BACKGROUND REPORT

Development of Military Technologies

Stanislav Kamenický
stanislav.kamenicky@amo.cz

#SUMMIT26

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1 PREFACE

This background report (BGR) is supposed to introduce you, the reader, to the topic of development of military technologies and the impact they have on NATO. It is not a comprehensive nor an exhaustive work, rather, it is a summary of the most essential information. You are highly encouraged to continue your research after finishing this document, especially for the purposes of writing a high-quality position paper. In the last two chapters of the BGR, you will find questions that will show you what to focus on and a list of sources where you can start your research.

2 INTRODUCTION

One of the key reasons for the success of NATO throughout its existence has been its technological edge. That edge, however, is getting duller. The technological landscape is rapidly evolving as high-end dual-use technologies (technologies that can be used both for civilian and military purposes e.g. drones[1]) are becoming widespread, all while the potential NATO competitors are increasing their research and development (R & D) spending. Put simply, the Alliance finds itself outpaced by technological progress.[2] If NATO wishes to keep its leading position, it needs to adapt.

3 EMERGENT AND DISRUPTIVE TECHNOLOGIES (EDTS)[3]

Let us start by establishing what technologies will be changing how warfare looks like in the span of the next 20 years. NATO classifies these as Emergent or Disruptive Technologies (EDTs). As of March 2020 there 8 such technological areas:[4]

- » Big Data and Advanced Analytics (BDAA)
- » Artificial Intelligence (AI)
- » Autonomy
- » Space Technologies
- » Hypersonics
- » Quantum technologies
- » Bio- and Human Enhancement Technologies (BHET)
- » Novel Materials and Manufacturing (NMM)

When considering their impact several things should be kept in mind. Firstly, these technological areas do not exist in a vacuum and in actual application, a significant overlap of several or even all of the EDTs is likely. Secondly, one needs to consider how ready the technology actually is. A useful measurement of this is NASA's Technology readiness level (TRL) scale originally developed for spacecraft, but applicable to EDTs as well.[5] [6]

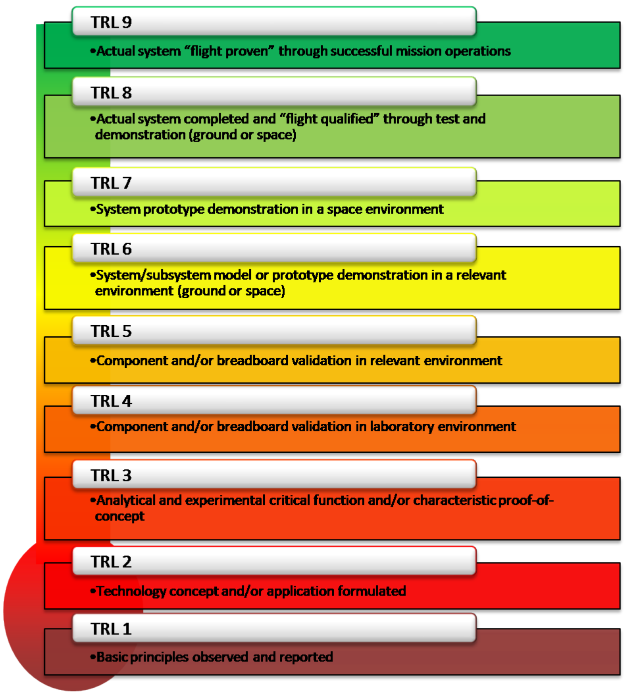

Figure 1: Technology readiness level

> Disruptive Technologies are those that build upon an established base of technologies and are either revolutionizing warfare already or will do so in a short time span

3.1 Disruptive Technologies

Disruptive Technologies are those that build upon an established base of technologies and are either revolutionizing warfare already or will do so in a short time span (5-10 years).[7] Of the above mentioned, these areas are considered disruptive:

3. 1. 1 Big Data and Advanced Analytics

Big Data refers to the vast amounts of data generated by the increasingly interconnected and digital world, while

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Data	Advanced Analytics	Revolutionary	Expectation	4	2025
	Communications	High	Enlightenment	6	2030
	Advanced Decision Making	Revolutionary	Disillusionment	6	2025
	Sensors	High	Expectation	4	2030

