

Finabel



Artificial Intelligence

Opportunities and Conditions for European Land Forces

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European Army Interoperability Center

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This focused question is a document that gives an initial reflection on the theme. The content is not reflecting the positions of the member states, but consists of elements that can initiate and feed the discussions and analyses in the domain of the theme. It was drafted by the Permanent Secretariat and is supported by the organisation.

LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
BATX	Baidu, Alibaba, Tencent et Xiaomi
CCP	Chinese Communist Party
DTIB	Defence Technological and Industrial Base
EU	European Union
GAFAM	Google, Amazon, Facebook, Apple, Microsoft
ICT	Information and Communication Technology
IO	International Organisation
IOT	Internet of Things
LAWS	Lethal Autonomous Weapons Systems
NATO	North Atlantic Treaty Organisation
NBIC	Nanotechnology, Biotechnology, Information technology and Cognitive sciences
NGO	Non-governmental organisation
NPT	Non-Proliferation Treaty
OODA	Observe, Orient, Decide, Act
PESCO	Permanent Structured Cooperation
UK	United Kingdom
UN	United Nations
US	United States of America
USSR	Union of Soviet Socialist Republics
WWII	World War II

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On the first of September 2017, Vladimir Putin – President of the Russian Federation – stated, “*Artificial intelligence is the future, not only for Russia, but for all humankind*”. “*It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes the leader in this sphere will become the ruler of the world*”¹. The Artificial intelligence is indeed no longer a science-fiction perspective, but an on-going revolution for societies, industries and eventually armies.

From 1770 to 1850 were developed steam engine as well as railway lines and thus, from 1870 to 1910 were born aviation, automobile, electricity and telephony. The twentieth century has been the century of the development and the individualisation of these new technologies in the new mass consumption societies. The European armies has been deeply transformed by these technologies. A third revolution is currently occurring, since the 1990s with NBIC technologies and the new world most valuable resource: data. Just as the previous ones, this technological and economic revolution is going to disrupt our world and the ways we live, work, and ultimately make war.

As a result of exponential progress in Nanotechnology, Biotechnology, Information technology and Cognitive sciences, scientists have been able to move forward an old scientific dream: AI. This must be considered as a “*concept for improving the performance of automated systems for complex tasks*”². As a result, the system is adapting itself to a situation and reacts autonomously – independently from human operators –. From this concept, system designers have developed several approaches – that include Machine Learning – to make

software perform perception, reasoning, knowledge representation, planning, communication or autonomy in order to achieve specific goals. If Machine Learning appears as the most advanced and usable AI approach, it is mostly given its high media coverage and its functioning. To summarize, a program can become intelligent in two ways.

On a formal way, the program is coded and any computer scientist can check down the parameters and way of “reasoning” of the machine. AI systems are then based on automation, to make a system process automatically. As an example, on machine vision, the program will make a system captures and analyses visual information using a camera, process an analogy-to-digital conversion and give an outcome.

Another mechanism is to feed the system with data. As we “show” it multiple examples, it then automatically identifies the features and learns “by association”. Deep Learning shows up as a technique of Machine Learning, using a neural network directly inspired by the human brain functioning.

Given the growing amount of data worldwide companies like the American GAFAM or the Chinese BATX are collecting everyday as well as the enhancement of the storage capabilities³ and the improvement of computer processing, AI systems based on Machine Learning capabilities can be considered as exponential. Indeed, the more these systems are fed by data, the more efficient and precise they become. Given the NBIC technology improvements these past decades, whether AI is going to happen is not a question. It is only a matter of time. Data are in this century what

¹ The editorial board, *Putin: Leader in artificial intelligence will rule world*, CNBC news website, 4th September 2017, available on <https://www.cnbc.com/2017/09/04/putin-leader-in-artificial-intelligence-will-rule-world.html>

² Stoney Trent and Scott Lathrop, *A primer on Artificial Intelligence for Military Leaders...*

³ Moors law – it is going to stop

oil was to the last one: a driver of growth and change. Then, the debates should focus on the following questions: how do we want AI to be implemented? To what end? Under whose responsibility and according which rules? If Transhumanism perspectives appear excessive, technophobia is just its negative twin.

Everyone has in mind a Hollywood's image of AI, in particular due to the success of movies like *Her*, *A space Odyssey* or *Matrix*. Nonetheless, such representations of IA are mostly fantasies, reductive, and obviously not in line with the projects and current applications of this new technology in our societies. In 2017, AI technologies have become a major topic following the defeat of a Go world champion against the intelligent program Alpha Go. This was proving that AI was "more intelligent" than the human playing at that particular game.⁴ If this is an impressive move, talking about intelligence remain tricky as this program took part in a game with limited outcomes and is not able to do anything else. General intelligence, which can be considered as "*possessing common sense and an effective ability to learn, reason and plan to meet complex information or processing challenges across a wide range of natural and abstract domains*"⁵, might be the future of AI. However, for the years to come, AI applications will remain narrowed intelligence systems, solving precise issues they are programmed for better than the human brain, but excluding any broader understanding. The private sector – especially business, communication or financial companies – has already started to implement kinds of AI to gain efficiency and make economies.

The European Land forces have no choices but to follow the progress or to face an unavoidable demotion. Among all the possible

applications of AI within armies, the debates remain focused on the LAW's question. These so-called "autonomous weapons" or "killer-robot", which have been described as the third revolution in warfare, after gunpowder and nuclear arms, are the main catalyst of fear from AI implementation into defence sector. However, if this issue legitimately rises up, it should not restrict the debate of AI implementation within the European armies. An assessment of the opportunities of AI implementation within land forces must be drafted (I) and technical, ethical and legal issues (II) have to be solved through cooperation (III) to allow European armies to safely but promptly enter this new technological age.

