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Battle Robots Rivalry and the Future of War

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Introduction

Unmanned military systems – or 'military robots' – are becoming more commonplace among the rising number of armies around the world and are used with increasing frequency in combat. Leading powers, their challengers as well as their non-state combat opponents have begun to design, test, and field numerous unmanned systems. The introduction of such technology is reshaping the way wars are fought and will have profound implications on human combatants, military tactics, and state policies for the near future.

The United States and Israel, long leaders in using unmanned systems in their militaries, are now finding themselves in a rapidly evolving technology race with nations that have launched unmanned development programs. Russia, China, Iran, Turkey, and a growing number of smaller states are developing various systems in quick succession, aided in no small part by the proliferation of civilian-grade hi-tech, IT, software, optics, and other know-how technologies across the world. In 2017, Russian President Vladimir Putin recognized the importance of military robots by stating that his country needs its own effective developments 'of robotized systems for the Russian Armed Forces'.[1] This evolution in the use of new technology is upending existing norms and military tactics, generating a lot of questions about the way military competition will unfold in the near future.

For the next several decades, the American military would encounter a number of actors that field unmanned systems in a growing set of missions. The American combat superiority of the past 20 or so years could be slowly eroded by various land, air, and sea-based unmanned systems of near-peer adversaries like Russia and China, as well as by other countries and non-state actors seeking to project their power outside of their immediate spheres of influence. What this uncertain combat future requires is a better understanding among major unmanned systems users how the introduction of this new technology on a mass scale would affect the way they encounter their combat opponents, and how they would try to deconflict their actions – even as they begin to formulate the rules of unmanned engagement for their own forces.

[1] *'Putin shares his view on what Russian Army needs most', 2017, TASS, January 26. Available from: http://tass.com/defense/927489*

Implications of Unmanned Military Developments Among Global Leaders

Air

Major changes are taking shape in the air – where American unmanned aerial vehicles (UAVs) like the Global Hawk, Predator, and Reaper reigned supreme. These machines have become the golden standards for nations seeking the same capacity to observe and hit targets at great distances, freeing up various manned aircraft that used to perform observation and combat roles. Building such UAVs could be an expensive and long-term process, though certain shortcuts like industrial espionage could be applied to accelerate the process. It is important to note that current and future American military plans build on such UAVs as key components of future combat – either in ISR (intelligence, surveillance and reconnaissance) or strike roles. America's experience with such technology in the Middle East since 2001 has had significant impact on its competitors.

The Russian Federation tried to develop such UAVs for over a decade, and despite numerous promises that its medium or high-altitude long endurance (MALE/HALE) UAVs could enter service by now, only this year have any concrete results available. Russian military will test several such UAVs later in 2018–2019 in order to start acquiring them in subsequent years.[2] China, at the same time, has been more successful in designing and developing a lineup of UAVs, including MALEs[3] with combat characteristics, and has achieved rapid success in exporting them into key markets.[4] Recently, Iran and Turkey have also managed to build and field several combat UAVs that were already used in Syria.

These developments should be considered together with the rapid growth in the numbers of smaller UAVs that have proliferated in the many thousands across the world's militaries. While MALE and HALE UAVs tend to be seen as key component in power projection, it is the smaller, lighter, cheaper UAVs that also share the burden of modern combat that continues to evolve. Today, Russian military establishment sees Syria as the conflict that defines future combat. To quote Russian Chief of the General Staff General Valery Gerasimov, '[…] The military conflict in Syria

[2] *Azanov, R, 2018, '«Skat» Prevzoidet «Khishchnika». Zachem Vozrozhdaiut Udarnyi Bespilotnik-»Nevidimku»' [SKAT Will Outclass the Predator: Why Is the UCAV Brought Back?], TASS, September 13. Available from: https://tass.ru/armiya-i-opk/5561040*

[3] *Kania, E, 2018, 'The PLA's Unmanned Aerial Systems: New Capabilities for a "New Era" of Chinese Military Power', China Aerospace Studies Institute, September. Available from: https://www.airuniversity.af.mil/Portals/10/CASI/Books/PLAs_Unmanned_Aerial_Systems.pdf*