Advanced Analytics is the process of understanding said data. BDAA has 4 main components:

- » collection (sensors);
- » communication
- » analysis and decision making

BDAA is a foundational technology for all other EDTs and correct utilization of it will yield significant advantages everywhere from logistical optimization to social media analysis. Examples of specific technologies within this field include the Internet of Things (a network of devices communicating with each other) or digital twins (extremely detailed simulations of weapon systems allowing for cheap testing).[8]

3. 1. 2 Artificial Intelligence

AI systems are those that emulate behaviour typically reserved only to humans like reasoning, planning or lear-

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Artificial Intelligence	Advanced algorithms	Revolutionary	Expectations	4	2030
	Applied AI	Revolutionary	Expectation	6	2030
	Human-Machine Symbiosis	High	Trigger	4	2035

ning. Especially in combination with BDAA and autonomous systems, AI is expected to have a significant impact on almost all aspects of NATO operations. The innovations in this area are likely to be driven by creating more complex artificial neural structures gradually coming closer to the human brain. Achieving human-level AI is however unlikely within the next 20 years.[9] A more realistic goal is achieving a human-centric symbiotic AI, where humans and machines work hand in hand. AI is therefore likely to manifest in the form of personal assistants or advisors in both business and military decisions.[10]

3. 1. 3 Autonomy

Autonomy is the ability of a system to act independently based on its knowledge of the environment and itself. Robotics, the study of building and designing autonomous systems also falls under this EDT. Autonomous systems are characterized by autonomy levels ranging from fully manual to fully autonomous. Platform autonomy is the development of unmanned vehicles (UxVs) for use on the ground (UGVs), the surface of the water (USVs), underwater (UUVs) or in the air (UAVs). These vehicles are already in use today, either piloted by humans or having a degree of their autonomy. Meanwhile, virtual agents or bots are autonomous systems operating in cyberspace and can be used both offensively as a virus or defensively as an "immune system" as well as to help with the analysis of data. Utilization of a great number of small UxVs, or swarming, to achieve highly precise strikes or wide coverage while being resistant to damage or destruction of single nodes in the swarm, is another important aspect of this EDT. As with AI, however, fully autonomous systems are unlikely to be developed within the given time period, except for the most straightforward of tasks, like logistical robotics or supply.[11]

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Autonomy	Autonomous Systems	Revolutionary	Expectation	6	2025
	Human-Machine Teaming	Revolutionary	Trigger	4	2030
	Autonomous Behaviour	High	Expectation	4	2030
	Countermeasures	High	Disillusionment	5	2025

Know the difference: BDAA, AI, Autonomy. If we imagine those systems as an organism, BDAA would be its senses, AI its brain and Autonomous systems (unmanned platforms like UxVs or virtual agents) are its body.

3. 1. 4 Space

Space is essential for NATO defence and deterrence as it is used for navigation, weather monitoring or reconnaissance. For these purposes, NATO does not own any satelli-

