Valdai | Discussion Club

The Future of War

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Introduction

'The old *cliché* is that generals are always trying to fight the last war,[1] and quite frankly, we are not. We are trying to win the next one. We are looking around in the world and we find ourselves at flexion point. For the last 16 years, we have been fighting in Afghanistan and Iraq, primarily doing counterinsurgency, counterterrorism type operations. We have just had a new National Defense Strategy come up, and we talk about great power competition.[2] Not necessarily that we are going to go to war with great power competition, but we as a military, we need to be ready. And so, we need to change the way we do business. The civilian industry, when it comes to technologies, moves very, very quickly, so we need to adapt our industrialized processes, so we can quickly modernize the military as we go forward.'

The above is an excerpt from what General James C. McConville, Vice Chief of Staff of the US Army, told Future of War Conference 2018[3] in Washington, DC, in April 2018. It reflects the three main concerns related to future armed conflicts shared by military leaders in all countries: to correctly gauge the likelihood of a conflict; to adequately identify adversaries and assess their potential; to avoid defeat before the war by properly organizing war preparations and coordination between military and civilian institutions.

Faced with the growing instability of the international system, greater uncertainty, and declining predictability in the course of international developments, the military, politicians, and experts have been increasingly compelled to speculate about the possibility of a major international military conflict. Most often, debates on this subject contain allusions to the international situation on the eve of World War I.[4]

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[1] *This observation was made by Winston Churchill, who meant to say that while preparing for likely military conflicts, the military rely on their past experiences and often neglect new circumstances and factors. In this sense, they are indeed preparing to fight the 'last war'.*

[2] *'National Security Strategy of the United States of America', 2017, Washington, DC, December, 56 p. Available from: https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf*

[3] *'Future of War Conference 2018', New America, April. Available from: https://www.youtube.com/watch?v=EykbbwUL3Y0&t=920s*

[4] *'Living in a Crumbling World', 2018, Valdai Discussion Club Report, October. Available from: http://valdaiclub.com/files/20155/*

The political antagonisms of the modern world have reached a degree that is indeed alarming. No less destabilizing than the lowered pain threshold that used to guard against the use of force or wars between the states – is the visible imbalance between the advancing technological warfare capabilities and the lack of practical experience in using these technologies. This is one of the reasons why the contours of a large-scale military clash between major or comparable powers[5] are still unclear.

The old cliché is that generals are always trying to fight the last war, and quite frankly, we are not. We are trying to win the next one

War As a Phenomenon: Nature versus Character

Since the 'future of war' and 'wars of the future' emerged as popular topics in academic and journalistic writings on international relations, there has been no end to the proliferation of possible scenarios and forecasts concerning the potential transformation of war as a socio-political and technological phenomenon.[6] The overwhelming majority of published works on the future of war today focus primarily on how to introduce and use advanced technologies in the defence industry, analysis of new theatres of operations, and speculations about the apocalyptic quality of this world.

On each point, what predominates is research on military artificial intelligence[7] and the future of information and cyber warfare.[8] Sporadic, if occasionally high-quality, work related to this and other subjects has failed, however, to create a critical mass of expert knowledge on the future of warfare. True, academic institutions are setting up large research centres to pursue

[5] Sushentsov, A & Kofman, M, 2016, 'What Makes Great Power War Possible', Valdai Discussion Club Report, April. Available from: http://valdaiclub.com/files/10683/

[6] Latiff, R, 2018, 'Future War: Preparing for the new Global Battlefield', Penguin Random House, New York; 'The Future of War – The New Battlegrounds', 2018, Special Report, The Economist, January; Tepperman, J, 2018, 'The Future of War', Foreign Policy, Fall.

[7] For a comprehensive analysis of this subject, see: Cummings, ML, 2017, 'Artificial Intelligence and the Future of Warfare', Research Paper, Chatham House, January.

[8] For more detail on this dimension of future warfare, see: Lewis, JA, 2018, 'Cognitive Effect and State Conflict in Cyberspace', Center for Strategic and International Studies, September 26.

THE GROWING NUMBER OF REGIONAL CONFLICTS AND THEIR VICTIMS IN THE WORLD

Only conflicts in which at least one party was the government of a state and which generated more than 25 battle related deaths are included. Deaths due to disease or famine caused by conflict are excluded. Extra-judicial killings in custody are also excluded.