[4] *'China's UAVs Proliferate in Middle East', 2017, Aviationweek, November 11. Available from: http://aviationweek.com/dubai-air-show-2017/china-s-uavs-proliferate-middle-east?Issue=AW-021_20171111_AW-021_21&sfvc4enews=42&cl=article_2&utm_rid=CPEN1000000910591&utm_campaign=12541&utm_medium=email&elq2=b54f7a48c183467594eb28bddedb1454*

is treated as the prototype of a new generation of war. The US and its allies used a wide arsenal of high-tech weapons – [...] drones, satellites, various robotic systems. The Western intervention in Syria forms the contours of the most probable future war.'[5] Moreover, Russian high command is actively incorporating the lessons learned in that conflict, such as the creation of 'reconnaissance fire and reconnaissance strike contours' – 'combining the existing modern reconnaissance and combat means under the command of one commander and the effective use of these assets'.[6] Various aerial unmanned systems will play a key role in such 'contours', serving as an ISR or targeting link between Russia's existing land, air, and sea-based forces in the near future. Russian military is already actively training to use its UAVs in such roles, suggesting a growing importance of this new technology in future combat.

Today's conflicts already shape the way unmanned aerial vehicles are used, and General Gerasimov's warning about Syrian conflict as the next kind of war has already become reality. In the skies above the country, American UAVs are getting buzzed by the Russian electronic warfare (EW) systems,[7] Russian forces are operating an entire suite of UAVs for intel, surveillance, and target acquisition,[8] while their bases are under persistent attacks by flocks of armed improvised drones launched by antigovernment forces.[9] Across the border from the Turkish territory, Ankara's combat drones are conducting strikes against pro-American Kurdish formations in Syria.[10] To make matters even more complicated, Iranian armed drones are based in the Syrian territory for potential attacks against Israel.[11] So far, all these aerial assets do not necessarily intersect in direct combat, since we are only now starting to develop drone-on-drone technology – but the military and political ambitions of actors involved certainly cross each other's path.

As the battle skies become crowded with unmanned aerial systems in the coming years, military actors will face new dilemmas, from the inability to shield and 'hide' their forces to the need for persistent awareness for UAVs of all sizes and missions, to the need for adequate 'friend–foe' identification, and many others. The ever-growing use of UAVs already has countermeasures, such as Russian and American counter-UAV

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[5] Zakvasin, A, 2018, 'Kontury Voiny Budushchego: Kak Rossiiskaia Armiia Gotovitsia k Konfliktam Novogo Pokoleniia' [Contours of the War of Future: How the Russian Army Is Preparing for Conflicts of the New Generation], Russia Today, March 27. Available from: https://russian.rt.com/russia/article/496787-gerasimov-voina-novoe-pokolenie

[6] 'Udarnye i Razvedyvatel'nye Kontury VDV Ob»ediniat pod Odno Komandovanie' [Combat and Surveillance Forces of the Airborne Forces to Be United under One Command], 2017, Topwar, August 1. Available from: https://topwar.ru/121652-udarnye-i-razvedyvatelnye-podrazdeleniya-vdv-obedinyat-pod-odno-komandovanie.html

[7] Kube, C, 2018, 'Russia Has Figured Out How to Jam U.S. Drones in Syria, Officials Say', NBC News, April 10. Available from: https://www.nbcnews.com/news/military/russia-has-figured-out-how-jam-u-s-drones-syria-n863931

[8] Lavrov, A, 'Russian UVs in Syria', 2017, CAST. Available from: http://cast.ru/products/articles/russian-uavs-in-syria.html

[9] Kozlov, D & Grits, S, 2018, 'Russia Says Drone Attacks on Its Syria Base Have Increased', AP News, August 16. Available from: https://www.apnews.com/2b07cc798d614d84a32ff83f6abe2e7e

[10] 'Turkey Flies "One of World's Most Advanced" Drones in Syria Operations',2018, Ahvalnews, May 1. Available from: https://ahvalnews.com/defence/turkey-flies-one-worlds-most-advanced-drones-syria-operations

[11] Hartman, B, 2018, 'Iranian Drone Launched from Syria Was on Attack Mission, Israel Says', Defense News, April 17. Available from: https://www.defensenews.com/unmanned/2018/04/17/iranian-drone-launched-from-syria-was-on-attack-mission-israel-says/

technology in use and under development. All major militaries would need to come up with similar defenses, prompting continuous rounds of technology races in electronic warfare, radar identification, and kinetic technologies. However, the room for error in these crowded unmanned skies may grow exponentially – as would the need to develop proper messaging and deconfliction channels among major users in order to avoid unintended escalation resulting from targeting the 'wrong' kind of drone.

