CHAPTER 1

INTRODUCTION

1.1 Background

The pursuit of effectiveness in technology has risen tremendously in the century, from the invention of computers to the internet itself, innovation has made life easier as time goes by. Now an extreme advancement has come in the form of an AI (Artificial Intelligence), which by definition according to Prof. John McCarthy, considered to be a legendary computer science in Stanford University that has founded the field of AI[1], is a science or engineering of making an intelligent machine similar to a human mind.[2] AI has reached a level that permits it to achieve a level of complex undertaking. Computers use AI in order to find locations[3], utilize advance mathematics[4] and even learn from its own experience and mistakes.[5]

With advancement of such capabilities, many machines around the globe have utilized such technology to increase the efficacy of many aspects of professions, China with over thirty institutions researching and engaging in the

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[1] Professor John McCarthy, Father of AI "Who is John McCarthy." http://jmc.stanford.edu/index.html. Last Access 22/11/2021

[2] What is AI?/Basic Questions, Answered by John McCarthy. http://jmc.stanford.edu/artificial-intelligence/what-is-ai/index.html Last Access 22/11/2021

[3] MIT Technology Review, "Google Unveils Neural Network with "Superhuman" Ability to Determine the Location of Almost Any Image**."** https://www.technologyreview.com/2016/02/24/161885/google-unveils-neural-network-with-superhuman-ability-to-determine-the-location-of-almost/. Last Access 23/11/2021

[4] The College Post, "AI Can Solve College-Level Math Problems in Seconds." https://thecollegepost.com/ai-solve-math-problems/ Last Access 22/11/2021

[5] Professor John McCarthy, Father of AI "The Branches of AI, Q and A session by John McCarthy." http://jmc.stanford.edu/artificial-intelligence/what-is-ai/branches-of-ai.html Last Access 22/11/2021

prospect of AI[6], the USA (United States of America) is investing over twenty-six billion dollars in total for AI funding in 2019, with sixty investments and five-hundred startups by the time of 2021.[7]

Arvind Krishna the Chairman and CEO of IBM[8] (International Business Machine Corp) has said that AI will add over ten billion dollars to the global economy, followed by a statement by the UAE (United Arab Emirates) that it will generate two-hundred billion dollars in productivity by adopting AI by the year 2030.[9]

However, though the use of AI may be commonly promulgated in commercial use, the efficiency such technology offers also invites it presences to another governmental institution, specifically the military with the development of an AI based weapon machinery called AWS (Autonomous Weapon System). By definition according to the U.S department of defense, an AWS is a system is capable to not only engage an enemy but to also make the decision to do so on its own, a level of autonomy that needs only a margin of human control or none at all.[10] As a system or software that AWS uses to rely on sensory recognition for its targeting.[11] It manifest in many levels of independence and form.

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[6] Center for Security and Emerging Technology. "China's Advanced AI Research, Monitoring China's Paths to "General" Artificial Intelligence." https://cset.georgetown.edu/publication/chinas-advanced-ai-research/. Last Access 22/11/2021

[7] Statista, "Artificial intelligence (AI) funding investment in the United States from 2011 to 2019." **https://www.statista.com/statistics/672712/ai-funding-united-states/** Last Access 22/11/2021

[8] IBM, "Arvind Krishna, Chairman and Executive of IBM." https://www.ibm.com/investor/governance/arvind-krishna Last Access 12/11/2021

[9] Leaf-EU, "Artificial Intelligence Will Add $10 Billion To The Global Economy Over The Next Decade – IBM CEO". https://leaf-eu.org/artificial-intelligence-will-add-10-billion-to-the-global-economy-over-the-next-decade-ibm-ceo/ Last Access 22/11/2021

[10] US Department of Defense, Autonomy in Weapon Systems, Directive 3000.09, Glossary, Part II Definitions.

[11] International Committee of The Red Cross, "What you need to know about Autonomous Weapon." https://www.icrc.org/en/document/what-you-need-know-about-autonomous-weapons Last Access 20/11/2021

There is the Fully Autonomous Weapons, A weapon with a system that is capable of engaging without any human intervention.[12] An example of this would be the Advanced Modular Armor Protection Active Defense System (AMAP-ADS) active protection weapons designed to protect vehicles by attacking incoming projectiles with a blast without any kind of human intervention when activated.[13]

Another is a Supervised Autonomous Weapon System that is capable of engaging but can be intercepted by a human to avoid unnecessary results. An example of this would be the Iron Dome Missile and rocket defense weapons made by Israel, a mobile-land based counter rocket system to intercept any attack but overall, always under supervision.[14]

With capabilities mentioned above, AWS provides a number of key strategic and operational advantages. They are significantly more competent than human warriors at adapting to and coping with the current battlefield's logical complexity in a faster pace[15]. The AWS is not subject to any type of emotional or traumatic distress experienced by human troops is not present on AWS. Thus, they can complete the tedious and dangerous activities without such impediment[16].