Average number of battle deaths per conflict since 1946, by type
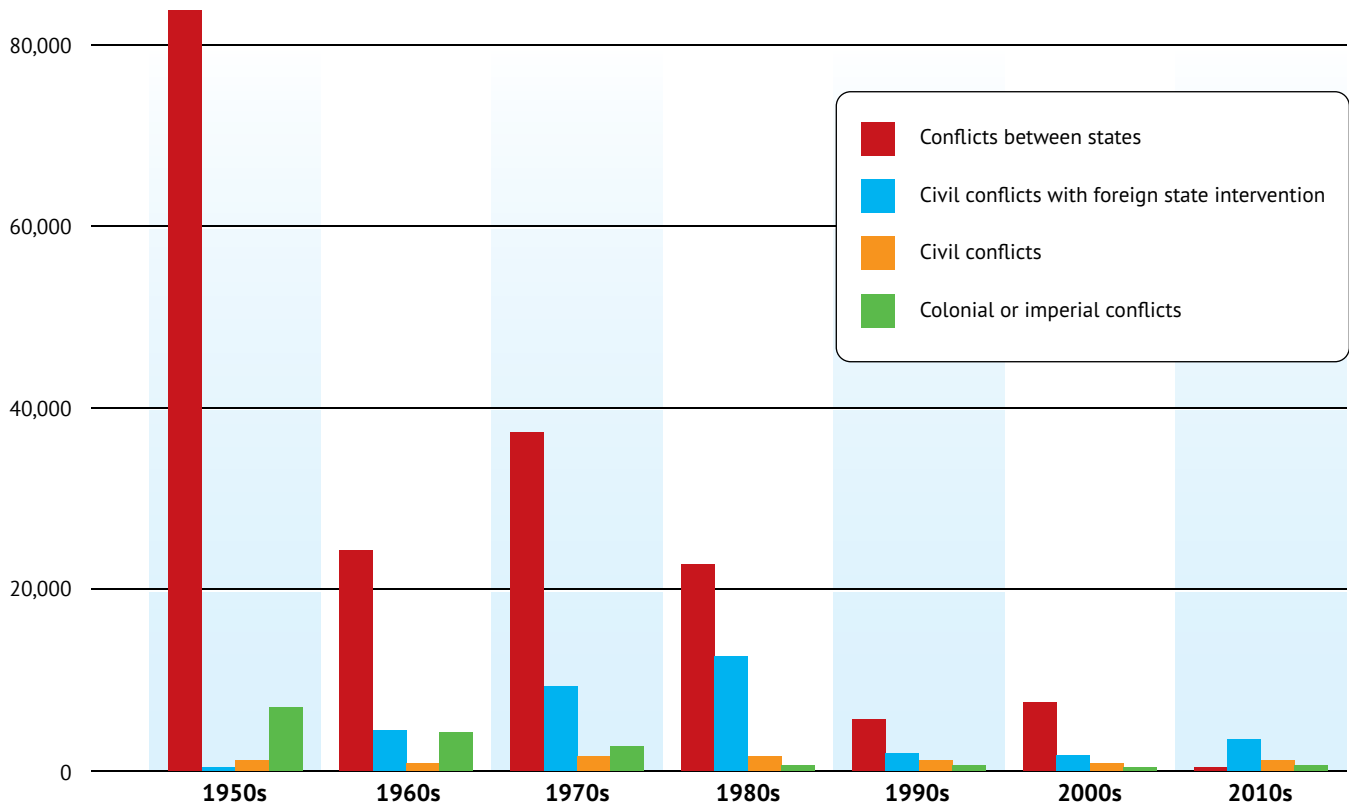
Sources: UCDP/PRIO.

comprehensive inquiries,[9] but they are still in the inception stage and the future of warfare remains one big grey zone. As such, it makes more sense to be pessimistic about what these conflicts could do to the world.

But the 'technological hype' is overshadowing the fundamental question regarding the future of war: what aspects of war are changing and which of them will remain the same? Depending on the combination of constants and variables that is ultimately selected, each researcher, as a rule, either seeks

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[9] So far, two US universities have launched centres conducting meaningful research into the future of warfare: Arizona State University's Center on the Future of War and Brown University's Costs of War Project.

the key to victory in the wars of tomorrow in innovative technologies, or, as the 'dean of British strategic studies', Sir Lawrence Freedman, has put it, looks at the future of war as a 'distinctive and revealing past'.[10] Although practically all of life's components change over time as humankind adapts to new conditions and seeks more effective paths of development, certain key principles show constancy. What changes in the case of war is its 'optics', external appearance, and *character*, while the fundamental *nature* of this phenomenon and its role in international relations remain unchanged.

Given this distinction between the character and nature of war, technological changes and the evolution of ideas can rather easily and quickly change the dynamics of war's character, in other words, transform the practice of warfare during conflicts and defence policy-making in peacetime. The constant, as before, is the higher, systemic level that includes the nature of war – the motives of war and the laws it follows within the system of international relations or state governance.[11] It is important to distinguish between these facets of war precisely for the reason that otherwise all forecasts concerning the future of war will be erroneous, and decision-makers will be preparing for wrong challenges and relying on decisions that are likely to fail.

In spite of the existing store of knowledge about war or the tactics and strategy used in past battles, new wars seem to catch politicians and generals off guard. Famous military leaders suffered setbacks because they were deceived by their own expectations and, as a consequence, misconceived how a battle or overall conflict would develop. These expectations, and the leaders' certainty of victory, were themselves often based on a seeming or perhaps even real technological superiority over the adversary. As such, the emphasis on developing modern military technologies as a 'silver bullet' in future wars must not mislead us as to their ability to transform the nature of war.

This outlook is not something new. Contemporary military practitioners like former US Defense Secretary James Mattis issued repeated warnings that no amount of change in military technologies would contribute anything

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[10] *For a comprehensive treatment of this subject, see: Freedman, L, 2017, 'The Future of War: A History, Public Affairs', 376 p.*

[11] *For more detail, see: Braumoeller, BF, 2019, 'Only the Dead: The Persistence of War in the Modern Age', Oxford University Press, 325 p.*

to military philosophy what was not known before. To quote Carl von Clausewitz: 'Inventions and ideas can hardly influence the nature of war,' and this dictum holds to this day.[12] The global political system continues to operate on the principles of power politics involving the use of force or a possibility thereof. Over a long period, diplomatic and economic tools of interaction between states were used to cultivate a stability of universal benefit. But the territorial integrity of states and the physical safety of populations and institutions are still guaranteed by military resources and capabilities.