Today's militaries are still human-centric, and widespread use of military robots requires a significant reevaluation of existing tactics and procedures in order to properly incorporate this new technology. Widespread UAV use may increase the likelihood of conflict well ahead of establishing official rules of engagement similar to those created for human-centric combat, like the Geneva Convention. While the world is willing to come together to discuss the use of artificial intelligence in unmanned military systems,[12] there has not been significant effort to define the emerging rules of combat and their consequences when battlefield skies would be even more populated by unmanned systems.

Land

While the United States has a lead with UAV military use, the situation with ground vehicles is less clear. Despite using numerous small-sized unmanned ground vehicles (UGVs) in a variety of non-combat roles, a closer examination of the American strategy reveals a cautionary, incremental approach to fielding and incorporating certain types of these vehicles. The US Army calls for 'optionally manned' vehicle development, followed by a series of logistics models and manned–unmanned teaming concepts, or 'mixed convoys' with manned vehicles in the lead followed by unmanned vehicles in order to ease the logistics burden on its globally dispersed forces.[13] Once these technologies start to mature, only then will the American military start fielding armored UGVs. None of the UGVs planned so far will be truly 'autonomous', or capable of navigating the battlefield and making decisions on their own. At this point, no hi-tech solution exists to give these machines enough 'intellect' to properly perform on their own.

Initially, these American combat ground vehicles may be controlled by a crew, but the timelines for testing, evaluating, and fielding them are unclear.[14] The current UGV technology requires a human operator to perform most combat duties – from directing where the vehicles travel, to evaluating the combat situation and making the final decision to fire. Depending on the UGV type, the operator may be relatively close to actual combat, increasing chances of casualties that this vehicle was designed to avoid in the first place – as a replacement for human assets.

According to official statements, the US Army 'wants to go from two humans remotely operating one robot to one human controlling one robot, to one human

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[12] *Motoyama, S, 2018, 'Inside the United Nations' Effort to Regulate Autonomous Killer Robots', The Verge, April 27. Available from: https://www.theverge.com/2018/8/27/17786080/united-nations-un-autonomous-killer-robots-regulation-conference*

[13] *Sydney, J & Freedberg, J, 2018, 'From Google Cars to Robot Tanks: Army RCV', Breaking Defense, August 31. Available from: https://breakingdefense.com/2018/08/from-google-cars-to-robot-tanks-army-rcv-part-2/*

[14] *Ibid.*

commanding multiple robots, with a human "in the loop" for the use of lethal force.'[15] Such a construct may run counter to the emerging battlefield realities, with numerous threats across multiple domains requiring instant evaluation and decision-making. While the US military currently experiments with a variety of logistics and support vehicles, it may get a combat UGV only in a few years' time, around 2023.[16] Moreover, the US Army wants to improve artificial intelligence (AI) so 'one human can supervise a squadron of robots' – the concept that will 'require extensive experimentation with both technology and tactics: how the command links can be secured against hacking and jamming; how self-directing robots can really be; how many a human commander can keep track of at once; and how they can expand the space and time a mixed human–machine unit can control.'[17]

The caution with fielding unmanned technologies is not unfounded. In 2007, a South African robotic gun malfunctioned at a test range, killing 9 and wounding 14 soldiers.[18] In 2008, American military utilized SWORDS unmanned combat ground vehicle as a learning platform in Iraq, after a few minor non-lethal incidents led to the birth of an exaggerated story that the vehicles' guns were not under human operator's control.[19] Most importantly, no military has yet mastered the software development necessary to create a truly autonomous UGV 'brain', though United States, Russia, and China have made public their desire to develop AI for their military's needs.

Before we see widespread use of ground combat robots in real combat, much rigorous testing must take place in order to determine if these designs can correspond to battlefield realities. It is for this reason that the Russian Ministry of Defense (MOD) has established several centers such as Main Research and Testing Center of Robotics, tasked with working alongside the defense-industrial sector to create unmanned military technology standards. The past several years have seen Russia challenge its American and Chinese counterparts in developing and testing a wide variety of logistics and combat UGVs, from small vehicles for demining and unexploded ordnance cleaning to larger, tanks-sized machines brimming with a variety of weapons. What remained was to figure out their role in combat….