Not to mention the potential cut of cost in the use of such technologies as the Department of Defense of the U.S which declared that it had spent annually

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[12] US Department of Defence, Autonomy in Weapon Systems, Directive 3000.09.

[13] OVD, "Modular Active Protection System Integration for US Armored Forces.". https://www.overtdefense.com/2021/02/26/modular-active-protection-system-integration-for-us-armored-forces/ Last Access 02/07/2023

[14] Army Technology, "Iron Dome Air Defense Missile System Iron Dome is an effective, truck-towed, multi-mission mobile air defense system developed by Rafael Advanced Defense Systems." https://www.army-technology.com/projects/iron-dome/ Last Access 02/07/2023

[15] Jeffrey S. Thurnher, "Legal Implications of Fully Autonomous Targeting," *Joint Force Quarterly* 67 (4th Quarter, October 2012), http://ndupress.ndu.edu/Portals/68/Documents/jfq/jfq-67/JFQ-67_77-84_Thurnher.pdf

[16] Gary E. Marchant et al., "International Governance of Autonomous Military Robots," *Columbia Science and Technology Law Review* 12 (June 2011): 272–76. **http://stlr.org/download/volumes/volume12/marchant.pdf**

$850,000 for each soldier in Afghanistan if not higher. In contrast to an autonomous weapon that is capable of doing the same job in the form of a rover to put as an example outfitted with a proper weapon which cost only $230,000.[17]

The prospect of the use of AWS in the military has led to a skyrocketing investment for AWS worldwide. The global market for Autonomous weapon system is expected to reach thirty billion dollars by the year of 2030, with North America exhibiting the highest compound annual growth rate of eleven percent for the period of 2021-2030. [18] Russia is developing Autonomous Combat Vehicle and AI guided missiles developed by JSC 766 UPTK[19] which Is a part of the infamous Kalashnikov group, according to the Russian President, Vladimir Putin who stated:

"… In the course of combat training, one should more actively master and test weapons and equipment with elements of artificial intelligence. Including a robotic complex, unmanned aerial vehicles, automated control systems." [20]

Indonesia, declared its interest in acquiring AWS for the Indonesian military forces AI weaponry to upgrade its armed capability to enforce and protect its interest. Indonesia President, Joko Widodo states that a leap of technological development will affect the military formulation of strategy and security. He

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[17] David Francis, "How a New Army of Robots Can Cut the Defense Budget," *Fiscal Times,* 2 April 2013 **http://www.thefiscaltimes.com/Articles/2013/04/02/How-a-New-Army-of-Robots-Can-Cut-the-Defense-Budget.** Last Access 19/11/2022

[18] Autonomous Weapons Market by Product: Global opportunity analysis. https://www.alliedmarketresearch.com/autonomous-weapons-market-A13132

[19] "Russia's AI Army: Drones, AI-Guided Missiles and Autonomous Tanks. A look at Russia's autonomous military capabilities as war rages in Ukraine." https://www.iotworldtoday.com/2022/02/27/russias-ai-army-drones-ai-guided-missiles-and-autonomous-tanks/

[20] *"*Putin spoke about the importance of introducing AI into the Russian weapons system**."** "*The use of artificial intelligence in weapons in the future will determine the outcome of the battle, said on Monday, December 21, Russian President Vladimir Putin at an expanded meeting of the collegium of the Russian Ministry of Defense.*" https://iz.ru/1102590/2020-12-21/putin-zaiavil-o-vazhnosti-vnedreniia-ii-v-rossiiskuiu-sistemu-vooruzhenii Last Access 07/09/2022.

proposed that the Indonesian military personnel should be educated in the use of Artificial Intelligence and nano machines in weaponry. [21]

South Korea establishes in turn a research center for AWS by KAIST (Korea Advanced Institute of Science and Technology) joined by Korea's leading defense company Hanwha system.[22] While China has remarked a $250 Billion annual budget for AWS and AI development.[23]

In fact, such weapons are already in use and deployed by the aforementioned nations and many others as well. In the demilitarized zone that divides both North and South Korea, a military hardware has been placed to ensure maximum effectiveness of security to the latter nation. The hardware came in a form of an AWS called Super Aegis 2, which is a gun turret that can deliver heavy firepower to any target it detects up to a distance of 2.2 Kilometers, equipped with a powerful camera that can withstand against extreme weather and an infra-red sensor to pick its targets.[24] A dangerous automaton that is developed by DoDAAM systems of South Korea.[25]

The Interim Government of Libya, the Government of National Accord Affiliated Forces (GNA-AF) with Turkish military support on Libya, was reported to have used an AWS in a drone attack in march of 2021 to the UNSC (United Nation Security Council).[26] The attack drone named Kargu-2, a