Considerable attention in debates on future wars is devoted to increasingly powerful non-state actors and the evolution of asymmetric conflicts.[13] It is common knowledge that the phenomenon of war predates that of the state, and that the earliest forms of statehood were often susceptible to centre–periphery confrontations with capitals pitted against insurgent or guerrilla forces. In this sense, 'asymmetric wars' as an evolutionary trend in the theory of war can hardly be called something new.[14] Undoubtedly, wars of this type in the past and present are not identical. However, their strategic framework has changed only marginally over centuries. New technologies and modes of operating can indeed give serious advantages to smaller adversaries, whereas better military organization and possessing the necessary resources and technologies will not add up to a 'strategic breakthrough', as evidenced by US military campaigns in Vietnam, Afghanistan, and Iraq.[15]

The proliferation and improvement of military capabilities in cyberspace will not transform the nature of war either. The basic concept of cyberwars is to target an opponent's communications infrastructure and political and economic foundations. This idea can hardly be called revolutionary. What has changed over time is the cyberenvironment – the infrastructure that now supports communications, economic cooperation, and transmission of political

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[12] *Gilbert, M, 2014, 'Clausewitz's Views on the Transformation of War, Politics and Society—An Analysis of the Wars in the 19th and 20th Centuries', Pointer, Journal of the Singapore Armed Forces, vol. 40, no. 4.*

[13] *For more detail, see: Deriglazova, L, 2009, 'Assimetrichny konflikt: uravneniye so mnogimi neizvestnymi' [Asymmetrical Conflict: An Equation with Many Unknowns], Tomsk University Press.*

[14] *The guerrilla war concept can be clearly traced in the strategy that the Roman dictator Quintus Fabius used in an attempt to degrade Hannibal's war machine during the Second Punic War (218-201 B.C.).*

[15] *See: Sushentsov, A, 2014, 'Maliye voiny SShA. Politicheskaya strategiya SShA v konfliktakh v Afganistane i Irake v 2000-2010 godakh' [America's Minor Wars. US Political Strategy in the Conflicts in Afghanistan and Iraq in 2000-2010], ed. A. Bogaturov, Moscow, Aspect Press.*

rhetoric. Although the cyberenvironment consists of tools that differ from those in the physical environment characteristic of conventional wars and requires a different configuration of resources and techniques, the strategic prescriptions for this environment are essentially identical to those involved in 'kinetic warfare' and amount to identifying an adversary's vulnerabilities and striking the right balance between defensive and offensive capabilities.

What changes in the case of war is its 'optics', external appearance, and character, while the fundamental nature of this phenomenon and its role in international relations remain unchanged

The same principle applies to information warfare, yet another type of future war. Technologies open up new opportunities in terms of the scale and quality of efforts to reach 'hearts and minds' in the enemy camp or third countries and can help protect people at home from 'toxic' influences. Although it is still more difficult to be on the defensive in information campaigns than to attack, the fundamental goal of propaganda and the information impact as a whole is the same as centuries ago and consists in destroying the adversary's idea without recourse to physical violence.
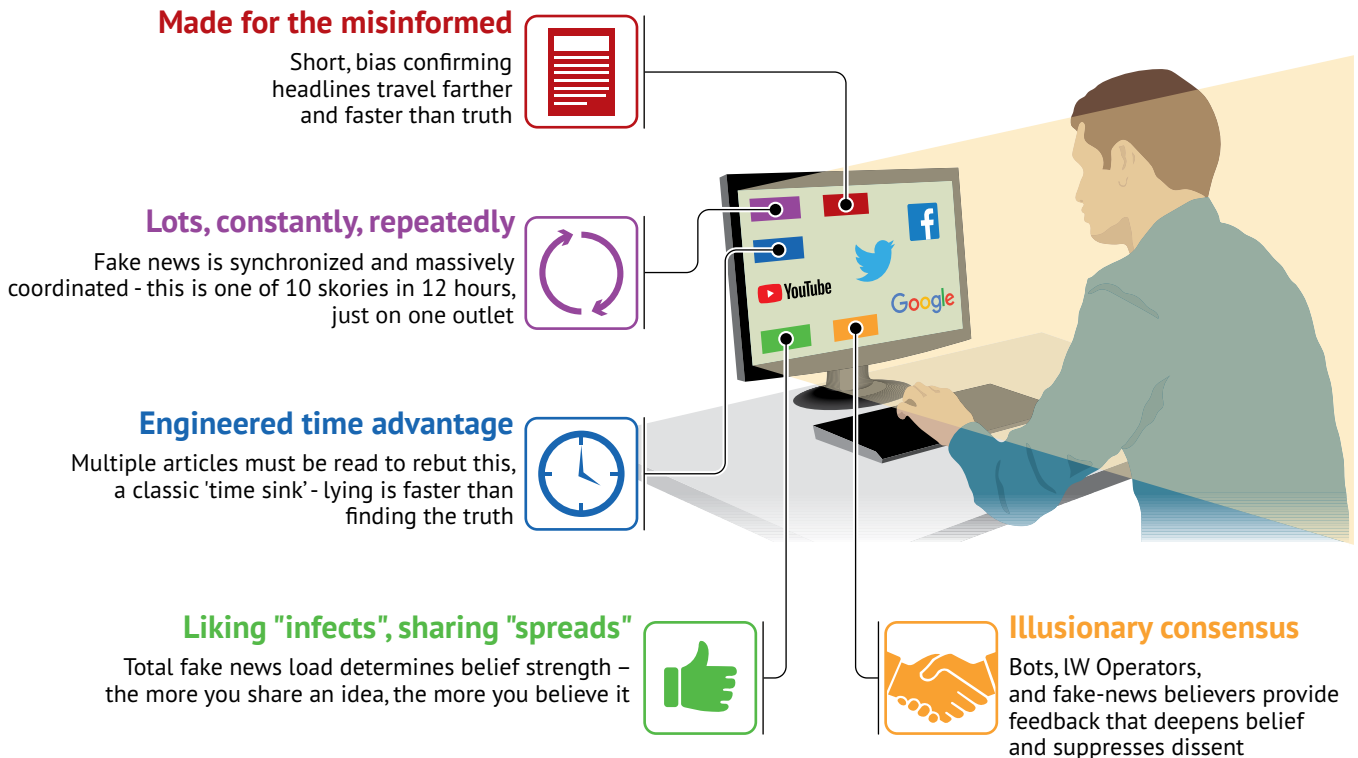
Nevertheless, significant changes are taking place on the tactical-operational level, changes that must not be ignored if we want to form the correct idea of what war will be in the future. It is necessary to adapt these changes to the current varieties of warfare in order to minimize losses and achieve more success in military operations. Drones have fared better than anything else in this sense, being an effective tool for reducing personnel losses, accelerating operations, and raising the level of mission performance if handled by competent operators relying on accurate intelligence.