Perhaps, one of the best explanations for American reluctance with fielding a full-fledged robotic tank is Russia's own admission that its Uran-9[20] combat ground vehicle fell far short of expectations when put into near combat conditions in Syria. In a candid presentation, the MOD's Central Research Institute reported on this

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[15] Sydney, J & Freedberg, J, 2018, 'From Google Cars to Robot Tanks: Army RCV', Breaking Defense, August 31. Available from: https://breakingdefense.com/2018/08/from-google-cars-to-robot-tanks-army-rcv-part-2/

[16] Ibid.

[17] Sydney, J & Freedberg, J, 2018, 'Army Pushes Bradley Replacement; Cautious on Armed Robots', Breaking Defense, June 27. Available from: https://breakingdefense.com/2018/06/army-pushes-bradley-replacement-cautious-on-armed-robots/

[18] White, C, 2007, 'Robot Cannon Goes Berserk, Kills 9', Gizmodo, October 18. Available from: https://gizmodo.com/312443/robot-cannon-goes-berserk-kills-9

[19] Weinberger, S, 2008, 'Armed Robots Still in Iraq, But Grounded', Wired, April 15. Available from: https://www.wired.com/2008/04/armed-robots-st/

[20] 'Chasovoi - Boevoi Robot «Uran-9»' [Chasovoi Program: Military Robot Uran-9], 2017, April 23. Available from: https://www.youtube.com/watch?v=QWVNNE_n07I&t=6s

vehicle's critical combat deficiencies in April 2018.[21] Most of Uran-9's key components malfunctioned, including communications that limited its operational range, weapons, gear, suspension, optics, electrical, and other elements. Probably, the most crucial failure was the inability of the operator to quickly understand and orient himself as he piloted Uran-9 – observing the battlefield via computer monitors proved an ineffective substitute to actual presence in combat. This challenges an entire concept of placing a piloted military robot in combat – a lesson that was likely not lost on the American counterparts as they contemplate the evolution of their own 'remote combat vehicles' (RCVs).

These failures are a sign that this (and perhaps other) much-discussed and much-advertised Russian vehicle is in need of significant upgrades, testing, and even a redesign before it gets put into another combat situation. Judging from this Syrian test, Russians made key conclusions which point to the potential trajectory of Russian combat UGV development – issues similar to those addressed by the American military establishment as they contemplate the use of unmanned systems on the battlefield. The inability of the operator, presumably located a safe distance from combat, to fully understand, process, and effectively respond to what is taking place with this UGV in real time is a problem that currently has no solution. Notably, a conclusion was made that for the next 10–15 years, Russian unmanned ground systems would be used in storming 'stationary and well-defended targets', effectively giving such combat UGVs a limited one-time 'kamikaze' role. Moreover, such UGVs should be used with other military formations in order to target and destroy fortified and firing enemy positions – but 'never on their own, since their breakdown would negatively impact the military mission itself.'[22] This setback, however, does not impede Russia's continued combat UGV development and experimentation, such as recent announcements for a new vehicle designed for urban combat.[23]

Not to be outdone, China is experimenting with a variety of UGVs in support and logistics roles, such as turning its older Type-59 tank into a remote-operated vehicle.[24] China still has thousands of these tanks, and these older machines can become significant unmanned mission multipliers in future wars, providing the nation develops specific concepts of operations (CONOPS) for their use, especially if they are equipped with artificial intelligence.[25] Owing to their simple and unsophisticated design, the loss of these remote-piloted tanks in combat would be of relatively small consequence to the Chinese military aiming to break through enemy defenses at a small cost to its manned assets. Chinese defense-industrial community also holds competitions for logistics UGVs with military missions in mind.[26]

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[21] *'Problemnye Voprosy Razvitiia Robototekhnicheskikh Kompleksov Voennogo Naznacheniia' [Problematic Issues of Developing Robotic Systems for Military Purposes], 2018, BMPD, June 16. Available from: https://bmpd.livejournal.com/3239351.html*

[22] *Ibid.*

[23] *Sidorkova, I, 2018, 'Glava UVZ Zaiavil o Razrabotke Al'ternativy Bespilotnoi «Armate»' [Head of Uralvagonzavod Announces Development of an Alternative to the Armata Based UAV], RBC, September 26. Available from: https://www.rbc.ru/society/26/09/2018/5baa4caa9a7947f29e4eff23?utm_source=fb_rbc*