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[21] Tirto.Id. "HUT TNI: Jokowi Ingin Tentara Bisa Gunakan AI dan Teknologi Nano." https://tirto.id/hut-tni-jokowi-ingin-tentara-bisa-gunakan-ai-dan-teknologi-nano-f5A9 Last Access 22/11/2021

[22] New Atlas, "South Korea establishes research centre to develop autonomous weapons." https://newatlas.com/korea-ai-weapons-military-kaist-hanwha/53576/ Last Access 20/10/2022

[23] Justin Haner and Denise Garcia, "The Artificial Intelligence Arms Race: Trends and World Leaders in Autonomous Weapons Development," Global Policy Vol. 1,0 Issue 3, September 2019, Page 333.

[24] Research Gate, "Mapping the development of Autonomy in Weapon System." A depiction of the AWS Super Aegis 2. https://www.researchgate.net/figure/Robotic-sentry-weapons-DODAAMs-Super-aEgis-II-Source-DODAAM-Combat-robot-lethal_fig12_321224462

[25] New Atlas, "South Korea's autonomous robot gun turrets: deadly from kilometres away." https://newatlas.com/korea-dodamm-super-aegis-autonomos-robot-gun-turret/17198/ Last Access 20/10/2022

[26] Letter dated 8 March 2021 from the Panel of Experts on Libya established pursuant to resolution 1973 (2011) addressed to the President of the Security Council, Page 17.

Quadcopter built by the Turkish Company STM. As explained by John McCarthy, a drone such as the Kargu-2 uses a machine learning algorithm which enables it to operate in an autonomous sense, specifically designed as an anti-personnel weapon that can engage without any decision on its own, and as it detects its target, it would proceed charge close and explode on impact.[27]

Israel, has been reported to use AI-guided combat drones in Gaza. With no human input necessary, its drones are reported to swarm and link together using Artificial intelligence and proceed to commence an attack[28].

Even from the early 1990s, the AWS has already existed in the form of a drone named Harpy designed by the Israel Aerospace Industries.[29] Fitted with a loitering munition system[30], which patrols or "Loiters" around a pre-designated area, it proceeds to hit a target by detonation-by-impact with impeccable accuracy.

Dozens of projects have also been undertaken over the years by various nations with their own versions of Loitering Ammunition Weapons like the aforementioned Harpy. Research by the Center for the Study of the Drone at the Bard College reveals the increasing use of AWS throughout the decades[31], confirming That the AWS is here to stay.

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https://undocs.org/Home/Mobile?FinalSymbol=S%2F2021%2F229&Language=E&DeviceType=Desktop&LangRequested=False

[27] Lieber Institute, West Point, Articles of war. "THE KARGU-2 AUTONOMOUS ATTACK DRONE: LEGAL & ETHICAL DIMENSIONS." https://lieber.westpoint.edu/kargu-2-autonomous-attack-drone-legal-ethical/ Last Access 02/01/2023

[28] The U.S.SUN, "SEEK AND DESTROY, Israel uses first-ever AI drone swarm in battle to hunt down and blitz Hamas terrorists with NO human input." https://www.the-sun.com/news/3222879/israel-first-ever-drone-swarm-hamas/ Last Access 18/10/2022

[29] HARPY, Autonomous Weapon for All Weather. https://www.iai.co.il/p/harpy

[30] Defense Bridge, Loitering Munitions. "*A loitering munition (also known as a suicide drone or kamikaze drone) is an aerial weapon system category in which the munition loiters (waits passively) around the target area for some time and attacks only once a target is located.*" https://defensebridge.com/article/loitering-munition.html

[31] Bard College, Center for the study of the Drones, "Loitering Munitions, in focus." https://dronecenter.bard.edu/files/2017/02/CSD-Loitering-Munitions.pdf

The increasing use of AWS has raised concerns to the IHL (International Humanitarian Law) due to its unique characteristic has given rise to intense debates and discussions on multiple fronts. On proceedings of warfare, there are factors involve during war that it necessitates the existence of laws that control the conduct and approach of the military procedures, these regulations have been stipulated by many to be difficult and problematic with the involvement of Artificial Intelligence and AWS, whilst others argue otherwise that its use could actually increase the likelihood of moral choices and results.

To provide further context, IHL consists of regulations on the conduct of warfare. It lays down rules to ensure proper action towards entities participating in hostilities or otherwise in order to fulfill a moral and humanitarian results by imposing limits to the means and acts of engagement during fighting[32], which exists by principles determined by the laws itself. As the implementation of AWS would consider it to be a military entity, it is safe to say to be affected by the rules of the IHL as well.