It must also be acknowledged that war does not change due to the dynamics typical of military affairs alone. Cultural characteristics and moral restraints also have their influence. The Geneva Convention, for one, structures military operations in keeping with international law and criminalizes certain acts of violence and methods of warfare. For the sake of fairness, it should be mentioned that critics of the legal approach to criminalizing war warn only against relying too strongly on international law in future wars. Sir Lawrence Freedman notes that the mission of humanitarian and diplomatic conventions was to take the edge off war and make it more palatable, not

FAKE NEWS

Fake news is a weapon that works online for financial or political gain.

Made for the misinformed

Short, bias confirming
headlines travel farther
and faster than truth

Lots, constantly, repeatedly

Fake news is synchronized and massively
coordinated - this is one of 10 skories in 12 hours,
just on one outlet

Engineered time advantage

Multiple articles must be read to rebut this,
a classic 'time sink' - lying is faster than
finding the truth

Liking "infects", sharing "spreads"

Total fake news load determines belief strength –
the more you share an idea, the more you believe it

Illusionary consensus

Bots, lW Operators,
and fake-news believers provide
feedback that deepens belief
and suppresses dissent

Sources: RAND, London School of Economics, Internet sources.

illegal. If in the past, the imperatives of military domination often clashed with legal restraints, it is unlikely that respect for legal norms will grow in the future, when the stakes might be even higher.

That being said, public opinion is gaining influence on government decision-making in matters of war and peace. Facing pressure from within or without, a growing number of countries seek to avoid open violence. But we also observe a countervailing trend in less democratic countries, where smaller public involvement in decision-making and the lack of public debates on problems of war makes it easier for their governments to plunge into risky military undertakings. Still, both of these broadly defined groups of states are prone to engage in manipulating war-related information to influence public opinion for their own benefit.[16]

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[16] For more detail, see: Mearsheimer, JJ, 2011, 'Why Leaders Lie: The Truth About Lying in International Politics', 1st Edition, Oxford University Press.
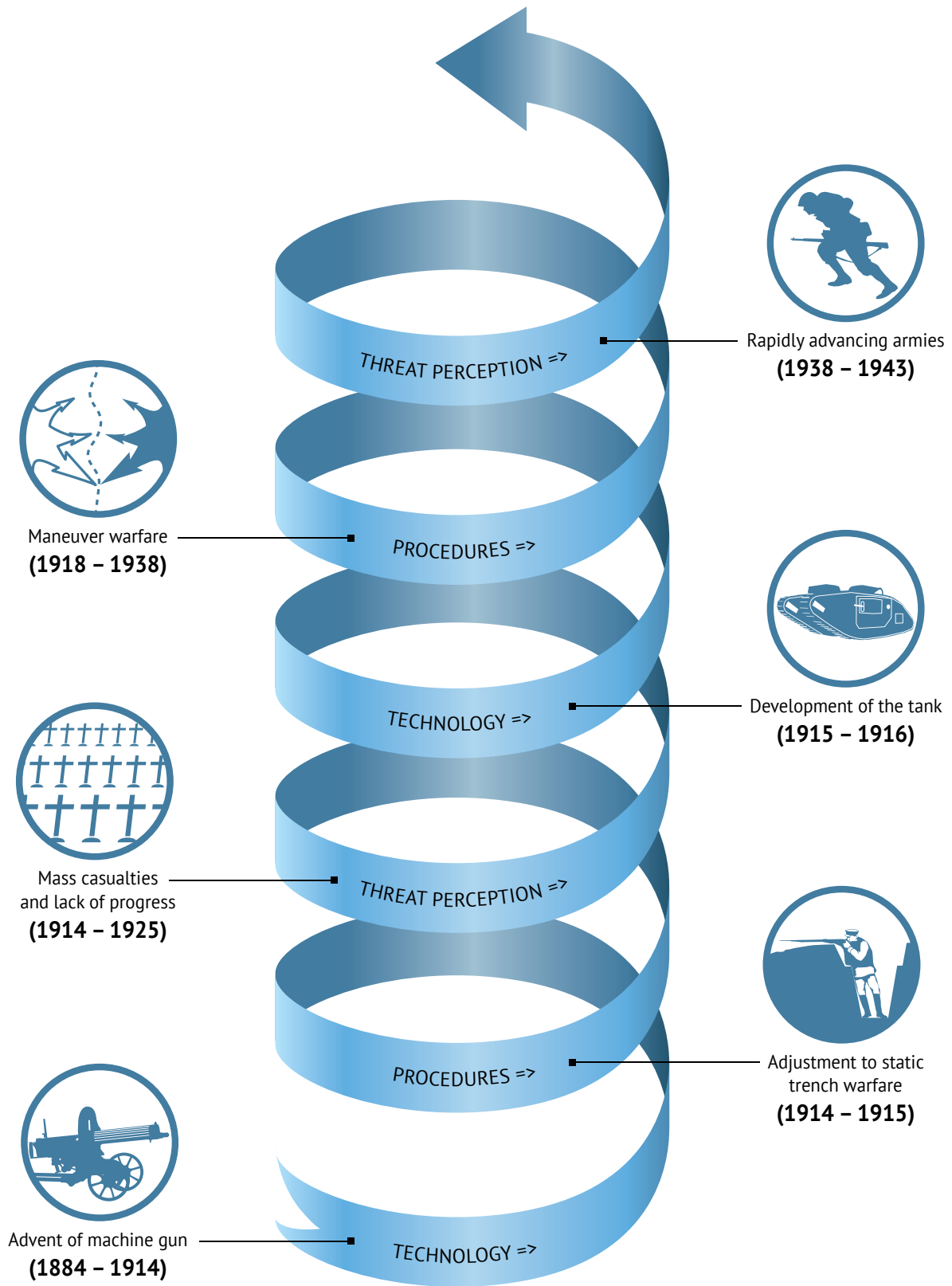
The Cyclical Evolution of War

