage is to develop a tactical system that can function within close proximity to Russia's forces. The next stage was to develop a longer-range system that can provide a better situational awareness. The third stage, and Russians are actually testing heavy UAVs for that particular effort, is to develop a truly long-range capability to target enemies' air defenses and to penetrate those air defenses. These systems involve the Okhotnik UCAV as well Altius, Altair, UAV and other systems.
- Samuel Bendett: So, the final stage I guess in this development cycle will be the fielding of either existing or augmented unmanned capabilities that will be able to target adversarial assets in space as well.
- Martijn Rasser: Here's a question on AI being integrated into nuclear weapon systems, nuclear command and control, which I think is particularly important given the fraying of arms control agreements. Is there much information in the public domain as to how the Russians are thinking about these types of capabilities in this context?
- Samuel Bendett: Well, we have information from public sources that are actually coming from Russian academics and some of the policy centers that are affiliated with the MOD. The issue there

is at one point or I should say on one side, there's caution in how such systems could and should be fielded. On the other hand, there is the trend, the general trend that I described where AI is functioning as a decision-making tool. So faster ability to make decisions, faster ability to analyze information for the human to make the final decision down range. And I think the debate is trying to incorporate both sides.

Martijn Rasser: Let's pivot back real quick to lessons learned from Syria. [Questioner] is interested about the discussion around UAV countermeasures in Russia, specifically what the impact the drone swarm attack in 2018 had on Russian thinking on these matters.

Samuel Bendett: Well, we know, for example, that Russians have fielded the so-called Eshelon defense when it comes to counter UAV capabilities, and that is the combination of electronic warfare, the radars for early warning and detection, as well as the kinetic systems that can shoot down those UAVs. But that Eshelon defense worked against the less sophisticated UAVs, such as the swarm attack that was mentioned was made up of relatively simple, do-it-yourself wooden designs. So, we actually don't know how such an Eshelon defense can work against more sophisticated UAVs. But we do know that today Russian electronic warfare forces and air defense forces are constantly drilling for a counter UAV action. So, every electronic warfare drill and exercise, every air defense exercise involves a UAV threat. So, Russians have actually built and developed several target UAVs that mimic some of the adversarial assistants they may encounter.

Samuel Bendett: So, there's a lot of drilling, and there's a lot of exercises across Russia's electronic warfare and air defense forces to specifically deal with the UAV threat. In fact, one of those target UAVs is supposed to incorporate the design for something that resembles global hawk and the American predator, longer and heavier UAV that has better capability than some of the small UAVs that Russians encountered in Syria.

Martijn Rasser: Here's a very interesting question from Natalia Jevglevskaia. This is about testing an evaluation and validation of AI. So, Natalia points out that US DOD is quite open about lacking T&E tools and validation tools for AI and machine learning models. DOD's been pretty adaptable over the decades when new capabilities come online as to how to address that. So, what discussions along these lines are happening in Russia? Are there considerations of reforming the OKR, the experimental design work process in Russia as these new capabilities come online?

Samuel Bendett: Well, there haven't been a lot of public statements from the MOD to that regard. But I did mention that there are in fact a lot of debates that are taking place in both unclassified and classified environment at Russian military expos, at events dedicated to artificial intelligence. So Russian military has been very open in stating that it needs to engage its domestic developers as well as to reach out to the international community for it to simply monitor what the international community's doing. So, I think right now as Russian military AI development is taking place, I think they're definitely looking over their shoulder to the AI leaders and the military, and that is the United States and China. We haven't seen a lot of public documents, but we do know that the debates and discussions are actually taking place. And quite possibly with the Russian experience in Syria and the lessons learned there, especially when it comes to situational awareness and incorporating vast amounts of very diverse data into the common operating picture, this is where Russian AI systems are going to become more invested.