To name a few, are the principle of proportionality[33] and the principle of distinction, that establishes the prohibition of an attack that may be expected to cause incidental loss of civilian life or injury to them or their objects, that which would be excessive in relation to the anticipated military advantage, As well as ensuring the primacy that the civilians and civilian objects must not be the subject of an attack itself, including those who are not directly participating in hostilities. And that any attack must be aimed towards combatants and military objectives. Which has been codified in multiple provisions of the Geneva

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[32] **What is international humanitarian law? https://www.icrc.org/en/document/what-international-humanitarian-law**
[33] International Humanitarian Law, Rule 14. Proportionality in Attack. *https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule14*

Convention, particularly to name a few are from the additional protocol I, such as Article 51[34] and article 57[35] of Additional Protocol I that collectively notes on the obligations of the armed parties, regarding the civilian protection and the precautionary of attacks in order to mitigate damages and indiscriminate attacks. Just as well as the Article 43[36], 48[37], 50[38], 51[39] and 52[40] of the Additional Protocol I and Article 4[41] of the Additional Protocol III, that gave the definitions and characteristic of combatants and non-combatants and the strict engagement and obligation in accordance to the aforementioned criteria of entities.

The protection also extends to a civil organization as well as entities not taking part in the hostilities as stated in Article 62[42] and Article 45[43] respectively of the additional protocol I. Elaborating that personnel of such organizations are entitled to perform their tasks except for essential military necessities, this includes buildings and materials that is of purpose with such establishments. Personnel that fall to the adverse party and that of which is taken should be presumed to be a prisoner of war even if the party is in doubt, unless determined by a competent tribunal.

And in the minimal of all circumstances, Article 75[44] of the Additional Protocol 1 demands that there must be a guarantee of humane treatment and

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[34] Additional Protocol I of the Geneva Convention, Article 51 – Protection of the civilian population.
[35] Additional Protocol I of the Geneva Convention, Article 57 – Precautions in Attack
[36] Additional Protocol I of the Geneva Convention, Article 43 – Armed Forces
[37] Additional Protocol I of the Geneva Convention, Article 48 – Basic Rule
[38] Additional Protocol I of the Geneva Convention, Article 50 – Definitions of Civilian and Civilian Population.
[39] Additional Protocol I of the Geneva Convention, Article 51 – Protection of the Civilian Population.
[40] Additional Protocol I of the Geneva Convention, Article 52 – General Protection of the Civilian Population.
[41] Additional Protocol III of the Geneva Convention, Article 4 – Prisoners of War.
[42] Additional Protocol I of the Geneva Convention, Article 62 – General Protection
[43] Additional Protocol I of the Geneva Convention, Article 45 – Protection of Persons Who Have Taken Part in Hostilities.
[44] Additional Protocol I of the Geneva Convention, Article 75 – Fundamental Guarantees.

must enjoy at the very least protection provided by the stated protocol, without any distinct discrimination based on the characteristic of the entity. The acts that are prohibited are violence to the well-being of a person such as murder, torture, mutilation and offensive mistreatment of the dignity of the person.

There are many more provisions in IHL that demands certain acts yet insofar it is with clarity from the provided elaboration above, that the IHL demanded appropriate acts and engagement in accordance to the circumstances that are involved by the military entities present during any armed conflict of all levels. And these conducts consist of both objective and subjective information that necessitates critical consideration from a military personnel capability to think critically and with complexity in order to ensure not only recognition of the circumstances of war but also reacts appropriately to the matter that is demanded by conduct.

Another simple example of this is the Article 18 of the Additional Protocol I[45], which states that parties in conflict have to endeavor to implement methods to ensure recognition of civilian units of various types by their own distinction E.g., by emblem or symbol. Which of course, is an issue when putting an AWS in the equation as an entity that is capable to engage with meaningful human control. These matters have resulted to the existence of a debates on the subject regarding the critical implications of the use of AWS.

According to Carl von Clausewitz, a prominent Prussian general during France revolution and also a military science thinker who wrote the book *On war,* believes that the war by its nature is uncertain and littered with dynamics[46].

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[45] Additional Protocol I of the Geneva Convention, Article 18 – Identification.
[46] Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret, ind. ed. (Princeton: Princeton University Press, 1984), page 89.

Meaning that there is varied context that demands specific acts to ensure a specific goal in war, as mentioned by the relevant laws as is the IHL above. Some of these context as provided by the ICRC and taken account in the aforementioned law for example are military objective and military advantage.

Military advantage are objects that which means the nature, location and purpose or use determines the action of the military and offers a military advantage through certain engagements.[47]

In addition, military advantage is a gain to a party of the conflict that is to be expected from an attack or any military actions.[48] All of these has been used in codified laws of the IHL relevant to the principle of proportionality and distinction as aforementioned on the paragraph above regarding the means and methods permitted to the armed forces during any conflict involving military force. In this we can conclude that there is information with varied nature established by the mentioned law, with such traits involve on the circumstances of war, it is with certainty the collective would question if AWS is capable to handle such prospect that needed human ability to not only absorb information but also act critically in accordance to it.