A WIDE FIELD OF POSSIBLE APPLICATIONS FOR AI WITHIN LAND FORCES

General Schwarzkopf, commander-in-chief of the allied coalition during the Gulf War, was the first beneficiary of the technological growth at the end of the twentieth century. He explained that technology has allowed him to gain omniscience on the battlefield and to dissipate Clausewitz's "fog of war". Since that time, the technological progress has gone on. Today, multiple sensors on a soldier's equipment inform the commandment in real time on its environment and drones are allowing intelligence to get information without sending any soldier. But at the time of hybrid war and guerrilla, omniscience appears as a utopia. The development of AI, temporarily with robotisation, might enhance prospective abilities and allow Land forces to better overcome their opponents out (A) and on the battlefield (B).

⁴ Website of Deepmind, "Discover more about AlphaGo", <https://deepmind.com/research/alphago/>, accessed on the 23rd September 2018

⁵ Nick Bostrom, *Superintelligence – Paths, Dangers, Strategies*, 2014, Oxford, Oxford University Press, p. 3

AI implementation out of the battlefield

According to the French General Barrera, innovation makes sense only if it helps “to maintain the operational superiority of our forces, to make our organizations more agile, simplify our operating methods, especially in daily work”⁶. Here is the good news: AI can truly be an asset for the Armies on a daily basis, especially out of the battlefield.

Like in the private sector, the Armies could implement AI within their medical care structures and processes. AI is currently tested to assist health professionals by analysing faster and more precise medical images, by deeply monitoring patients via smart devices or supporting clinical decisions with predictive analytics.

In the industrial sector, AI devices are just about to assist maintenance services. Predictive maintenance actions could then be better scheduled and sensors will be able to warn technicians about dysfunctions the machine is facing. The European civil project SERENA and several private companies’ products are nearly or already available. Such systems would help military capabilities to remain roadworthy.

AI can also be applied to legal devices. Some intelligent systems have already been created – like Hyperlex for example – to analyse legal contract and give advices and feedback about it. If this kind of software need to be deeper developed, they can

become truly useful. As an example, the multiple legal documents accompanying external operations are often complex and sometimes tricky. Legal advisors are always trying to find the breach in them. For instance, Westerners have more or less diverted the UN mandate during the Libyan conflict. With intelligent tools, legal officers might gain efficiency.

Thus, in the prospect of the increasing level of cooperation to come between European countries, language barriers remain a difficult challenge. Even if European armies were led by officers speaking C1-level English, there would still have specific issues, specific top-



⁶ “En somme ça n’a de sens que si l’innovation concourt directement à conserver la supériorité opérationnelle de nos forces, à rendre plus agile nos organisations, plus simple notre fonctionnement, en particulier celui du quotidien”, Général de corps d’armée Bernard Barrera dans “Scorpion : nous préparons déjà le jour d’après”, *Defense et Sécurité Internationale*, Hors-série n°61, août-septembre 2018, p. 22

ic on which the stakeholders would not feel comfortable speaking in another language than their mother tongue. A lot of documents also need to be translated in all the 24 European languages, which include important costs. However, AI is also improving on this issue. As an example, Google launched in 2016 its Neural Machine Translation system. But more should be achieved to help officers understanding each other, like audio automated translator systems.

AI may also become a way to spare money and protect the environment. Google has announced that it has entrusted its intelligent system Deepmind to manage and optimise the energy consumption of its huge data centres. Energy management, which is increasingly costly, is emerging as one of the new capabilities of AI and could be used in military Headquarter as well.

On typical military related issues, some experts consider AI will be a game changer for Intelligence, Strategic Planning and Surveillance.

In a faster and uncertain world, the State still have to predict the coming issues in their environment. However, the decision making process and the OODA loop need to be implemented as fast as the situation evolves and the human brain is then really challenged. Some strategic military planning tool have then been designed to help commandments, but an intelligent system able to adapt itself constantly to the environment evolutions would be even more effective. Decision-making would end up more technical and rational as based on predictive analysis and Armies would be able to compress and accelerate the OODA loop. If some analysts consider that soon enough technicians and engineers would replace strategist, it remains a whimsical idea: AI systems won't be mature enough to enable this before a long time and a complete reliance on the machine

appears risky. The human kind should always be able to understand its actions. As a result, such system would be an advisory tool for commandment to take a decision.

To feed such system, Intelligence cells of Armies need to gather as much information as possible: defeating its opponents will increasingly depend on tackling the best data. There, AI can make a huge difference and might revolutionize warfare more than AI used in the application of lethal force. Several projects are already in development or implemented. Facebook uses AI systems to find and remove terrorist content from its platform, which could inspire armies in their cyber fight against terrorism. The EU funded civil project BRIDGET is already over, and allow visual search engines to find and recognise monuments, locations, buildings, products, books, logos or objects. Such AI applications should be developed for the European Land forces too. Indeed, in 2014 while soldiers of unknown nationality occupied the Donbas in Ukraine, the military intelligence services were not the first able to determine with certainty who they were. However, a Polish researcher using facial recognition software found a proof they were Russian on the basis of pictures taken in Chechnya of these same men wearing Russian uniforms. AI may then ensure intelligence service a better assessment of collecting information. Such systematic analyses would allow the detection of some precursor signals that are yet impossible to perceive and improve Armies' abilities regarding simulation and modelling. The Pentagon is already working on this opportunity as project Maven monitored by Google is dealing with these technological possibilities.

AI devices and systems implementation in Armies daily services and functioning could definitely reduce some costs and make processes faster in an uncertain and changing world.