To understand what future wars could be like, it is important to know not only which aspects of war change and which remain the same, but also how these changes take place, what factors propel them, and how exactly they are cyclic. Understanding the cyclical nature of modernization processes, adapting to new technologies, accommodating threats, and filling gaps in resources and development is important in fully conceptualizing future military conflicts.

As a motive force in how war changes, cyclical evolution is based on several distinct elements.

The evolution of technologies is the first and perhaps main element where public perceptions are concerned. However, with all their importance, technologies are only able to foster change in tandem with other components. Their emergence and subsequent introduction in the armed forces facilitates the development of relevant skills and capabilities, which in turn stimulate the emergence of new procedures to harness their potential. Finally, implementing a specific procedure gradually creates a new situation that forms a certain perception of the new threat – the final element in the cyclical evolution of war. As soon as this threat is perceived, a technology is conceived to respond to it. From a political and military standpoint, threat perception is an important force determining what technologies, ideas, and procedures are needed to counter threats. These, in turn, create a new perception of threats thereby perpetuating the evolution of military practices.

A graphic example of how this process unfolds is the invention of the machinegun in the late 19th – early 20th century, which eventually led to an evolution of military practices that lasted for many years to come. Before machineguns became weapons of war, infantry used to advance in close formation. But now even one machinegun had enough firepower to mow down the formation with heavy losses for an adversary. This ushered in a change in military procedure that prescribed how the infantry should move on the battlefield, practically ruling out cavalry charges,

TECHNOLOGY AND WEAPONS

Rapidly advancing armies
(1938 – 1943)

THREAT PERCEPTION =>

Maneuver warfare
(1918 – 1938)

PROCEDURES =>

Development of the tank
(1915 – 1916)

TECHNOLOGY =>

Mass casualties
and lack of progress
(1914 – 1925)

THREAT PERCEPTION =>

Adjustment to static
trench warfare
(1914 – 1915)

PROCEDURES =>

Advent of machine gun
(1884 – 1914)

TECHNOLOGY =>

thus depriving military leaders of an important mobile asset. During World War I, machinegun fire brought about even more perceptible changes, such as the rise of covered weapon emplacements (pitfalls),[17] which, along with enhanced artillery capabilities, rendered obsolete once effective battlefield manoeuvres.

Thus, emerging out of the new technology and capabilities, the new procedure gave rise to a new threat in the form of heavier casualties in offensives and reduced battlefield mobility. But this challenge, in turn, initiated a new cycle of military evolution in the field of technology, with the invention of the tank as one of the solutions that increased battlefield mobility many times over. In parallel, the use of chemical weapons emerged as a method of directly killing or 'smoking out' enemy soldiers from covered emplacements. By the start of World War II, tank mobility and firepower had undergone further qualitative improvements, which triggered a new, even more rapid cycle in the evolution of military theory and practice than the invention of the machinegun earlier in the century.

For all the immense importance of technologies, innovation in warfare is not confined solely to introducing new weapon models, even though this can drive innovation in a big way. New ideas on their own can be a source of new procedures on the operational and tactical levels. The key example here is military mobilization. National armies had to come a long way, from the days of *ad hoc* levies and private mercenary units to the emergence of regular armies. Along the way, different countries periodically toyed with ideas ranging from compulsory military service to maintaining a strictly professional army, to relying solely on mercenaries. These evolutions were not a result of technological breakthroughs. They resulted from an altered ideological paradigm and a reassessment of the concepts of 'sovereignty' and 'statehood', as well as from practical military thinking that saw fit to revise the concepts of 'military training', 'professionalization' and 'readiness'. In other words, we can speak about both tech-based and ideas-based evolution of warfare.

The difficulty in forecasting the future of war is that the trajectory is not linear. Moreover, the technological, procedural, and other changes

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[17] *For more detail, see: Fowler, W, 2012, 'Battle Story: Ypres 1914-1915', The History Press.*

are anything but universal. Not all state and non-state actors in this sphere transform at equal speeds or at all levels. Given the uneven distribution of resources and unique threat perceptions of each particular actor, individual styles abound in the 'future of war' culture. In turn, the convergence of these different paths creates 'threat environments' that define development priorities in this area. The main difficulty involved in visualizing the future is untangling this web of individual technology development models and forming a reasonably clear idea of how one influences the other.

The Role of Technologies in Shaping the Future War

While purely military elements of the future of war are being analysed by the military in key countries (and in this regard there is both a certain vision of ongoing processes and a trajectory of where the evolution of warfare is headed), the political aspects of possible conflicts are far less studied.

Currently, two trends are developing in the world. One could be described as 'post-nuclear disappointment'. International relations were for too long weighed down by the fear of nuclear weapons and associated risks. For decades, the dominant aim was to deprive the adversary of victory, with costs growing and major powers willing not so much to win as to not be defeated. Such a guideline implied a fundamentally defensive strategy, even if it involved a build-up of offensive weapons mostly meant for containment. Nowadays the thinking undergoes the transformation. The focus is shifted: rather than deprive the adversary of a victory, states want to assure their own winning.[18] This is explained by both a change in political moods in the world and the promising potential of incipient technologies. This trend implies aggressive military strategies and a corresponding reorientation of basic attitudes.