[24] *Mizokami, K, 2018, 'China Is Experimenting with Remote Controlled Tanks', Popular Mechanic, March 21. Available from: https://www.popularmechanics.com/military/weapons/a19544755/china-is-experimenting-with-remote-controlled-tanks/*

[25] *Ibid.*

[26] *CCTV [CCTV军事], 'Military Technology' [《军事科技》 跨越险阻2018—直击陆上无人系统挑战赛（上）20180929], September 29, 2018. YouTube video. Available from: https://www.youtube.com/watch?v=0pzkOpN0ftk*

Fully autonomous operation so far eludes major UGV developers, who are nonetheless still working toward achieving such operational goals. As UGV technologies begin to proliferate, they, like their UAV counterparts, will become cheaper, more available, and therefore more easy to use. Although such use would answer the mission for saving soldier's lives, the potential simplicity in using UGVs of this kind may trigger the chain of reaction that could be difficult to stop. Similar to the ongoing UAV proliferation, combat UGV use could trigger a new and potentially dangerous arms race to ensure that such vehicles can overcome adversaries via their on-board technology and AI-powered command and control. Although the international community is so far years from such breakthroughs, the debates and discussions of limiting the role of these lethal, AI-powered machines have already begun, and show no sign of abating.[27] To make the matter even more complicated, Russia and the United States – which see each other more and more as adversaries – jointly stopped a resolution on forbidding a battle AI development.[28] As combat UGVs become more and more commonplace in the military, the question of making them 'smarter' will be front and center in order for a given force to achieve combat superiority. As the current technology developments and policy discussions show, while the world may accept the use of such vehicles as inevitable, no one has clear answers about the effect of such 'smart' weapons in future combat.

Sea

It is, however, at sea that the most significant changes to military operations can take place. Currently, the United States has undisputed command and control of the maritime domain, capable of fielding a large amount of assets across the global ocean. Its surface, underwater, air, and space-based naval systems give it an unprecedented global presence. US Navy has pursued active unmanned underwater and surface vehicles (UUVs and USVs) developments,[29] fielding a variety of platforms over the past several years.[30] American military and its allies are also pursuing a number of projects[31] that tie together UUV, USV, and UAV operations. At the same time, adversarial USV and UUVs, when working with various manned and unmanned assets, are capable of projecting significant ISR and combat capability far from home shore, presenting a unique maritime challenge to an established force like the US Navy.

Today, Russia and China are both working on a wide variety of USV/UUVs that can operate at various depths and are equipped with various optic, electronic, and sonar technologies. Specifically, Russia is working on large UUVs capable of driving to the depth of several miles, as well as on relatively inexpensive 'gliders' functioning

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[27] '2018 Group of Governmental Experts on Lethal Autonomous Weapons Systems (LAWS)', 2018, UNOG. Available from: https://www.unog.ch/80256EE600585943/(httpPages)/7C335E71DFCB29D1C1258243003E8724

[28] Chernenko, E, 2018, 'Roboty Ne Volk — v Les Ne Ubegut' [Robots Will Not Disappear for Nothing], Kommersant, September 4. Available from: https://www.kommersant.ru/doc/3731577

[29] Keller, J, 2018, 'Navy Eyes Unmanned Underwater Vehicle (UUV) Weapons Payloads to Stop or Disable 160-Foot Ships at Sea', Military Aerospace, May 24. Available from: https://www.militaryaerospace.com/articles/2018/05/unmanned-underwater-vehicle-uuv-weapons-payloads.html

[30] Wittman, R, 2018, 'US Navy's Unmanned Vehicle Efforts Are the Answer to Deterring Adversaries', Defense News, April 26. Available from: https://www.defensenews.com/unmanned/2018/04/26/us-navys-unmanned-vehicle-efforts-are-the-answer-to-deterring-adversaries/

[31] Walan, AMG, 'Anti-Submarine Warfare (ASW) Continuous Trail Unmanned Vessel (ACTUV) (Archived)', DARPA. Available from: https://www.darpa.mil/program/anti-submarine-warfare-continuous-trail-unmanned-vessel

near the surface. Russia has also made public its plans for UUVs armed with warheads and fit to evade shore-based defenses.[32] Russian designers have commenced work on a UUV 'swarm' that can help guard its maritime borders and perform search rescue missions, not to mention potentially participate in combat. The nation's fifth-generation submarine could potentially carry companion UUVs that would extend its combat and ISR range.