Applicable to the subjects mentioned regarding AWS capability, a study has been made to know regarding the characteristic of the intelligence on Artificial Intelligence. Mary Louise Cummings[49], a professor in the Duke University Pratt School of engineering and Brain Sciences, and director of the Humans and Autonomy Laboratory, has published a research paper on the characteristic and capabilities of an AI in warfare, aptly entitled "*Artificial Intelligence and the*

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[47] ICRC. Military objectives. https://casebook.icrc.org/glossary/military-objectives
[48] ICRC. Military advantage. https://casebook.icrc.org/glossary/military-advantage
[49] Duke, Pratt School of Engineering "Biography and Background Mary Louise Cummings," https://pratt.duke.edu/faculty/missy-cummings Last Access 11/11/2021

Future of Warfare".[50] According to the published document, an AI (or an Autonomous System according to the paper) decides on its behaviors and action by analyzing the information and pattern it absorbs through any sensory traits it has and guesses which outcome is the best possible conclusion, and proceed to make it so, Depending on the input it receives (The information it gathers) regardless if it is a repeat of the same or otherwise, the result would relatively come in a range of behaviors.[51]

The research stated that AIs adopt the human intelligence sequence of acquiring information as a basis, which is the perception-cognition-action information processing loop, where a human will absorb information through all its sensors from the ears, eyes and touch to consider the best course of action, but it started to differ when the research studied upon the relative strength of an AI compared to the human mind, by providing the levels of cognitive concepts.[52]

The concept basis came from aspects of information that decides on the acts level of uncertainty, these aspects of information are skills, rules, knowledge and expertise, the more these aspects exist in a task, the greater also the uncertainty. The research deduces that a profession that relies on skill based alone would be of the lowest of the uncertainty scale, as skill-based task relies on sensory-motoric action that will become highly automatic after some period

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[50] M.L. Cummings, "Artificial Intelligence and the Future of Warfare", International Security Department and US and the Americas Programme, January 2017.
[51] M.L. Cummings, "Artificial Intelligence and the Future of Warfare", International Security Department and US and the Americas Programme, January 2017., Page 3
[52] M.L. Cummings, "Artificial Intelligence and the Future of Warfare", International Security Department and US and the Americas Programme, January 2017., Page 5

of time. It is the otherwise to a profession that relies on all aspect of information.[53]

Compare a regular fast-food employee with a pilot. The former relies on heavily automatic routine of in most cases short and quick in access and delivery, whilst a Pilot not only has to memorize all the instances and the purposes of a planes dials and gauges but to also expertly manipulate such functions in accordance to the environment to ensure the safety of the passenger with each flight bearing varied possibilities and events to consider that relies on the pilot's capability to think critically and adapt on the occasion.[54]

A provided example by the paper of such human ingenuity on the essentialism of critical thinking and the ability to adapt is readily apparent on the US airways flight 1549 event on 2009, in which the pilot   Capt. Chelsey Sullenberger and his Co-Pilot Jeffrey have to decide on high stake choice on whether to ditch the aircraft or attempt to land on a nearby airport, as the engine broke from a migrating flock of Canada Geese. Using his experience, he learned from being an air force pilot and his decades of employ in the US airways, he resolved to make an unpowered ditching on the Hudson River, as the captain believed that he would be unable to reach a nearby airport safely. He expertly landed the plane whilst maintaining proper momentum and in part to the fuel thanks to make use of its buoyancy on the waters, ensuring the mitigation of damages and fostering proper safety for the passengers. An investigation is made by the NTSB (National Transportation Safety Board)

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[53] M.L. Cummings, "Artificial Intelligence and the Future of Warfare", International Security Department and US and the Americas Programme, January 2017. Page 5-6
[54] M.L. Cummings, "Artificial Intelligence and the Future of Warfare", International Security Department and US and the Americas Programme, January 2017., Page 6.

which they have verdict Capt. Chelsey and his Co Jeffrey have made an appropriate decision.[55]

It is plain, that due to the expertise and knowledge of the Pilots and their capability to make a quick assessment of the circumstances, which led to the best possible choice that save all people aboard. There were no fatalities and they were aptly hailed as national heroes. A state of affair an AI would be doubtful to surpass much less reach.[56]

Yet in March of 2014, on Geneva, Switzerland the ICRC have conducted an Expert Meeting regarding the technical, military, legal and humanitarian aspect of AWS[57], the second on March of 2016 that specifically discussed the implication of the increasing autonomy from the weapon itself.[58] Prominently provided by the words of experts who have directly converse on its implications on the laws provided by the IHL (International Humanitarian Law), through many notions. these expert meetings have made not only the same negativity but the positive implications to the use of such weapon as well.