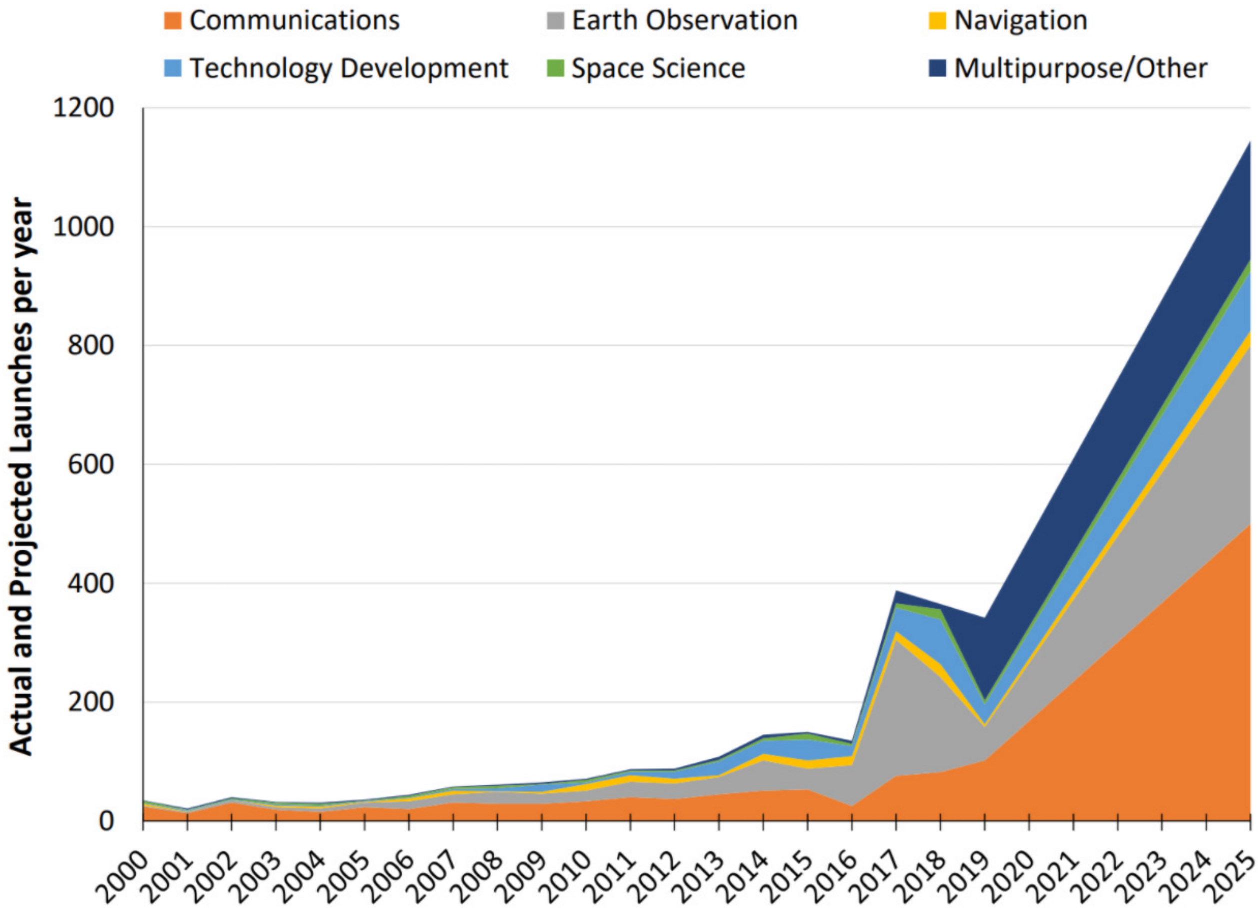

Fig 2: Projected satelite launches per year

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Space	Platforms	Moderate	Expectation	6	2025
	Operations	Moderate	Expectation	5	2030
	Sensors	High	Trigger	3	2035

tes but rather uses satellites launched by its members, who currently own over half of the 2000 satellites orbiting Earth. In the near future, a proliferation of so-called smallsats, satellites lighter than 500kg, is expected. Smallsats can be used to create large constellations orbiting Earth facilitating high-quality communications or surveillance globally (eg. SpaceX's Starlink programme). Additionally, smallsats present the ideal platforms for other EDTs such as quantum, BDAA or AI.

Though NATO still considers space a peaceful domain used only for the above-mentioned purposes, the increasing commercialization of space and the growth of space infrastructure[12] is likely to transform this environment into a one which will be very inviting for a direct attack carried out through e.g. weaponized space debris, hunter-killer satellites or earth-launched anti-satellite missiles.[13]

3. 1. 5 Hypersonics

Hypersonic systems operate at speeds exceeding 5 times the speed of sound (Mach 5). Technologies in this EDT are

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Hypersonics	Platforms and Propulsion	High	Trigger	5	2025
	Countermeasures	High	Trigger	3	2030