These unmanned maritime technologies could be much cheaper than building a manned vessel and are capable of providing a country with vastly improved ability to monitor and affect the maritime domain. It is not yet clear if the United States has begun to adopt to this new technological reality of being potentially challenged at sea, as these UUV/USV technologies are slowly starting to mature. Clear signs of potential conflict are there – there have been instances of Chinese Navy grabbing American UUVs out of the water.[33] While both sides have downplayed these incidents, as the unmanned maritime technologies proliferate, so will the episodes of targeting the 'wrong' kind of vehicle that too can start a chain of events that may be difficult to stop. The pursuit of UUV/USVs is justified as a key maritime domain awareness and combat tool, and the end result could be the leveling of the military playing field between various established and rising navies across the world. Already, improvised remote-piloted armed boats can cause significant harm to naval assets off the Yemeni coast, forecasting a potentially dark future for maritime conflict.[34] Although the United States is the current dominant power across the world's oceans, that position could start to erode with ever-increasing speed should Washington's competitors start fielding unmanned maritime systems on a massive scale that would be able to better track American underwater assets and eventually threaten its surface vessels.

'Future Imperfect'

Certain key developments are front and center for major powers seeking to develop an ever-sophisticated array of unmanned technologies, such as the 'swarm' – the impending capability to use multiple unmanned vehicles in coordinated fashion to overwhelm adversary defenses and inflict maximum damage. The United States and China are experimenting with 'swarm' concepts, while Russia is seeking to develop this capability in the near future. Should the unmanned 'swarm' be endowed with the capacity to 'think' for itself via AI or machine learning tools, the propensity to use

[32] *'Istochnik: Podvodnyi Apparat «Poseidon» Smozhet Nesti Boegolovku Moshchnost'iu do Dvukh Megatonn' [Source: UUV Poseidon Is Capable of Carrying a 2-Megaton Warhead], 2018, TASS, May 27. Available from: http://tass.ru/armiya-i-opk/5208267*

[33] *Cavas, CP, 2016, 'China Grabs Underwater Drone Operated by US Navy in South China Sea', Defense News, December 16. Available from: https://www.defensenews.com/naval/2016/12/16/china-grabs-underwater-drone-operated-by-us-navy-in-south-china-sea/*

[34] *Perper, R, 2018, 'Drone Boats Filled with Explosives Are the New Weapon in Global Terrorism', Business Insider, October 4. Available from: https://www.businessinsider.co.za/drone-boats-filled-with-explosives-houthis-saudi-arabia-2018-10*

it would itself start the chain reaction involving the world's militaries that could lead to unforeseen consequences for armies and societies alike. Additionally, major powers seek to avert the loss of unmanned technology on the battlefield via enemy interference or other vulnerabilities. Accidents and incidents, as well as technology breakdowns and unpreparedness still frame some of the thinking behind integration of certain unmanned military systems with existing combatant formations. Presumably, the solutions to these shortcomings can then be incorporated into subsequent unmanned models that can better serve the warfighters' needs. This ongoing evolution is often running into issues resulting from breakthrough technology getting incorporated with long-established combat concepts and principles.

Moreover, even the most advanced unmanned systems such as those fielded by the United States cannot guarantee the user against certain collateral damage, which leads to political debates that the military would rather avoid. However, none of the above slows down the overall unmanned technology race that is only expected to heat up. Rapidly rising number of military robots among the major manufacturers and users will redefine the political and tactical battlefield framework, while generating additional friction among the proponents and opponents of this technology in today's and future wars.

Conclusion

Unmanned military technologies will rewrite combat rules and could push the world into different kinds of conflict, the consequences of which are difficult to predict today. Presently, the international community is in the midst of an unprecedented change – the ongoing and ever-increasing challenge to the American military superiority by the rising number of competitors capable of extending the quality of their militaries via unmanned systems development and deployment. Currently, the United States leads in financial and technological investment into this new way of war – but other nations are inching close via their own unique blends of political and military approaches. New technology will be followed by the need for a new policy framework among major users to define this new combat, its potential limitations, and perhaps even deconfliction rules. How this global combat environment will shift in the next 10–15 years remains to be seen – and all major militaries must start preparing for this inevitable technological shift.

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