Professor Marco Sassòli[59], provided one technical assumption that has been discussed is regarding its capability in targeting decisions during warfare that involves the existence of subjective judgements. As case-by-case basis, during

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[55] **US Airways flight 1549.** Water landing, Hudson River, New York, United States [2009] https://www.britannica.com/topic/US-Airways-Flight-1549-incident Last Access 21/09/2022

[56] M.L. Cummings, "Artificial Intelligence and the Future of Warfare", International Security Department and US and the Americas Programme, January 2017, page 6. "*The resultant fast mental simulation meant that he chose the ditching option, with clear success. At the time, no autopilot system had the capability to respond in such a manner (as remains the case, although there is active research in this area) ... ... particularly in the face of uncertainty (Gigerenzer, Todd and ABC Research Group, 1999). In humans, the ability to cope with the highest situations of uncertainty is one of the hallmarks of a true expert, but in comparison such behaviors are very difficult for computers to replicate*."

[57] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014.

[58] Expert Meeting, Autonomous Weapon System, Implications of Increasing Autonomy in the Critical Functions of Weapons. Versoix, Switzerland, 15-16 March 2016.

[59] Marco Sassòli is a Professor of International Law at the University of Geneva since 2004. He is also a Commissioner of the International Commission of Jurists (ICJ) since 2013 and a member of its Executive Committee since 2021. https://www.geneva-academy.ch/the-academy/about-us/experts/detail/25-marco-sassoli

times of war comes the modelling and indicators that must be assessed in order to make the best possible decisions, such situation unfortunately comes in many varieties, which would lead to difficulty for an AWS to make proper decision in line with existing regulations[60]. The IHL for example, particularly principle of proportionality and the Principle of Distinction. As concrete and military advantage or plan resulting from an action or an attack could change in accordance to the commanders' strategy and the development of military operation from any party involved.[61]

The difficulty arises in continuing duty from target planning to execution and determining feasible precaution. As principle of proportionality and distinction imply, there are obligations to verify the characteristics of the circumstances and the legality of an action, this is done to ensure the utmost minimal incidents or avoiding one entirely. As AWS is used in terms of their sensory capability and ability to change behavior, there must also be an obligation to ensure it can be as capable to perceive the environment as a human being can[62].

A second technical assumption that has been discussed and presented is that though AWS has the capability to adapt through machine learning, the notion that they have no limit in their autonomy could lead to further ramifications with the IHL (International Humanitarian Law), particularly for the fact that they cannot be an addressee of the law and therefore incapable to be held

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[60] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, page 41.
[61] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, Page 42.
[62] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014., page 42.

responsible.[63] In a traditional sense, when a decision has been made that lead to acts of violation, the proper proceeding would be the undertaking of prosecutions, disciplinary actions and compensation/reparations. Unexpected result may happen in the use of machinery regardless of its immaculate work, malfunctions may occur and the machine learning capability may adapt with wrong information, The issue arises when the use of AWS leads to the lack of human control, which would lead to difficulties in determining culpability[64], when considering the fact that a machine have no sense of ethic[65], it would be nonsensical to attribute responsibility to a machine when it does commit violation.

The true source of the difficulties come from the requirement of *mens rea[66]* or the mental intent. With no human control on the action of AWS, the wider loop exists to see the causality of its use, there is the commander that allows deployment of the weapons, the engineers that work on its programs and the field soldiers that may directly uses them on war. though the user of AWS is expected to have foresight in its use. The specific details of the technology may be indefinite to the authority, hence when an act of violation occur with its use it would result in pointing fingers and accusation with inconclusive results.[67]

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[63] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, Page 41, paragraph 1.

[64] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, page 45

[65] Expert Meeting, Autonomous Weapon System, Implications of Increasing Autonomy in the Critical Functions of Weapons. Versoix, Switzerland, 15-16 March 2016. page 40.

[66] Legal Dictionary, "The concept of **mens rea**, which is Latin for "guilty mind," allows the criminal justice system to distinguish someone who set out with the intention of committing a crime from someone who did not mean to commit a crime. **Mens rea** refers to what the accused individual was thinking, and what his intent was at the time the crime was committed." https://legaldictionary.net/mens-rea/ Last Access 20/11/2022

[67] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, page 46-47.

However, arguments in the support of AWS also have been forwarded. Professor Marco Sassòli, accounts for two technical assumptions mentioned above. He presented that an engagement delivered by the AWS would also have beneficial aspect towards the principal of distinction, precaution and proportionality. The argument came from the notion that only a human can act in a manner that is inhuman, stipulating in the sense that only human beings can make a drastic and conscious choice to not comply with the rules or orders they are demanded to follow during such times of warfare.