- Martijn Rasser: So, let's take a step back and take a broader societal perspective on these developments. Lewis Shepherd is interested to know whether you've seen any signs of domestic civilian pushback on the levels of military investment in AI or more broadly on lethal autonomous weapon system regulations? How's the Russian public thinking about these big changes at Russia MOD?
- Samuel Bendett: So, the short answer is no. We haven't seen the pushback like the one that happened at Google and other American flagship high tech companies. Mostly because right now when it comes to a lot of research and development of these systems across the military industrial complex, practically all of that research is funded by the state. When we talk about private sector in Russia, we also have to caveat that. The state still is the main investor in a lot of high tech and military investments. The same goes for Russia's, for example, flagship SMP Universities. Practically all of them are state funded. So Russian private sector isn't the same as, for example, American private sector.
- Samuel Bendett: In the United States, the high-tech companies like Google and Facebook and Apple and others can actually dictate the terms because of the market share and because of the achievements in that particular high-tech sector. In Russia, the situation is reversed. The biggest funder and investor in high tech development is the state. So, you don't bite the hand that feeds you right now. So, I think in the near term it's unthinkable to see the type of protest and pushback against the systems that we have seen, for example, here in the United States or possibly in Europe. But there are debates that are taking place in Russian media and they're relatively lively debates where various authors and various experts talk about what is the meaning of a truly autonomous military system for future conflict and whether that's actually a good idea.
- Samuel Bendett: But there are debates that are taking place in Russian media and they're relatively lively debates where various authors and various experts talk about what is the meaning of a truly autonomous military system for future conflict and whether that's actually a good idea.
- Martijn Rasser: That's a nice segue to our next question from Richard Bitzinger. So, Richard points out that AI demands a high degree of expertise in cybernetics, so software, algorithms, big data and the like. How does Russian cyber sector compare with the West and China, and what are its weaknesses? He also wants to know how much interplay and cross-fertilization there is between the civilians, cyber sector, and the military. In other words, how much military civil fusion is going on in Russia at the moment?
- Samuel Bendett: So, I wouldn't necessarily compare the Russia sector with the American sector, the Chinese sector as apples and apples or oranges and oranges. Russia's high-tech sector is a fraction of the American one. It is definitely a fraction of the Chinese one. The investments dollar for dollar are also a fraction of what the United States and China invests. But it's not about the dollars invested. It's about what people get or what the MOD gets back for its investment. And so, Russia has a very sophisticated academic system that feeds into some of these military developments. In fact, yesterday Russian trade minister spoke about certain advantages that Russia has in the development of high tech, and two of these advantages is the fact that Russia has very educated cadres. It has a lot of well-educated people, and he also talked about the strength of Russian fundamental sciences in education. So, Russia has a lot of very talented people that could be drawn into a specific project if that is necessary.

- Samuel Bendett: Again, I wouldn't necessarily compare that effort in a direct fashion to the American effort as well. After all, the American military budget is bigger than... I believe this statement is the next five military budgets combined. But that doesn't mean that Russia with its own limited funds when compared to the United States cannot field the specific solution. It doesn't have to match United States dollar for dollar, organization for organization, and effort for effort. It has to have that one specific breakthrough that will then be disseminated across the armed forces. So, I mentioned the ERA Technopolis where a lot of AI research is taking place. I mentioned Russia's own DARPA as an organization. And their budgets are a fraction of the American one, but there's a lot of very interesting and capable research that is taking place there that will eventually be incorporated into the Russian military.
- Martijn Rasser: Excellent. Well, Sam, we still have over a dozen open questions, and unfortunately very little time. So, I think we can squeeze in one more. And it's been very difficult to choose these because all these questions are fantastic. But I like this one because it, again, looks at the broader societal impact of these developments. So, Andrea Kendall-Taylor points out that you mentioned a new national coordination system that's incorporating AI systems to help analyze text and imagery. So, Andrea would like to know is this for external threats or is this also being used to address perceived domestic threats as well?
- Samuel Bendett: So that's a good question. The National Defense Coordination Center is supposed to be MOD-oriented. That is, it is the big nerve center where all that information will be incorporated and analyzed. And the data that is ingested by the center has to do with MOD, the status of weapons manufacturing, the status of Russian forces domestically and internationally, down to the health conditions of all the soldiers. The larger security environment that effects Russia. But again, it is a MOD-oriented center. It is not the one that is supposed to work instead of Russian domestic agencies. But we do probably have to expect that given certain level of domestic threats, some kind of cross pollution is going to take place between that environment and the Russians' civilian security agency, like the FSB and Interior Ministry and others. But the National Defense Coordination Center as it stands right now and as its mission dictates is MOD-oriented only.
- Martijn Rasser: Great. Thank you, Sam. Now unfortunately we're out of time. I wish we could keep going. This has been absolutely fascinating discussion. Sam, before I thank our participants, are there any closing thoughts that you'd like to share with us?
- Samuel Bendett: Well, I'd like to say that probably the biggest watershed that Russian military has experienced has been its involvement in Syria, and the lessons learned from that conflict and Russia's ongoing involvement in Syria is probably going to influence Russian military development of advanced systems such as unmanned and AI for decades to come. So, this is definitely one conflict that has had the most profound effect on the modern Russian military in this century so far.
- Martijn Rasser: Great. Thank you so much, Sam. And thank you to all our participants. Thank you for these great questions. I'm sorry we couldn't get to them all. We'll have to bring Sam back and do this again because we could've easily gone on for another hour with all the questions that were lined up. I learned a ton. I hope you did as well. Thank you again for joining us. Be well, be safe, until next time.