primarily weapon systems like Hypersonic Glide Vehicles (HGV), Hypersonic Cruise Missiles (HCM) or hypervelocity guns. These weapons may rely on the force of impact alone or carry additional conventional or nuclear payloads. HGVs are vehicles carried by a ballistic missile to orbit and that continue unpowered to their target. They move at extreme speeds (Mach 10-25) and their flight paths are very unpredictable. While current ballistic missiles also reach such speeds, their flight path is predictable and as such much easier to counter. HGVs will provide quick long-range strategic strikes as an alternative to the nuclear option. HCMs are usually air-launched missiles that use hypersonic jets (scramjets) to sustain speeds of Mach 6-8. Their use is in precision strikes against high-value targets, e.g. aircraft carriers. Hypervelocity guns come in two varieties, either as an adaptation of existing guns for hypervelocity projectiles[14] or as railguns using electromagnetic forces to fire projectiles.[15] Additionally, this EDT includes hypersonic aircraft, successors to the Cold War SR-71, developed for reconnaissance or weapon delivery purposes.[16] The speed of hypersonic weapons would make crisis situations much more volatile, as the time in which decisions are made would be reduced. This, combined with the lack of adequate defences, gives hypersonics weapons great destabilizing potential.[17] There are, however, equally great challenges to overcome when implementing them. So far only the most advanced nations can afford to develop new materials to combat the extreme heat generated at high speeds,[18] while the high costs of railguns have led the US Navy to favour slower hypervelocity projectiles for the immediate future.[19]

Emergent technologies that explore brand new fields of study rather than build upon existing technologies.

Quantum superposition is the ability of a particle to exist at several states at once until observed. This translates to e.g. quantum computers being able to do several operations at once.

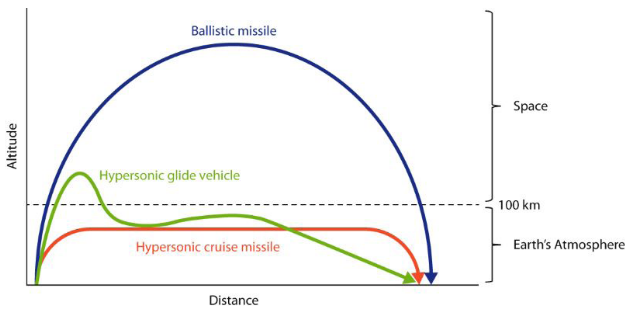

Figure 3: Difference between trajectory of ballistic missiles, HGVs and HCMs

3.2 Emergent technologies

Emergent technologies that explore brand new fields of study rather than build upon existing technologies. Their use is currently very limited and larger disruptive effects are expected to be felt in a longer timeframe (10-20 years).[20] They include:

3. 2. 1 Quantum

This EDT exploits quantum effects like superposition to surpass conventional technologies. Military application

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Quantum	Communication	High	Trigger	5	2030
	Information Science	Revolutionary	Trigger	4	2035
	Precision Navigation	High	Disillusionment	6	2025
	Sensors	Moderate	Trigger	3	2040

of quantum technology include Computers used for specialized roles, like simulations or optimization; Sensors that make stealth technology obsolete e.g. by using extremely precise gravity sensors to detect submarines[21] or virtually undetectable quantum radars to spot aircraft.[22] The same sensors can also be used for precision navigation where GPS

4D printing refers to a process where a 3D printed object changes its shape when exposed to external stimuli e.g. folding itself when the temperature rises.

signal is unavailable. Lastly, Cryptography, both as a tool to make current encryption methods useless and to create unbreakable encryption. There are however still serious limitations to quantum technologies, as they are vulnerable to interference[23] or even too perceptive and can pick up unwanted background noise.[24] [25]

3. 2. 2 Bio- and Human Enhancement Technologies

Biotechnologies use, manipulate or create living material by intervening in its normal function or by genetic engineering to perform a number of different tasks. Examples range from the creation of novel pathogens or cloning to nano-scale engineering using viruses. A HET is a technology improving the human body and mind beyond their normal limits. A great number of technologies fit this definition from implants, exoskeletons, biosensors or drugs. Practical applications of BHETs are wide-ranging. Combatants in the field will be more efficient thanks to better pharmaceutics and better monitored through biosensors, while behind the lines exoskeletons will make logistical operations far easier.[26]

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Biotechnologies	Bioinformatics	Moderate	Expectation	6	2025
	Human Augmentation	High	Expectation	5	2030
	Medical Countermeasures	High	Trigger	4	2030
	Synthetic Biology	High	Trigger	6	2025