AI implementation on the battlefield

Some innovations are already semi-autonomous by coupling some AI and robotic technologies. As an example, South Korean troops are assisting in the Korean Demilitarized zone by SGR-A1 robots with surveillance, tracking, firing and voice recognition skills. According to some experts, Israelis would also detain some really innovated capabilities implementing AI systems. LAWS – military robot, which autonomously search and engage targets based on programmed requirements – rise as a very hot topic since a few years. Indeed, there are many ethical and legal concerns about it. However, such innovation has undeniable assets. If robots replace humans on the battlefield, they would protect both physical and mental health of soldiers. They also might be more efficient as a machine has no emotions, cannot feel stress, hatred, be tired or hungry. Therefore, if soldiers are well trained, they may have a different behaviour on the battlefield. A machine will always perform in the same way. These are the advantages of unmanned systems, whether they are vehicles, drones, LAWS, etc. The possibilities are huge and these abilities can also be “mixed” to get, for example, unmanned vehicles equipped with autonomous offensive capabilities.

In the case of weapons with a non-autonomous lethal system, some intelligent automation can still be implemented to assist soldiers in their decision to fire and to ensure more precision. This can still improve the soldier resilience during its mission and efficiency.

Drones with intelligent devices are the solution for dull or dangerous missions of reconnaissance and surveillance. For instance, on the 18th of August 2008, French troops were ambushed in the Uzbin Valley, Afghanistan

during a NATO-led mission. As a result, 10 soldiers died and 21 were wounded. Today, drones can achieve reconnaissance missions to avoid such trap. Armies will be able to anticipate the enemy positions and capabilities. Some robots are even able to check down buildings and undergrounds. Drones are already more and more implemented within some Land forces around the world. In Europe, it should be implemented too. With AI capabilities, the drones would follow their mission autonomously without any soldier guiding it. Soldiers’ skills could then be better employed.

AI systems are still under development, but expert already predicts they will make an important disruption. As European countries are trying to invest more in their Armies, such investments might be a way to gain efficiency and to reduce some cost on the long term. However, the implementation of AI the Armies comes along with a long list of issues that need to be tackled.

A LARGE SET OF CONDITIONS REQUESTED FOR AI IMPLEMENTATION

AI implementation in land forces, including automation of weapons systems, is the ineluctable future and European armies have to prepare this coming reality. Today, if AI technologies are still at their early stage, considerable financial resources are provided for their development. But implementing AI without dealing with some crucial issues into the armies – and even in our societies – would be a mistake. Technical issues, on which security relies on (A), Human resources challenge (B), Ethical aspects (C) and Regulation needs (D) should rise as AI pre-implementation top priorities.

Technical issues

One of the biggest fear when it comes to AI is the loss of control. A lack of loyalty of the software could come from the fact that the AI system would no longer act according to the way it was programmed or parameters were settled. To ensure the correct functioning of systems, computer scientists have two approaches. If the intelligent program is coded, experts can quite easily check the lines of code. However, when AI is operating with Machine Learning, the only way to evaluate its behaviour is to execute as much as possible the system. If we can reasonably trust the program, it will nonetheless never be tested on every possible situation.

If a loss of control happens, it could also be as a result of a security breach, cause by human mistake – i.e. Stuxnet virus in Iran – or a hard cyber-attack on the system. As a consequence, the implementation of AI implies ensuring cyber security. Cyber security issues are already an important topic for the European armies, especially toward soldier use of social media and IOT. AI of things will soon enough be a reality in soldiers both professional and personal lives. The damages are already annoying, but with AI coming to such an ever more connected while uncertain world, armies cannot afford such security breaches anymore. In case of cyber war, if AI systems dealing with intelligence or military planning, for example, are breached and a malware introduced to generate a wrong outcome, the consequences can be dramatic for an operation. Indeed, a slight alteration of the system, even imperceptible for the operators, can provoke a spill over effect.

In case these tools would turn out to be unusable or in the case of an Electromagnetic bomb

or pulse, that is disruptive or damaging to electronic equipment, the armies should obviously be trained to continue their mission in a degraded or contested environment. As it would not harm civilians directly, such weapons could be quite easily used by the armies and the risk to be drawn into the fog of the war arise as a major risk. Specific training toward this issue already exists in some armies regarding the damage of communication or localization systems, but it should definitely be extended.

In the military sector, ensuring security also deals with ensuring confidentiality of classified data and AI system must be programmed to respect and disclose information according military pre-existing classification. But AI technics may also produce high value outcomes from common data. From there, any machine should be able to estimate the level of confidentiality of its own outcomes and to classify them.

AI could also become an issue of safety, as the RAND Corporation assessed in its article *How Artificial Intelligence Could Increase the Risk of Nuclear War*⁷, by looking back to the story of the Russian Lt Col Stanislav Petrov. This officer was working with a machine meant to detect a missile attack on the 26th September of 1983 when its siren clanged off as it detected a launched missile. However, he knew the computer had glitches and was convinced there was an error. In fact, the machine misread sunlight glinting off cloud tops and no missile had been launched on the soviets. If he had not recognized it as a false alarm, at a time of high tensions between the US and USSR, the soviet nuclear response could have led to a disaster. Through that little piece of History, one must remember that the reliability on the machine that can makes mistake as well as men, but that we

⁷ Doug Irving, "How Artificial Intelligence Could Increase the Risk of Nuclear War", *RAND corporation*, 24th of April 2018, <https://www.rand.org/blog/articles/2018/04/how-artificial-intelligence-could-increase-the-risk.html>, accessed on the 23rd of September 2018

trust may make us do terrible things. And as AI would be considered as “more intelligent” than the human being, we may rely even more blindly on its sensors and conclusions. As a consequence, we must ensure, first, that the employment of such machine is preceded by a clear assessment of its technological maturity and proceed according regular audits. Then, must be determined to which extend and to which tasks AI autonomy’s may be acceptable from an ethical point of view, but also to ensure safety. More generally speaking, safety protocols and precautions, of electricity, for example, have been established. The same will have to be thought and put in place for AI.