[18] Fitzsimmons, M, 2017, 'The False Allure of Escalation Dominance', War on the Rocks, November 16. Available from: https://warontherocks.com/2017/11/false-allure-escalation-dominance/

The other trend, speaks to the growing disappointment with balance of power. It was believed during much of the latter half of the 20th century that a balance of power created opportunities for agreements. Achieving a balance of power meant entrenching the status quo, sharing spheres of influence, and later engaging in the governance thereof. But the latter half of the 20th century also demonstrated that after achieving a balance of power and reaching a 'nuclear stalemate' (parity), states would veer into other areas of confrontation. Nonetheless, great power confrontation relagating to the periphery retains the aim of depriving the adversary of victory. Here these two trends converge.

The understanding that a balance of power does not lend itself to agreements makes to look up to asymmetric actions. In turn, asymmetric moves complicate the process of entrenching the balance of power to an even greater degree, which makes reaching agreements problematic. It is required to win the assymmetric conflicts in order to conduct great power confrontation effectively. The great powers end up in a situation when they are doomed to a rather lengthy peroid of confrontation without any chance to reach meaningful agreement without being commited to a balance of power.[19] The question that arises, therefore, is how to win in this sort of rivalry.

The impact on the pain threshold in the run-up to a war is seen as the issue of vital importance. So far technologies themselves are unlikely to influence the pain threshold since this concept is more closely associated with the idea of balancing political objectives and war costs. But the likelihood of major wars could diminish when automatic control and unmanned warfare technologies were to reach a truly advanced stage in spite of apprehensions that this might multiply associated risks.

Clausewitz's idea of the dualistic nature of war as something rational and yet 'elemental' undermines political goals and inevitably prolongs warfare. Thus, everyone will benefit if at some point in the future technologies manage to sideline the human factor along with all the 'elements' identified by Clausewitz. Combat operations will become unnecessary because it will be possible to calculate their consequences with much greater precision, reducing warfare to staff exercises and computer modelling.

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[19] See: Kofman, M, 2018, 'Great Power Competition in 21st Century', Valdai Paper No. 86, June. Available from: http://valdaiclub.com/files/18724/

The rapid advance in reconnaissance capabilities is yet another argument in favour of this line of reasoning. Parties in possession of this resource will have essentially exhaustive information on the lay of the land in the enemy camp, thus making it easy for military planners to estimate risks and opportunities in each military operation and enabling better informed decision-making. But there is a risk that better positioned players will be able to consolidate their advantage and, being confident of victory, grow convinced of the logic of going to war. However, if the risks are recognized as unacceptable, the appetite for war may indeed wane.

Three Axes of the Future War

There is a different vision of the future of war. New technologies are influencing the nature of modern conflicts and worsening the international security environment. While previously wars were growing increasingly massive in scale, today they are increasingly remote-controlled affairs. Information and cyber technologies make this vector practicable. The worst-case scenario also cannot be ruled out – a regional proxy conflict escalating into nuclear war between major powers that involves the use of the latest technologies, cyber technologies, biotechnologies, as well as space militarization. For now there are several leading powers in the technological race, and the gaps between them are not great. Nevertheless, some experts are confident that the leaders' technological edge will only grow, increasing the risk of a 'disarming and stunning strike' being launched.

Noteworthy in this sense is the evolution of strategic concepts in the leading countries, which reflects their perceptions of the likely future of wars. Russian military doctrine regards disruption of command and control information infrastructure as a main threat. Blinding the opponent and casting him back technologically into the 20th century is seen as one of the most probable scenarios in a future war.

Any state expecting at least to endure a future war must timely identify the key risks involved in technological development and appreciate how it

THE COMPLEX NATURE OF THE FUTURE THREATS

Cyberwar
(cyber warfare)

Growth in the number of cyber threats in all areas of activity

Kinetic warfare

The growing number of regional conflicts and their victims in the world

Cognitive warfare
(with long-term effort to undermine people's morale)

Deliberate Disinformation

can contribute to the potential of a possible future military conflict. For Russia, this task is of extreme importance, given that it has constantly been under strong geopolitical pressure and that certain influential international players see itself as a threat. However, if the mutual containment system persists into the new technological environment, a future war can be pushed beyond the horizon if not avoided altogether.

All parties, including opponents, estimate the current state and quality of Russia's armed forces as sufficient for defending the country and inflicting unacceptable damage on the adversary in case of a hostile attack. Its hypersonic weapons and nuclear triad are enough reason to regard a direct confrontation, or 'hot war', as unlikely. But a strong army and nuclear weapons are unable to keep a country against disappearing from the political map, with the fate of the USSR being a case in point.

Russian military experts mostly proceed from the assumption that the US and/or an American-led group of European states is the main potential adversary in any war of the future. But mindful of the huge asymmetry in military budgets, they have to cut corners and look for alternatives to direct military confrontation, with an emphasis – in both the defensive and offensive segments – on the cyber and information spaces (as most possible battlefields in a potential confrontation). These two notions often merge in public discussions, but they are not identical. Information warfare is a war of ideas, and the winner is whoever has the more convincing narrative. Whereas cyber is about technological

tactics – systems, networks, data, and the like. Accordingly, this future confrontation is aimed at achieving a cognitive effect – debasing values, damaging the ideological framework, and weakening the will to resist – rather than directly inflicting defeat.

At the current stage, it is understood that the character of future wars will be different. But full realization of where these changes are heading will come after we enter a new technological cycle. Right now, however, we are approaching the end of the previous one. The combination of technologies, ideologies, and the new cycle's social infrastructure will bear first fruit 12–15 years from now at the earliest. Interstate rivalry in this context will develop along at least three axes.