3. 2. 3 Novel Materials and Manufacturing

The most prominent technology in the Novel Materials part of this EDT are the so-called 2D materials like graphene. Essentially just single-atom layers of material, they are stronger, harder, more flexible and even conduct electricity better than regular material.[27] They are still a relatively nascent technology and development over the next 15 years is expected to be focused on exploring the full potential of these materials rather than direct application. Manufacturing under this EDT is represented mostly by additive manufacturing (3D or 4D printing). Though currently not advanced enough to replace traditional processes, in the near future a huge expansion in additive manufacturing capability is expected and will eventually be used for a number of purposes, e.g. in-field repair, construction, or printing of new organs.[28]

EDT	Technology Focus Areas	Impact	Attention	TRL	Horizon
Materials	Novel Materials	High	Trigger	2	2040
	Additive Manufacturing	Moderate	Enlightenment	7	2025
	Energy Storage	Moderate	Trigger	5	2030

3. 2. 4 Impact of EDTs on warfare

All this scientific progress will have a transformative effect on the waging of war in what is being called the seventh military revolution, one driven by autonomous systems.[29] It is difficult to predict how exactly war will change in the coming years. A revolution in military affairs has already been predicted in the 1990s, but this "revolution" had not resulted in many truly revolutionary changes. It also had not rendered the old tactics and systems fundamentally obsolete. A similar revolution is being predicted now, and this time it might have a greater impact.[30] If we assume a truly disruptive change, future conflicts will be characterized by minimizing human presence, which will be reduced to oversight and planning and even there assisted and advised by AI. Humans who still remain in the field will be augmented by technological or biological means to be as efficient as possible. Reduced human presence combined with AI-driven streamlining will make logistics a far simpler affair. Combat will also become much faster thanks to the speed of AI decision making, hypersonic weapons, cyberwarfare and the use of autonomous swarms, resulting in a so-called hyper war.[31] Information warfare affecting people behind the lines will also become more widespread as internet coverage spreads. The employment of AI-created deep fakes coupled with autonomous agents spreading fake news (both positive and negative) will make it a valuable tool for psychological warfare, intelligence gathering and sowing confusion and mistrust by weaponizing social media.[32] More conservative estimates predict gradual improvement of existing technologies like sensors. At the same time somewhat more limited use of new technologies is estimated mostly in supporting roles, like robots resupplying soldiers in the field and anti-submarine and mine-clearing UUVs and USVs. Limited progress is also expected from the areas of material development and construction of conventional vehicles, simply because we are approaching the limits of hydro- and aerodynamics.

Military Revolution	Implications
First Revolution	
Westphalian System	Revenue generation, banking and taxes for financing wars, and professional militaries
Second Revolution	
French Revolution	National mobilization, levy en masse, and large-scale armies with conscription
Third Revolution	
Industrial Revolution	Mass production, standardization, and large-scale economic exploitation
Fourth Revolution	
World Wars I & II	Combined arms, armored blitzkrieg, carriers, bombers, and jets
Fifth Revolution	
Nuclear Revolution and missiles	Nuclear weapons and intercontinental ballistic missiles
Sixth Revolution	
Information Revolution	Command and control, connectivity and instant global reach, imagery, and cyber levy en masse by violent extremists
Seventh Revolution	
Autonomous Revolution	Autonomous weapons, swarms of robotic vehicles in multiple domains, self-organizing defensive systems, automated weapons, big data analytics, and machine and deep-learning programs

There are also doubts about the effectiveness of additive manufacturing stemming from the fact that, while additive manufacturing can considerably help in remote logistics operations and construction, supplies like fuel or water simply cannot be printed.[33] It is clear that warfare will change but how much remains to be seen.

4 SCIENCE, TECHNOLOGY AND NATO

4.1 NATO's S & T institutions

It is difficult to predict how exactly war will change in the coming years.

The fact that technology is rapidly advancing is not lost on NATO and it has created several institutions that directly deal with science and technology (S & T) and their application in the wider alliance. Two institutions play a main part in these efforts - The Science and Technology Organization (STO) and the Allied Command Transformation (ACT).