This is further extended by Ronald Arkin, a professor in the Georgia Institute of Technology[68] who questioned that human behaviors have been questionable in adhering to established conducts. He gave potential examples on the occurrence that could lead a human to do acts of violation in war, such as a tendency to seek vengeance due high loss of friendlies, questionable chain of command that results in weak leadership, the dehumanization of the opposing armed forces by monikers and derogatory names, the immaturity and inexperience of the troops, a need to produce high body counts and in the least favorable of circumstances a psychopathic tendencies in deriving pleasure from killing or through overwhelming sense of frustration.[69] With this implication involved there is a believe in implementing AWS some of these issues would be addressed at the very least.[70]

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[68] Georgia Tech, College of Computing. Ronald Arkin Biography. https://www.cc.gatech.edu/people/ronald-arkin Last Access 21/11/2022

[69] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, Page 33-34. *See also,* US Surgeon General's Office, Mental Health Advisory Team (MHAT) IV Operation Iraqi Freedom 05-07, Final Report, 17 November 2006.

[70] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, page 33

Unlike the human factor and capability to feel emotion, fatigue and various instinct to survive, a machine cannot feel such thoughts and acts. An AWS cannot feel hate or fear that could lead to a human acting in a vile manner such as rape and torture and only will be demanded to make actions that it has been programmed, to do so which to add that it can delay to engage in force unless it is of the most appropriate or opportune times as it is established by the legitimacy of the attack and the target. Complimenting this, the professor (Marco Sassòli) stated that with the AIs capability to process information faster than a human can, it is possible for them to deliver acts of force in a fast pace and more complex, whereas a human may be overwhelmed with such drastic circumstances where there is too much information to be considered, thus by extension a compliance to the IHL.[71]

Another argument added to the idea, is that there are still exist a factor of human control in the processes of warfare. The professor specifically mentions that there are obligations of precaution that entails to verify the nature of the attack or deployment, such as the legality of the act and the determination of the target, which if in compliance to the IHL means using methods to avoid and minimize any inhuman ideas and incidental effects on civilians and the addresses of the proportionality principle. With such aspects in mind, it is in the notion that though the AWS will have autonomy in its engagements during actions of direct warfare, the prelude of such events are still under human control, particularly during the phases of planning and decision making before the attack, which by proxy means that the human commanders are still within

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[71] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, Page 41-42

the equation. During such times, the human planners and commanders of any kind can determine or define the information and parameters needed to make proper choices by both human and AWS entity in accordance to the factors involved.[72]

Another direct argument also has been provided by Ronald Arkin in this subject, he states that the existence of AWS in the battlefield means a reduction in friendly casualties as well as the weapon would replace any human factors from dangerous circumstances, as it also acts as a force multiplier by extending the soldiers reach, expanding space and aid in responding faster on the circumstances, which by proxy means that the operators and the commanders would be capable to make a more effective choice in adherence to the IHL and in completing the military objective.[73]

With these elaboration in mind provided by the expert meeting, it is clear that the use of AWS is fundamentally the same with human infantry, relies on proper planning and deployment in accordance to the information of the military operation. Which led one to believe the fault if such a violation comes may result from improper establishment of military operation rather than the characteristic of the weapon or an entity itself.

Issues raised as well of course on the other spectrum of the prevailing use of AWS. With though there are recorded use of such a weapon worldwide, many have questioned regarding the lack of any regulations or legal instruments that could account on the autonomy of the weapon system. With reports that has told

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[72] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, page 42-43
[73] Expert Meeting, Autonomous Weapon System, Technical, Military, Legal and Humanitarian Aspects, Geneva, Switzerland 26-28 March 2014, page 34-35

of only several nations over hundreds have appropriates legal review process that entails and take account of the IHL humanitarian demands in its principles.

Thus it is the purpose of this thesis, the topic of Artificial intelligence of course is not an uncommon one in the realms of the law. Many such papers elaborated regarding the how AI changes society by its means of interactions and influence such as the paper "*PROGRESSIVE LAWS AND DEVELOPMENT OF ARTIFICIAL INTELLIGENCE TECHNOLOGY*" *by Qur'ani Dewi Kusumawardani.*[74] Another work is perhaps would entail on the implication of moral thinking of AWS in which they argue against its existence solely by its problematic traits such as the paper "*Arguments for Banning Autonomous Weapon Systems: A Critique*" by Hunter B. Cantrell of Georgia State University.[75] Another one that is heavy in relation would be the paper "*Marten's clause: filling the gaps for international humanitarian law in regulating autonomous weapons systems*" by Andrieta Rafaela[76] of UPH (Universitas Pelita Harapan), a senior of mine, in which the paper explores the deep characteristic of AWS and how to fill the lack of law with the Martens Clause as a basis.