First, new technologies will emerge in military spheres. These include not only combat robots and drone aircraft, the centrepiece of current research, but also a likely new line of products that science can contribute – and is contributing – to the traditional army. For now, however, things are at a standstill, with further progress impeded by the present level of technological development. The main challenge is to discover a power source fit for modern machines, their platforms, and component units.

A cheap, compact, and mass-produced power source is what will produce a revolution in military technologies within the next 20 years. A similar challenge impedes the effort to develop combat robots and massively introduce them to the army. Today, their self-sufficient operations and capabilities are restricted by the lack of a compact power source to fuel protracted battlefield action.[20] Making a breakthrough in this sector would mark a serious bid for victory in future wars.

Drone aviation is also considered as a promising avenue in most militarty advanced states and is thriving on artificial intelligence. Higher requirements for battlefield reconnaissance make drones more efficient, as battlefield surveillance tools and targeting information suppliers. Further progress in these technologies will call for new networking capabilities and

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[20] *'War of the Future: What Should We Prepare For?', 2018, Special Session of the Valdai Discussion Club's 15th Annual Meeting, October. Available from: http://valdaiclub.com/events/own/15-annual-meeting-of-the-valdai-discussion-club/*

even more sophisticated artificial intelligence applications in the military sphere.[21] The next ten years will see drone systems acquire the ability to identify enemy equipment on the battlefield, classify, and rank it in accordance with specific priorities. But drones will remain human-controlled for quite long. Yet, research and development on ground robots is lagging behind the aircraft development effort. The military operation in Syria allowed Russia to test several models of this kind. Russia will likewise reach a high level of quality in remote controlled robots within the next 10–12 years. For the time being, however, this sector is subsisting on 20th century concepts. Finally, precision munitions constitute yet another promising area in military technologies, and the work to upgrade these is due to cut their cost and eventually phase out unguided weapons within the same 10–15 years.

While previously wars were growing increasingly massive in scale, today they are increasingly remote-controlled affairs

The second axis is related to venturing into new spheres. Napoleon's definition of war as the ability to use time and space to good effect is inspiring technological improvements of military practices aimed at attaining an edge in speed and manoeuvre. Geography should no longer impede operational missions. The reference here is not only to longer-range missiles, streamlined artillery systems, or more agile armoured vehicles. Technologies like battery-powered exoskeletons and load-bearing robots are, in fact, a solution to the eternal problem of limitations on infantry mobility. As soon as the issue is removed from the agenda, the earlier space and time calculations will have to be adjusted to the modern battlefield environment.

The battlefield itself has been expanding to new dimensions (cyber) and reaching new depths in the old ones (outer space and oceans). Wars fought in the last few years (specifically, Russia's operation in Syria) illustrate the crucial role that surveillance and communications satellites as well as GPS have come to play in warfare. In the future, as even more advanced systems are put in orbit, their operational and tactical importance will grow many times over to the extent that they will become indispensable

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[21] *Joshi, N, 2018, '4 Ways Global Defense Forces Use AI', Forbes, August 26. Available from: https://www.forbes.com/sites/cognitiveworld/2018/08/26/4-ways-the-global-defense-forces-are-using-ai/#8247919503e4*

GROWTH IN THE NUMBER OF CYBER THREATS

Global number of cyber security incidents in 2017, sorted by victim industry and organization size

		Large	Small	Unknown	Total
Accomodation		40	296	32	368
Administrative		7	15	11	33
Agriculture		1	0	4	5
Construction		2	11	10	23
Education		42	26	224	292
Entertainment		6	19	7,163	7,188
Finance		74	74	450	598
Healthcare		165	152	433	750
Information		54	76	910	1,040
Management		1	0	1	2
Manufacturing		375	21	140	536
Mining		3	3	20	26
Other Services		5	11	46	62
Professional		158	59	323	540
Public		22,429	51	308	22,788
Real Estate		2	5	24	31
Retail		56	111	150	317
Trade		13	5	13	31
Transportation		15	9	35	59
Utilities		14	8	24	46
Unknown		1,043	9	17,521	18,573
Total		24,505	961	27,842	53,308

in any military operation. The traditional fog-of-war effect will not be what it was before, or it will have to be made 'denser' through the use of new technological solutions.

Detailed research into the less explored submarine sphere seems to be perspective, with its progress accompanied, among other things, by military development of robots capable of operating at the depth of five kilometres. In the future, warfare at sea will not depend on the ability to locate ships and guess where they are headed, for sensor interdiction will help to obtain such data even before the conflict. This kind of the development in this sphere can significantly change the whole conception of naval warfare. Nonetheless, a complete portrait of character and potential of warfare in these new domains remains a job for science fiction writers.

Blinding the opponent and casting him back technologically into the 20th century is seen as one of the most probable scenarios in a future war

Like in the former case, advances in artificial intelligence will count for much on this axis. Artificial intelligence is the third greatest innovation in warfare after gunpowder and nuclear weapons. But it is still early to say that we have full-blown artificial intelligence. Experts claim that at least 30 years are required to create an artificial intelligence that will address intellectually demanding tasks on its own rather than on an algorithm-by-algorithm basis as 'machine intelligence' may. Within the next few years, progress in this sphere will be fuelled by the effort to create target identification and image recognition libraries. In the mid-term, this could make stealth technology (a sub-discipline of military tactics that covers a range of techniques of decreasing visibility of military machines) redundant. In parallel, opportunities are being studied to develop machine-to-man interactive systems that would be able to withdraw personnel from the battlefield and go on fighting in their own right.[22] Computers have a proven ability of better risk calculation and selection of options within fractions of a second. Under the new circumstances, human response,

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[22] *For more detail, see: Sharre, P, 2018, 'Army of None: Weapons and the Future of War', Norton and Company; Singh, T & Gulhane, A, 2018, '8 Key Military Applications for Artificial Intelligence in 2018', Market Research, October 3. Available from: https://blog.marketresearch.com/8-key-military-applications-for-artificial-intelligence-in-2018*

including psycho-emotional reactions and cognitive function, is an encumbrance.