4. 1. 1 NATO Science and Technology Organization (STO)

STO was established in 2010/11 during the reform of NATO's agencies and governed by the Science and Technology Board. Nowadays the organization is NATO's premier scientific structure. Its work focuses on analyzing and supporting the development of technological trends.[34] Additionally, the leader of the STO, the NATO Chief Scientist, acts as a senior scientific advisor to NATO leadership. There are about 6000 scientists working on about 300 different projects under the STO programme. Their work is divided into 6 specialized technological panels and a group. These are namely:

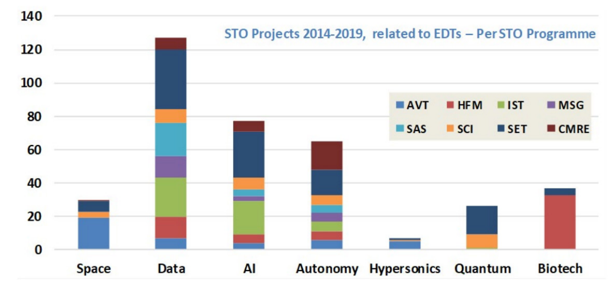

Fig 4: STO research related to EDT's conducted by STO

» Applied Vehicle Technology (AVT)
» Human Factors and Medicine (HFM)
» Information Systems Technology (IST)
» Systems Analysis and Studies (SAS)
» System Concepts and Integration (SCI)
» Sensors and Electronics Technology (SET)
» NATO Modelling & Simulation Group (NMSG)

Most of the work of these panels is done in collaboration not only among NATO members but also with partner countries under programmes like Partnership for Peace, all coordinated by the Collaboration Support Office.[35] NATO also has its own research facility in the form of the Centre for Maritime Research and Experimentation (CMRE), which operates NATO's two research ships, the Alliance and the Leonardo.[36] [37]

There are about 6000 scientists working on about 300 different projects under the STO programme.

4. 1. 2 NATO Allied Command Transformation (ACT)

ACT is one of the two commands at the head of NATO military structure. It is responsible for leading the warfare development of NATO. Its headquarters is in Norfolk, USA, and has three subsidiary bodies. The Joint Warfare Centre responsible for training Alliance personnel on a strategic and operational level; the Joint Force Training Centre doing the same on a tactical level and the Joint Analysis and Lessons Learned Centre providing post-exercise analysis. Additionally, ACT coordinates NATO's educational facilities – like the 25 Centres of Excellence, which help in research and doctrine improvement in specific areas from cold weather operations to strategic communications.[38] ACT is also responsible for the Long-Term Military Transformation (LTMT) programme advising NATO on challenges and opportunities that await in the future and what is furthermore needed to overcome or utilize them. The current LTMT sets recommendations up to 2035 and technologies are a major part of it.[39]

4.2 Use of EDTs by potential NATO adversaries

4. 2. 1 China

NATO is not the only one looking at the potential of new technologies and its near-peers like China or Russia will take advantage of the edge given by technological development. China already has advanced supersonic programmes and uses hypersonic weapons like the DF-17 hypersonic missile[40] in limited numbers.[41] It has also successfully tested a short-range quantum radar[42] and has set a goal for itself to become a world leader in AI research by 2030,[43] as well as being a leader in novel materials development, though other actors, NATO members included, are catching up.[44] The

Chinese military has also shown off what is likely to own a highly supersonic or hypersonic drone as well as a stealth UAV.[45] Additionally, an advanced railgun programme is emerging as a ship sporting a railgun was spotted at the end of 2018[46] and the People's Liberation Army (PLA) showed off prototype rifle sized railguns.[47] With both increasing numbers of satellites and crewed spaceflight, Chinese space capabilities are also growing. This growth is accompanied by the development of both kinetic energy and anti-satellite weapons, and robust communication and navigational networks.[48]

4. 2. 2 Russia

Like China, Russia also pursues R & D into hypersonic weapons, already having developed the Avangard HGV[49] and is testing the Zirkon HCM.[50] The Avangard was among the six next-generation weapon systems introduced by Vladimir Putin in 2018. Alongside the Avangard there were also introduced additional upgrades to Russian nuclear arsenal like an unmanned nuclear-tipped long-range torpedo.[51] Russians also tested the so-called "inspector satellites" which are suspected to be anti-satellite weapons in disguise.[52] Russia is also focusing on development of UGVs. According to some sources, it has up to 37 types of UGVs focused on specific tasks.[53] The most remarkable among these is the Uran-9 drone, a light fire support vehicle armed with an autocannon and missiles. The drone has already been used during a combat service in Syria. Its service there was, however, poor. The vehicle had problems with its track and fire control and its tracks could only be used at short range from the control station. In addition, the connection with its operators broke down often.[54] It should be said that such teething issues can be expected from new technology. On this note, the experience in Syria will provide invaluable data for the development of more functional UGVs. With that being said – the technology still needs to advance for UGVs to become more practical.