The “safety” of robots implementing AI systems should also be ensured. Indeed, these technologies developed in the robots – i.e. drones – and acting autonomously in their environment could become a true strategic target for the enemy. Given the foreseeable costs of these capabilities, they should be able to avoid incidents or the enemy’s attempt to put them down.

Considerable technical concerns need to be discussed before AI applications get usual within armies. Ensuring AI safety, security and confidentiality are the first steps. Then, logistic issues regarding this new type of tools or weapons need to be assessed, especially when considering their implementation during external operations. First, one of the major characteristics of the armies’ equipment is adaptability. Indeed, armies need capabilities that can be deployed in specific areas under specific conditions. From a technical point of view, AI applications have to be designed for high resistance to weather conditions as well as energetic lacks. Another logistic issue secondly arises : to implement in good conditions AI within land forces, soldiers must present specific skills.

Human resources issues

Outsourcing and subcontracting are becoming common practises in western armies, but with AI implementation in the European armies, the integration of AI expert within



them seems inescapable. If external experts coming from subcontracting companies could theoretically realize audits and controls of the systems, such a solution contains various weaknesses.

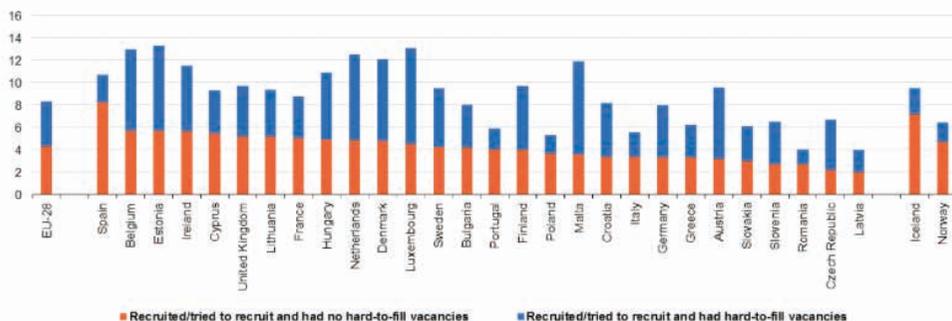
To begin, with the integration of a growing amount of external experts in their regular processes, the Armies will have to deal with serious confidentiality issues given the sensitive data the external auditors could access. This should arise as a bigger and bigger issue with the spreading of AI technologies within military tools. The need of AI operators will extend and these positions will need to be fulfilled by soldiers able to take part in external operations on the battlefield. Ultimately, independence and non-reliance of the armies on external companies for technical aspects of AI systems should be ensured. This should nonetheless not exclude any cooperation between private and public sector on AI system maintenance or processing.

Hiring computer experts and AI experts will emerge as a top priority for European armies in the coming years. Even if avoiding the “black box”, i.e. not understanding AI decisions, will mostly means to be able to detect

AI biases or errors, the Armies cannot allow themselves to completely rely on machines. Then, computer scientists should establish a regular audit, test of loyalty and review of the machine algorithm. But operators should also be able to detect abnormal situations or outcomes from the system. Then two types of education should be provided.

The education of the computer scientists will probably be provided by universities or high schools as the private sector skills on AI appears in advance compare to the military one. However, digital jobs require high skilled profiles that are not yet really widespread. Countries around the world are already increasing their research and recruiting to hire top scientist. Japan, China or the US are attracting a lot of Europeans eager to work with high financial investments. As a proof, even enterprises – that usually offers better opportunities and remuneration than the public sector – have difficulties to recruit experts. (Figure 1) As a result, the European armies should consider offering more than they usually do to their experts in order to become competitive. Once these experts are recruited, updating their skills on a regular base should also be an important feature. Several European armies have already es-

Enterprises that recruited ICT specialists, with and without difficulties in filling vacancies, 2016
(% enterprises)



Source: Eurostat (online data code: isoc_ske_itrcm2)

tablished in the past years a Cyber command and therefore face similar issues.

The education of AI systems operators, which may be regular soldiers, also needs to be provided. Just as soldier are receiving cyber security training, they should receive information and specific sessions on AI, depending on which systems they are working with. Efficiency and performance will indeed highly hang on human-machine teaming.

Anticipating skills needs, managing coming vacancies, recruiting new agents and retaining the best despite competition from private companies, improving the salaries are all challenges human resources will have to face with the implementation of AI within the Armies.

Ethical issues

Ethical debates regarding AI are taking an increasingly important place in the scientific sphere, as well as in public one through media. Given AI dual-use, these debates are way wider than the military application of these new technologies. However, it is what arouses most passions. Some study, like *The malicious use of AI: forecasting, prevention and mitigation*⁸, are forecasting dangerous features of AI. Among main fears stand population monitoring, democratic elections breaching, or terrorism. Overall, the idea that such a technology would fall into the wrong hands is the main concern.

Recently, several stakeholders gathered themselves and published ethical principles, guide-

lines or open letter to warn the international society of AI dangers and to ensure its appropriate use. One of the main initiatives was launched in 2017 by the Future of Life Institute and its *23 Asilomar AI Principles*⁹ that have been endorsed by hundreds stakeholders including scientists, AI researchers and industries. Besides, at the end of 2017 the University of Montreal drafted a *Declaration for a Responsible Development of Artificial Intelligence*¹⁰. These declarations are particularly insisting on the necessity to research, by the time we are researching for AI, on questions in computer science, economics, law, ethics, and social studies related to it. There is also a clearly wish for cooperation, trust and transparency regarding on-going and future researches. AI systems are expected to get along with the ideals of human dignity, rights, freedoms and cultural diversity, as well as under Human control. On a specific military aspect, LAWS are clearly not recommended. One of the main ideas toward it remains that humankind, in the name of human dignity, deserves not to be killed by a machine.