The main uncertainty in this context is whether or not a lower share of human involvement on the frontlines will further relax inhibitions with regard to entering into war. After all, in a situation where warfare is performed by machines, the main restraint – the desire to avoid war casualties – will be rendered increasingly insignificant.

But the trend towards ever more advanced technologies and effective procedures, given the reduction in the number of soldiers on the frontlines, does not necessarily mean that the battlefield role of humans will decline. Now, however, a relatively small number of personnel is required to perform the same missions as more massive armies did in the past. Modern individual weapon systems have unprecedented targeting accuracy and killing power, which is why it takes fewer people to capture and hold a territory, particularly when the military have advanced surveillance systems.

The flip side of this process is higher demands on the quality of soldiers. Strength and courage – characteristics of the nature of war – are still respected, but a modern soldier in a combat environment must know how to operate sophisticated technologies and handle information supplied by complicated intelligence subsystems. It is increasingly difficult to find and train people of this kind. As estimated by US military leaders, a mere 29% of young people in the US are fit for military service as part of the US army. But there is an even greater number of people operating more complex systems behind the frontlines, such as aircraft and drones, modern encrypting systems, information transmitters, and communications networks. This trend is supposed to help soldiers on the frontlines, while at the same time making commanders think up more effective practices and procedures to derive maximum effect from the available technology, particularly in a situation where there is a threat of sustaining losses from identical enemy weapons. It goes without saying that training both these categories of military takes a lot of effort and money.

Finally, the third axis is about the total nature of warfare. Interstate rivalry, including with the use of brute force, will permeate all spheres of human

and public life, such as the economy, finance, ideology, culture, and sport. It seems likely that wars of armies will evolve into wars of societies fighting for the projects they seek to advance. This scenario represents war as a conceptual process and phenomenon.

Going digital – possibly the main characteristic of the modern era – is already today linked to serious national security vulnerabilities and will be central to any war in the future. A scenario where cruise missiles capable of penetrating antimissile defences are launched at data centres, thus creating an immediate threat to the banking sector, food security, infrastructure, etc., no longer seems unimaginable. Such a state of affairs effectively eliminates the pain threshold to starting a war. A war will break out when one of the parties becomes confident of victory, with *blitzkrieg* preceded by protracted information preparations, a cognitive war of meanings, and attacks on consciousness in order to affect the morale, unity, and political stability as well as erode the enemy's resolve to resist.

Artificial intelligence is the third greatest innovation in warfare after gunpowder and nuclear weapons

In this sense, the war of the future will be a combination of cybernetic and kinetic actions against the background of a protracted cognitive preparation to sap the enemy nation's morale. This is a three-fold warfare – cyber, kinetic, and cognitive. It will be possible to hold out in such a war provided a country's foreign and domestic policies are based on a combination of mental and technological methods and there is the requisite share of mental and organizational flexibility in both army and government structures. This will help them adapt to unexpected situations and promptly adjust to a changing environment. The first to adapt to a surprise will win. On the contrary, highly bureaucratized vertical structures have few chances of survival in the wars of today, let alone the wars of the future.

Clausewitz's classical definition singles out among the aims of war the need to make an enemy incapable of resisting by making life difficult for them for a long time. In the 21st century, this should be interpreted as the ability to control markets, the movement of capital, non-material flows, and critical industries. States failing to control the information, economic, and monetary spaces will lose.

Conclusions

New technologies have the potential to drastically change the effectiveness of combat operations. Their introduction can be understood as a series of qualitative and quantitative changes in accuracy, lethality, survivability and/or mobility of the armed forces. But all of this has little impact on the nature of war as a socio-political phenomenon.

The armed forces are becoming more technologically complex, and this is forcing governments to approach military planning more wisely, while complicating military service and compelling more and more states to renounce conscription in favour of enlistment and professionalization.

New technologies can accelerate combat operations many times over, leaving decision-makers no time to weigh options (e.g. automated exchange of missile strikes) and forcing them to do post-mortem *ex post facto*. If this is understood by those responsible for critical decision-making, there is a chance that subsequent debates on this subject can help devise non-military responses and new containment options. For the time being, we see that militaries are reluctant to fully automate all defensive and offensive systems. This is a positive sign that gives us a hope that military incidents of the new type, though happening sometimes, will be short-lived and confined to marginal conflicts that nevertheless will not be devoid of significant political consequences. If, however, the trend towards full automation continues, the outlook for future wars could be much less optimistic.

Addressing a military practice conference at the Academy of Military Science in Moscow, in March 2018, Chief of the General Staff, first Deputy Defence Minister, Army General Valery Gerasimov said: 'Today, interstate confrontation has intensified. Its foundation still consists of non-military measures – political, economic, and informational. Moreover, apart from the aforementioned spheres it has spread to all spheres of activity in modern society – diplomatic, scientific, sport, and cultural – and, in fact, has become total in scope.'[23] Coming only a month before General McConville's Washington appearance, this assessment is not only a sign of Russia's concern over the future of war but also a warning that the future is already upon us.

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[23] *Khudoleyev, V, 2018, 'Voyennaya nauka smotrit v budushcheye' [Military Science Looks into the Future], Krasnaya Zvezda, March. Available from: http://archive.redstar.ru/index.php/component/k2/item/36626-voennaya-nauka-smotrit-v-budushchee?attempt=1*

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