4. 2. 3 Other actors

Even NATO non-peers or non-state actors can benefit from the lowering costs and higher availability of autonomous systems, advanced biochemical substances and other EDTs.[55] Some technologies are already in use by rogue actors like the Houthi rebels in Yemen who used drones and mass assault tactics to overcome Saudi missile defences and struck a major oil field. Iran has been accused of sponsoring that attack.[56] Iran is at the same time making advancements in space technology and weapons of mass destruction (WMD) delivery systems.[57] Though not a leader in this area, EDTs like additive manufacturing could boost their efforts significantly, as printing the necessary parts is much easier than producing them traditionally.[58] 3-D printing could be used for e.g. printing out the centrifuges necessary for enriching uranium for nuclear arms. With enough time and new materials, there is a chance for foreign actors to be able to print out whole missiles.[59] Another EDT with the potential to aid in WMD development are biotechnologies – specifically genetical engineering that could be used to make "super germs" resistant to existing cures.[60] The use of AI and bots could benefit actors already using cyber and information warfare like North Korea, which is responsible for a great number of large-scale cyberattacks.[61]

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4.3 Challenges presented by EDTs

The implementation of EDTs is not an easy task and in order to successfully do so, NATO must engage and overcome numerous challenges, which can be group under several categories:

4. 3. 1 Interoperability

Even the best technology is useless to NATO if it exists in 30 different varieties across 30 Alliance members. In order to successfully conduct operations, systems must be developed based on common ground. The impending military revolution may be used to get rid of some of the systemic inefficiencies, like producing multiple lines of expensive combat equipment (178 major weapon systems to US' 30, 17 main battle tanks, to US' one).[62] European members of NATO are trying to remedy this through programmes like the Permanent Structured Cooperation (PESCO) or the European Defence Fund (EDF), that are trying to establish a cooperative framework in the EU for the development of military capabilities. Among the projects in PESCO there are e.g. semi-autonomous maritime systems or a number of space and cyber projects.[63] Although some PESCO projects are appreciated by the US,[64] concerns have been raised that while these projects may improve local European cooperation, they could also lead to a divergence of standards and creation of unnecessary competition between the EU and the rest of NATO.[65] This view is not supported by the fears that US companies and their subsidiaries will not be able to

> To what degree will NATO nations allow genetic engineering? What level of lethal autonomous systems will NATO members accept? Should an Alliance member under cyber attack invoke Article V. of the North Atlantic Treaty and activate NATO's collective defence

participate in these projects – fears which have been called a "misunderstanding of how the EU works" by European officials.[66]

4. 3. 2 Financial

Developing new technologies can be quite costly and NATO members must be ready to pay those costs to maintain their technological superiority. NATO has set a guideline of 20 % of defence budget spent on acquisitions and development, not all members are however reaching that threshold.[67] Especially European budgets could benefit from restructuring as some estimate that about 50 % of their money goes effectively to waste due to inefficiencies mentioned in the interoperability section.[68] Sceptics can, however, be found even in the EU as some members e.g. the Netherlands are somewhat sceptical about the prospect of limiting their security autonomy.[69]

4. 3. 3 Legal and Ethical

A number of EDTs carry with them a significant burden in the form of legal and ethical questions. To what degree will NATO nations allow genetic engineering? What level of lethal autonomous systems will NATO members accept? Should an Alliance member under cyber attack invoke Article V. of the North Atlantic Treaty and activate NATO's collective defence?[70] If yes, how far does it need to go? All these and other questions need to be addressed before EDTs are fully implemented. Some EDTs have already fallen under the scrutiny of international law, for example, UNESCO and WHO have called for at least a temporary ban on genome editing of children.[71] [72] By far the most looked at EDT is currently the "Autonomy" part, specifically fully autonomous weapon systems. There have been calls from states, non-governmental organizations and even the UN Secretary-General for a treaty to ban the "killer robots" and retain human control over the use of force.[73] [74] It should also be kept in mind that trying to outperform your opponent is not the only way of dealing with an issue. Negotiating a treaty with potential adversaries that would restrict the development and placement of EDTs like hypersonic weapons would be both helpful in stabilizing the global situation and save the signatories a lot of money. This is currently relevant mostly for hypersonic weapons, which present a very near future threat and could be included into existing nuclear limitation treaties like the New START, a flexible treaty due to be renewed by 2021.[75]