The military applications of AI are considered as such a threat that Google, which was working on a project for the Pentagon, had to justify itself and developed its principles toward AI systems elaboration. Indeed, Google got several resignations and a petition from employees that did not get along with its activities. In its statement, the company generally speaking declares itself in compliance with human rights and liberties and wish to avoid harmful applications. It nonetheless declares its will to continue its collaboration with the Pentagon in other areas than AI for

⁸ Future of Humanity Institute and others, "The malicious use of AI: forecasting, prevention and mitigation", February 2018, available: https://img1.wsimg.com/blobby/go/3d82daa4-97fe-4096-9c6b-376b92c619de/downloads/1c6q2kc4v_50335.pdf, accessed on the 23rd of September 2018

⁹ Future of Life Institute, "Asilomar AI Principles", 2017, available: <https://futureoflife.org/ai-principles/>, accessed on the 23rd of September 2018

¹⁰ University of Montreal, "Montreal Declaration Responsible AI", 2017, available: <https://www.montrealdeclaration-responsibleai.com>, accessed on the 23rd of September 2018

use in weapons. Cyber security, training, human resources, health care have for instance been mentioned. As a consequence, if a strong international campaign has been launched to warn and fight against AI possible bias, it should not hold AI technology implementation in the Armies down.

However the importance of some ethical questions cannot be put in question. Decision-making and eventually LAWS remain issues where the debates are not yet concluded. The main doctrinal question regarding AI military applications is “Should humans stay in the decision making loop?”.

Nowadays, it appears that militaries do not intend to use fully autonomous weapons and want to remain responsible for lethal-force decisions. The US Department of Defense stated in that sense that “autonomous and semi-autonomous weapon system shall be designed to allow commanders and operators to exercise appropriate levels of human judgment over the use of force”¹¹ More generally, people are recognizing that “black box” AI approaches are unacceptable. If such systems are to be deployed in domains where the consequences can be serious and dangerous – LAWS, military planning... – independent experts must have the ability to analyse the system and its operation. However, this is yet impossible to do. Most of AI systems decisions path cannot be examine and therefore their outcomes might then not be understandable. Then, Human control remains essential, especially given the early age of AI. It should also be accounted that, from an ethical and legal point of view, LAWS present some features of mass killings weapons, and particularly swarming LAWS, which consist of a dozens of unmanned aircraft that, “*once*

activated, can select and engage targets without further intervention by a human operator”¹².

In the future, Armies should always carefully choose how and whether to delegate decisions to AI systems. Nevertheless, future adversaries might not subscribe to the ethical standard European armies follow. This rise as a major issue, as of course Armies will not accept to be demoted and to take the risk of loosing on the battlefield. From this situation, if other countries get autonomous weapons capabilities, then they may have to equip themselves too, in order to remain competitive. Moreover, the definition of an “autonomous weapon” appears as a bottleneck as different points of views already confront themselves.

Belgium’s Parliament already voted in order to prohibit any development of LAWS and many scientists refuse to work on AI programs linked to the defence sector. However, AI researchers need to do more than opt out if they want to bring about change. Indeed, they should rather explain their concerns to policymakers and military professionals. They need to figure out AI systems’ limitations, which would be possible only if scientists bring their technical expertise. A constructive dialog between all stakeholders – scientist, NGOs, policymakers, industrials – appears as the way to implement in the best way AI within Armies. A solution, both in national, European and international scene, will probably include regulation. Vincent C. Müller and Thomas W. Simpson¹³ wrote about some interesting possible legal solutions to establish. They proposed to create an international agency dealing with LAWS regulation, to define common technical requirements and to delimit specific situation where LAWS should be allowed.

¹¹ US Department of Defence, *Autonomy in Weapons Systems*, Directive n°<3000.09, 21st of November 2012, P2

¹² Ibid

¹³ Vincent C. Müller and Thomas W. Simpson, “Réguler les robots-tueurs plutôt que les interdire”, *Multitude* 2015/1, (n°58), P77-81



A need for regulation

As all new technology, AI is raising new legal issues related to responsibility and decision-making. The EU, true regulation champion, already stated that new technologies did not come with new values. Consequently, the Commission promised guidelines on AI implementation from a legal point of view in accordance with the European Charter of Fundamental Rights. On AI regulation in the defence framework, two tracks exist that might put some restriction on these new technologies. On the one hand, general principles – and rules applying on every kind of battle have been established through customary law or “contracting” law between States. The Geneva Conventions of 1949 and its additional protocols are the cornerstones of International Humanitarian Law (*jus in bello*) and aim to protect civilians during a conflict. On the other hand, several conventions regulate or prohibit the use of specific kind of weapons, like the Biological and Toxin Weapons Conventions of 1975 or the Convention on Cluster Munitions of 2008.

The first legal question is then whether the pre-existing general principles and rules will have to be amended or modified to fit new realities or if they remain valid and resilient. It turns out that the following principle may be interpreted in a way that ensure true limits to the development of some AI systems, such as LAWS. The principle of humanity, directly inspired by the Martens Clause of the 1899 Hague Convention, prohibits the use of autonomous weapons by the simple fact that they lack emotion as well as legal and ethical judgement. Indeed, the principle of humanity requires respect for human life and human dignity. Would an AI system be able to recognise a soldier *hors de combat*? Doubts also arise when it comes to the principles of distinction between soldiers and civilians, as it might be an issue for automated systems. AI systems would have to comply with principles of proportionality and necessity too.