Though there are similarities to be had from all of these works, especially the most latter one as we share the basic premise. The true novelty of my piece is that the paper will explore a rather controversial side on the support of the use of AWS in regards to IHL, arguing that there are merits in not only the use of

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[74] Qur'ani Dewi Kusumawardani Kementerian Komunikasi dan Informatika Republik Indonesia, HUKUM "PROGRESIF DAN PERKEMBANGAN TEKNOLOGI KECERDASAN BUATAN"

[75] Arguments for Banning Autonomous Weapon Systems: A Critique Hunter B. Cantrell Georgia State University. https://scholarworks.gsu.edu/philosophy_theses/250/

[76] Andrieta Rafaela, "Martens' clause: filling the gaps for international humanitarian law in regulating autonomous weapons systems." http://repository.uph.edu/13883/ (Search for 'Autonomous Weapons System Martens Clause')

the mentioned weapon but to argue that in its implementation is in line and in support to the international humanitarian law in question. As above discussion has entails, the implication of it is thoroughly in avid debate that still put the use of AWS in question in the equation. It is imperative to note that not only its merit of the aspects and capability of the system or weapon itself would be discussed, but also on the fields it is lacking as well in order to provide a proper conclusion at best in consideration to the law in topic. To conclude the author of this piece hopes to prove in defence of AWS and also provide help in the implications of the provisions in IHL regarding the existing of AWS in the battlefield and all its insinuations.

1.2 Formulation of Issue

In regards to the topic of this thesis, the author will explore and discuss the following questions of the subject:

1. How is the use of AWS regulated under IHL?

2. What are the safeguards that must be established to ensure compliance to the IHL?

1.3 Research Purposes

The Purposes of writing this thesis is to research and analyse:

1. The rules of governing the use of AWS under IHL.

2. Safeguards that can be applied to the AWS to ensure its compliance to the IHL.

1.4 Research Benefits

1.4.1 Theoretical Benefits

The theoretical purpose of this thesis, is to give further insights on the status of AWS use under IHL. It also elaborates on the nature of the aforementioned weapon system in depth and how such characteristic relates again to the international humanitarian law. with hope from the author, that the conclusion would provide an insightful understanding on the implications on the use of the Autonomous Weapon Systems in regards to the international humanitarian law in both side of the spectrum.

1.4.2 Practical Benefits

This thesis endeavors to educate the reader on the core legal issues on the use of a weapon that is capable of autonomy. The practical purpose is to relay and convince the reader, that such weapons have both exceptional capabilities that would aid in supporting and applying the regulated ethical behavior and actions demanded by the international humanitarian law. But also conveying critical flaws that the system has that would also in the same sense, compromise the mandate. By the end and with great hope, this thesis would address the concerns of the legal issue and allow for greater accessibility of the use of autonomous weapons in war in order to further apply the Geneva Conventions and its protocols, with consideration from both the positive and the flaws of the subject matter that would lead to a proper authentic conclusion.

1.5 Framework of Writing

This thesis will be arranged into chapters that will provide the necessary information that will be discussed:

CHAPTER 1: INTRODUCTION

The Introduction, contains general and relevant information on the topic itself, which consist of Background Formulation of Issue (Research Questions), Purpose of the research, Framework of writing.

CHAPTER 2: THE LITERATURE REVIEW

Consist of Theoretical framework and Conceptual framework, which will explain discussions, theories and concepts that relates to the topic regarding the use and legal issues of artificial intelligence and autonomous weapons in regards to the IHL and its relevant provisions and protocols, that will be used as a basis of this thesis.

CHAPTER 3: METHODS OF RESEARCH

Research Methodology, contains the explanation of the type of research the author uses for the making of this thesis, such as the type of research, data analysis method, the types of data and research approach. These are essential in ensuring a valid and accurate study. In this paper, the legal research will entail normative and empirical methods. Which would respectively rely on legal principles and implementation, just as well as state practice and case study. These methods will also rely on secondary data and primary data materials to strengthen the points of the legal research conducted on this thesis.

CHAPTER 4: DISCUSSION AND ANALYSIS

The discussion and Analysis will answer the formulation of issues, which would explore on research, what is the implication of an Autonomous Weapon System, its many types, how it changes warfare and its application in general and its deeper complexity in a legal sense of the IHL. This chapter will cover how does the characteristic of AWS is still in accordance to the existing provisions of the IHL and what is absent on the mentioned law's provisions that not only cover the evolution of warfare due to AWS but also the link that led such weapon to be stigmatised with legal issues prevailing it.

CHAPTER 5: CLOSING

This chapter will present the conclusion of this thesis that has been discussed chapter 4 and recommendation on the issues, raised by any suggestion and recommendation that is useful and relevant to the topic.