5 CONCLUSION

The development of military technologies presents both a challenge and an opportunity for NATO. If NATO approaches this issue incorrectly, it can lose its technological supremacy and get itself into a significantly more precarious strategic and political position. That would further make NATO operations much more difficult to execute. If done correctly, NATO can secure itself for another generation. To achieve that goal and overcome the associated challenges, it needs to utilize all the tools at its disposal and create new ones if need be.

6 FUNDAMENTAL QUESTIONS

1. How does Your state contribute to the NATO scientific community? Are there any areas of research your state specialises in?

2. Are there any private or government institutions based in your country that deal with the development of EDTs?

3. Does Your country comply with the 20 % of the defence budget spent on development and acquisitions? If not, does it plan to do so in the near future?

4. Would your country be in favour of expanding the powers of NATO S & T organizations?

5. How does your state regulate some of the more controversial EDTs? Are there any technologies that, according to your state, should not be used in warfare? If yes, should NATO members try to negotiate regulations with potential adversaries?

6. How would you ensure that NATO adopts new technologies along standardised lines?

7 RECOMMENDED SOURCES

A library for all things NATO. This might be a good place to start your research:

https://www.natolibguides.info/?b=g & d=a

A massive report by the STO on technology development in the next 20 years. You do not have to read all of it (though you are welcome to do so!) but here you will find deeper information about EDTs that is outside the scope of BGR:

https://www.nato.int/nato_static_fl2014/assets/pdf/2020/4/pdf/190422-ST_Tech_Trends_Report_2020-2040.pdf

Framework for Alliance operation by NATO – ACT can give you some additional insight into the topic as well as ideas where to steer NATO during negotiations:

https://www.act.nato.int/images/stories/media/doclibrary/180514_ffa018.pdf

A good thinkpiece about the changing nature of war through the lens of classical military theory:

https://publications.armywarcollege.edu/pubs/3554.pdf

An essay on hyper-war with a thrilling depiction of how it might actually look like:

https://fortunascorner.com/2017/07/10/on-hyper-war-by-gen-ret-john-allenusmc-amir-hussain/

For all the dormant scientists in you, here is a video explaining quantum computing:

https://www.youtube.com/watch?v=JhHMJCUmq28

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Pražský studentský summit

Pražský studentský summit je unikátní vzdělávací projekt existující od roku 1995. Každoročně vzdělává přes 300 studentů středních i vysokých škol o současných globálních tématech, a to především prostřednictvím simulace jednání tří klíčových mezinárodních organizací – OSN, NATO a EU.

- studentsummit.cz
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AMO je nevládní nezisková organizace založená v roce 1997 za účelem výzkumu avzdělávání v oblasti mezinárodních vztahů. Tento přední český zahraničně politický think-tank není spjat s žádnou politickou stranou ani ideologií. Svou činností podporuje aktivní přístup k zahraniční politice, poskytuje nestrannou analýzu mezinárodního dění a otevírá prostor k fundované diskusi.

Stanislav Kamenický

Autor je spolupracovníkem Asociace pro mezinárodní otázky a členem přípravného týmu Pražského studentského summitu.

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RESPEKT

Autor: Stanislav Kamenický
Imprimatur: Miroslav Řehounek, Martin Blecha
Jazyková úprava: Barbora Kolečková
Sazba: Martin Gráf
Grafická úprava: Lucie Vodvářková

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Asociace pro mezinárodní otázky (AMO)
Žitná 27, 110 00 Praha 1
Tel.: +420 224 813 460, e-mail: summit@amo.cz
IČ : 65 99 95 33

www.amo.cz
www.studentsummit.cz