The UN and the meetings have initiated a reflexion on a specific regulation on the topic of AI autofocus weapons in the frame of the Convention on Certain Conventional

Weapons. The idea of a meaningful human control on weapons has been approved, which *de facto* disapproved LAWS¹⁴. But the document presents only recommendations and is not binding any State. In fact, one of the main issues remains to define what are autonomy and LAWS. As a result, there is no specific regulation on LAWS or on AI system in general. However, this should rise as a top priority in the perspective of AI capabilities development. If they were implemented without any regulation, how to put in place a legal responsibility in case of disrespect to the *ius in bello* by AI? State, soldier, technician or selling company may all be potentially responsible. Then, and as International Law remains a contractual law; there is a genuine need for cooperation.

AN UNDENIABLE NEED FOR COOPERATION THROUGH EUROPE AND THE WORLD

As AI and data are becoming conveyor of society revolution, economical growth, new strategic issues and new geopolitical landscape, it may become a new issue of international relations. According to Realism, States would always act in accordance with their national interest, and then, trust and cooperation among stakeholders seems to last as long as they share common interests. In addition, sovereignty prevails when it comes to Defence and International Security. Nonetheless, AI is such a growing issue in an evermore unpredictable world, that it becomes a priority to collaborate on this matter, to ensure that primary conditions for AI development are fulfilled. Even with trust issues, common understanding and collaboration should occur

between States (A) as well as between private and public sector (B).

Cooperation between States

AI is going to give to any actor detaining it a competitive strategic advantage, from a military point view, but also from an economic one. The industrial revolution made the UK the global hegemon in the 19th century. Nuclear power and ICT development crowned the US as its successor since the end of the WWII. AI may interfere with the current world's geopolitical landscape.

For that reason, several countries have launched themselves into a race – which appears rather economical for the moment – aiming the development of AI. As a part of AI systems are developed with Machine Learning, having data is already a sign of power. Europe is late on AI advancements and do not host any big company holding a significant amount of data, which could arise as an issue for European companies that wish to train their system.

The two leading countries, in terms of investments and intentions mostly – it is difficult to assess and compare the technical progress of countries in such sensitive topic – appear to be the US and China. China has declared its intention to grow as the global leader in AI by 2030. This appears achievable given the level of investments the government is providing to its companies. In fact, the Chinese model of military-civil fusion is a true asset for the country as AI researches in the civil – but deeply connected to public power – sector will directly feed the military industries. US are not in such an efficient situation as

¹⁴ Fifth Review Conference of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, *Report of the 2016 Informal Meeting of Experts on Lethal Autonomous Weapons Systems (LAWS)*, 10 June 2016, CCW/CONF/2

the polemic around Google and project Maven demonstrate it. Russia recently started to invest in AI, but benefits from a key alliance with China in the military sector, as well as in the private sector that may enhance their abilities to develop their capabilities. South Korea, Israel or Japan can be considered as medium AI powers too.

Europe is late compared to these powers, as private investments in AI only reach €2.4-3.2 billion in 2016, compared to €6.5-9.7 billion in Asia and €12.1-18.6 billion in North America.¹⁵

Several national units dealing with AI are created around the world. The Pentagon requested \$70 million (even though \$10 million have been authorized) to establish a National Security Commission on Artificial Intelligence, supplemented by a Joint Artificial Intelligence Centre (JAIC) and estimated that it could have a total cost of up to \$1.75 billion over the next seven years. It will be tasked with assessing how to improve the use of artificial intelligence capabilities for national security, its effects on national security risks and ethical considerations. The French Defence Minister Florence Parly announced on 16 of March 2018 the creation of a "Defence Innovation Agency", with a budget of 100 million euros for artificial intelligence, mostly to rapidly recruit of 50 experts in the field. France may be, with the UK, one of the most innovative Army in Europe, but is clearly far from the real AI powers investments.

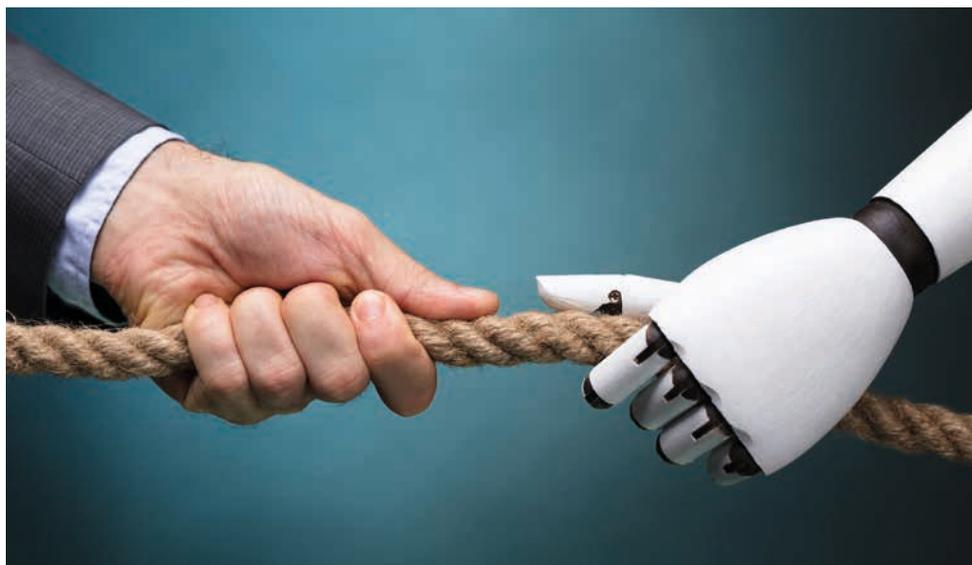
A Battle has started between stakeholders. Between States, which want to develop their AI related skills and capabilities, both in private and public sector, but also with NGOs and IOs which try to influence the way it will be developed. But to ensure the right implemen-

tation, especially in the defence sector, there is a crucial need for cooperation. Cooperation appears as the only way to established ethical and legal borders to systems that – if not into the right hands and for right purposes – can become dangerous. It is also a way for medium powers to refill the gaps that have already appears between them and the US or China. None of European Armies and European DTIB are able today to develop on its own such technical capabilities. Eventually, given the importance of coalitions and common external operations for States nowadays, interoperability between the AI capabilities should be ensured.

Cooperation at the global level is essential. However, these years are tough times for multilateralism. Indeed, the step up of populism through the democratic world brought back inward-looking attitude of the States. The perfect example of that process is Brexit. Setting up a global international treaty assessing the future developments of AI, as the NPT did, would then seem an arduous challenge. But it may worth to try, especially to precisely define LAWS and establish an international legal framework about it. NPT has several weaknesses – recently, North Korea and Iran cases – and is based on discriminations. Still, it avoids nuclear bomb explosion since the end of the WWII and ensure a minimum level of international security. This outcome should inspire the international community.

Several meetings on LAWS occurred within the UN framework, gathering until 70 countries. Different kinds of position have emerged. China, Russia, and the United States reject a politically binding code of conduct or a legally binding treaty on AI or LAWS, and rather wish to focus on the definition of LAWS. On the contrary, some countries like

¹⁵ European Commission, "Factsheet: Artificial Intelligence for Europe", 25th of April 2018, <https://ec.europa.eu/digital-single-market/en/news/factsheet-artificial-intelligence-europe>, accessed on the 23rd of September 2018



Austria, Brazil or Belgium – which already prohibit the development of these weapons in its army – wish a prohibition treaty, as well as a moratorium. In the middle of these opposed views stand some EU countries like the UK, France or Germany. They mostly pronounce themselves against LAWS but their position is not completely clear when it comes to the ideas of politically binding agreement or Treaty. To protect their sovereignty, the States are yet not ready to commit themselves in any way.

Meanwhile, bilateral cooperation, which is already happening, is a way for armies to get more interoperable and to develop their AI capabilities. Following the path of the so-called “Special relationship”, the UK and the US have launched a common artificial intelligence hub, which host new joint Defence Innovation Board meeting in May 2018. As a consequence, experts can share experiences and innovation priorities, as well as deal with industrial features. In July 2018, UK and France also announced a partnership to

facilitate AI researchers exchanges across the Channel.

At the other side of the world, India and Japan are cooperating on defence applications of AI systems. The two Asian partners, along with Australia and the US, are preparing themselves to counter Chinese growing power. In the mean time, a next level of strategic cooperation between China and Russia have been reached given the four days of military drills in Central and Eastern Russia, called Vostok-18 that occurred in September 2018.

The EU and NATO are relevant organisations to organise a strategic cooperation between Europeans in order to face the new geopolitical reality. This strategic cooperation should involve the development of common AI capabilities – to reduce their industrial costs – but also the elaboration of a common doctrine toward them. Indeed, technological revolutions bring a lot of change from the strategic

to the tactical level. The American Revolution in military affairs is a proof of it.

NATO is already dealing with the future capabilities of the alliance. Indeed, its military exercise to be held in Norway in October and November 2018 will test new technologies, including AI systems. General Denis Mercier, Head of the Allied Command Transformation, is already calling for in-deep collaboration between the allied as he stated that “*the mistake would be for each of the NATO countries to develop its programs alone, which would ultimately raise issues of technical, ethical and political interoperability*”¹⁶. However, uncertainty is rising around the organisation as Europeans experts show more and more doubts about the resilience of NATO and the reliance on the *US Umbrella*.

Consequently, German and French Government are pushing for more European cooperation. During its annual speech to diplomats the French President Macron stated, “Europe can no longer rely on the United States for its security. It is up to us to guarantee European security”. The German Foreign Minister Maas also urged to boost military cooperation aiming to “form a counterweight” to Washington and “take an equal share of the responsibility” as Europe-US relations cool.

A European cooperation on AI appears then as an accurate solution for European Armies, to develop their capabilities and doctrines. Since a few years, the European policy on defence and security took a slight step forward. The European States proved their ability to collaborate on some sensitive aspects of the

civil project Galileo – the public regulated service: a encrypted signal with restricted access to provide information to European armies and polices – or on the PESCO projects.

The European Commission has already established a European Strategy about AI in April 2018¹⁷, even though it is focused on civilian aspects. It is proposing an approach following three objectives: increase public and private investments and boost Europe’s scientific base and industrial capacity, prepare the European society for the socioeconomic changes brought by AI and ensure an appropriate ethical and legal framework. Meanwhile, a Declaration of cooperation has been signed by 24 Member States to ensure a coordinated European plan on AI by the end of the year, to increase the impact of investment at the EU and national levels and to exchange best practices. In addition, the European Group on Ethics in Science and New Technologies, which is an independent advisory body for the European Commission presidency, currently research on Artificial Intelligence, Robotics and Autonomous Systems.

The EU has started several projects, like Smokebot – Civil robots to support fire brigades in search and rescue missions to perform in harsh conditions – or Serena – an AI system to predict maintenance of industrial equipment. The EU funding for AI-related project and research is over 1.5 billion of euros¹⁸.

If these initiatives yet have a civil purpose, they can be extended to the defence sector. Most of the European Armies, which are just at the early stage of developing Innovation

¹⁶ “L’erreur serait que chacun des pays de l’OTAN développe ses programmes seul, ce qui poserait à terme des problèmes d’interopérabilité technique, éthique et politique.”, in Nathalie Guibert, “Comment l’OTAN se prépare aux guerres du futur”, 30th of March 2018, https://www.lemonde.fr/europe/article/2018/03/30/pour-la-guerre-de-demain-la-ressource-strategique-est-la-donnee_5278849_3214.html

¹⁷ European Commission, “Factsheet: Artificial Intelligence for Europe”, Op. cit.

¹⁸ European Commission, “Artificial intelligence: Commission outlines a European approach to boost investment and set ethical guidelines”, Press release, Brussels, 25th of April 2018

cells, are looking for interesting solutions for their future and civil projects can find some application within them. The next steps should then be to establish a concrete European cooperation on Innovation, including on AI issues, related to military environments. States that show interest and true commitment to a European cooperation could then aspire the development of their common strategic autonomy. Today, no European State is able to develop on its own AI capabilities: the cost of such programs is too high and no country detains all the skills to conceive and develop them. Then, there is a true need for a more unified European defence industry.

Cooperation between private and public sector

If the traditional national defence industries have been able in the past to foster some of the major advanced technologies – nuclear, internet, aeronautic – they are overcome by the private sector on AI. Even the American Defence Department has to negotiate and launch programs to buy from the Silicon Valley.

Many projects exist yet. Amazon is providing to the US government a facial recognition system, Google is working on the project Maven which aim to analyse drone image and Booz Allen Hamilton recently sealed a contract with the Pentagon with the objective to allow a rapid employment of AI for intelligence, surveillance and reconnaissance operations. In China, President Xi Jinping has considered the civilian and military integration issues as one of the main topic to solve. The CCP wishes to coordinate the Chinese economy with defence to give birth to a strong strategic military planning.

Collaboration between Armies and the private sector is required even though the workforce and public opinion are not really ready to see these types of companies working for defence. (I.e. Google scandal with the Maven project) The key for a good collaboration will then be communication. Dialogue should be reinforced within these companies and as much as possible with public opinion. A *bona fide* dialogue should also be ensured between the armed forces and the companies to deliver equipment with high-level of technologies, that fit military requirements for an affordable cost. In the US several companies – like Intel – are already looking for assisting, influencing and exchanging with the new National Security Commission on Artificial Intelligence.

Usually, traditional defence industries are criticised for being slow to move and for the long time delivery of their products. Nonetheless, in a new industrial ecosystem gathering new types of companies (i.e. start-up) and researchers, the defence industries might shift themselves to comply with more competitive framework. As an example, Thales sets up its new AI global hub in Montreal – *Cortex* – to collaborate with several Canadian research institutes. A strong European hub on AI should also be established, gathering European companies and funds to get a true AI European defence industry.

European industrial autonomy toward AI has to be ensured for obvious strategic issues. However, to develop a strong new cooperation between private and public sector, research and development budget, both at national and European level, have to be reinforced. After the 2008 economic crisis, governments have made important cuts in defence budgets. As a result, the European defence investments in research

¹⁹ “A corporate mind-set favourable to innovation is critical”, Interview of Marwan Lahoud in European Defense Matters, A magazine of EDA, 2016, Issue 10, P18-19

and development have declined by 30%¹⁹, even though the international security context makes the investments moving toward improvements. On the other sides of the world, the US invests 54.6 billion of euros per year, which represent four times EU member States spending combined, Russia had doubled its investments between 2012 and 2015 and according some prospections China will override its American competitor by 2022.²⁰

To try to fill this gap, the EU announced a 500 million of euros support in 2019 and 2020 in favour of the European Defence Industrial Development Programme.²¹ Achieving an integrated European DTIB is the cornerstone of European defence and security. The fund is then expected reach €1 billion per year from 2021. Despite these efforts, the amount is definitely too low compared to the other powers investments.

The European States and their Land forces are not playing the same role as the US or China in the world. However, their interests need to be protected in the same way. To that end, AI represents many opportunities for European Armies. Today, they are in the early phase of understanding what benefits it could bring as well as the conditions to implement it in a right way. Being afraid or banning coming technologies are surely not solutions. It is still unclear for many leaders about how AI could be integrated into existing infrastructure and legacy systems. Then, European States should gather themselves, provide financial support to advanced study on AI related issues and cooperate on research and development. However, their sovereign concerns and their disagreements are obstacles to a deep European collaboration.

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²⁰ Ibid

²¹ Martin Banks, “EU offers up cash infusion to European defense industry”, 23rd of May 2018, available at : <https://www.defensenews.com/global/europe/2018/05/23/eu-offers-up-cash-infusion-to-european-defense-industry/>, accessed on the 24th of September 2018

Created in 1953, the Finabel committee is the oldest military organisation for cooperation between European Armies: it was conceived as a forum for reflections, exchange studies, and proposals on common interest topics for the future of its members. Finabel, the only organisation at this level, strives at:

- Promoting interoperability and cooperation of armies, while seeking to bring together concepts, doctrines and procedures;
- Contributing to a common European understanding of land defence issues. Finabel focuses on doctrines, trainings, and the joint environment.

Finabel aims to be a multinational-, independent-, and apolitical actor for the European Armies of the EU Member States. The Finabel informal forum is based on consensus and equality of member states. Finabel favours fruitful contact among member states' officers and Chiefs of Staff in a spirit of open and mutual understanding via annual meetings.

Finabel contributes to reinforce interoperability among its member states in the framework of the North Atlantic Treaty Organisation (NATO), the EU, and *ad hoc* coalition; Finabel neither competes nor duplicates NATO or EU military structures but contributes to these organisations in its unique way. Initially focused on cooperation in armament's programmes, Finabel quickly shifted to the harmonisation of land doctrines. Consequently, before hoping to reach a shared capability approach and common equipment, a shared vision of force-engagement on the terrain should be obtained.

In the current setting, Finabel allows its member states to form Expert Task Groups for situations that require short-term solutions. In addition, Finabel is also a think tank that elaborates on current events concerning the operations of the land forces and provides comments by creating "Food for Thought papers" to address the topics. Finabel studies and Food for Thoughts are recommendations freely applied by its member, whose aim is to facilitate interoperability and improve the daily tasks of preparation, training, exercises, and engagement.



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