

The development of Lethal Autonomous Weapon System and its impact on arms control negotiations

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ABSTRACT. *With the development of high-technology and artificial intelligence, conventional weapons have become more intelligent. A large amount of high technologies have been used in weapons, lethal autonomous weapon system is a typical example. Compared with conventional automatic weapon, autonomous weapon can make its own decisions, which has brought new challenges to arms control. The structure of this passage is as follows: First, we give the definition of this new weapon system. Second, we introduce the development process and current situation of this weapon system. Third, we introduce the motivation to develop this weapon system. The next part we introduce the threats and challenges of the new system and we will discuss the influence it may take to arms control negotiation. In the last part, we give some suggestions to regulate and better take advantage of the new weapon system.*

KEYWORDS: *Lethal Autonomous Weapon System, Global Governance, Artificial Intelligence*

1. Introduction

1.1 The definition of Lethal Autonomous Weapon System

The Lethal Autonomous Weapon System, which can also be called as LAWS, it is a new weapon system with the advent and development of artificial intelligence. The first word lethal, which means it can cause death of both soldiers and civilians. The second word autonomous means it can make its own decisions without human control compared with conventional weapons. It is in some degree given rights to make decisions, it can decide whether to strike or not. With the development of high-tech, artificial intelligence is beginning to be used in this new weapon system. The algorithm of AI is planted into the operating system of the weapon system, with the continuous upgrading and self-improvement of the algorithm, the LAWS can make its own decisions.

There are three main degrees of autonomy:

(1) Remote control: the robot carries out the commands of a distant human operator, while supporting the operator through complexity reduction.

(2) Autonomous maneuvers under human steering control: A human operator can intervene at any point in time and override the autonomy of the robot.

(3) Autonomous execution of tasks without human control ,but with veto right:

A human operator can only intervene in the machine's operations with a veto command, for instance, by activating an emergency stop button. At present, there is still no clear definition of the scope and autonomy of weapons' lethality, so it is difficult to start arms control negotiations on such weapons.

1.2 Development process and current situation

The predecessor of autonomous weapon system is automatic weapon system, the difference between the two weapon systems is that the automatic weapon system is still controlled by human beings, it cannot make its own decision. By contrast, the autonomous weapon system is given self-decision making authority. More than 40 countries are exposed to be designing, researching and tending to put into practice the so-called lethal autonomous weapon system. Now some countries have already developed relevant weapon system .For example, the US has invented the “Square Array” weapon system. Israel has developed Habi system and Britain has developed Raytheon Jet Unmanned Combat Aircraft. Samsung has invented Tech-Win surveillance and security robot, which was deployed in the DPRK-ROK demilitarized zone. All of these weapon systems have some specific characteristics of the LAWS, but none of the is an absolute lethal weapon system. The improvement of the LAWS will take a long time to go.

At present, the research and development of related technologies are carried out secretly .Until now, no country has made a commitment not to develop this weapon system. The US practice of selective assassination, carried out mainly using armed UAVs in states like Yemen, Pakistan, or Somalia, has had a major impact in terms of stimulating political debate on the use of drones. Recently, the United States used drones to attack and kill general Sulaimani of Iran's Revolutionary Guard. Some people suggested that the United States should rely more on drones, cruise missiles, traditional combat aircraft air strikes and other means to carry out anti-terrorism operations, rather than large-scale ground war. The use of these autonomous weapons can reduce the casualties of war. China, Russia and the United States have not expressed support for the development of the LAWS, but there is no country against the development of the weapons system.

Compared with the government's vague statement. Some companies have made it clear that they are opposed to the research and development of the LAWS. More than 2000 experts in the field of artificial intelligence, including Elon Mask, founder of SpaceX, and founder of Google Deepmind have jointly signed the Declaration on the prohibition of the LAWS, pledge not to participate in the development of Lethal Autonomous Weapon System.

2. Methodology

LAWs is a weapon system created with the development of high technology, especially the development of artificial intelligence. The emergence of this new weapon system is bound to have an impact on the traditional arms control negotiation mode. Here, we can divide countries into four categories according to their economic and technological strength and willingness to develop such weapon systems: (1) capable and willing; (2) capable but unwilling; (3) lacking capability but willing; (4) lacking capability and unwilling.

capable and willing	capable but unwilling
lacking capability but willing	lacking capability and unwilling

As a result, there will be about four kinds of subjects in the formal situation of arms control negotiation, and the conflicts between the will and ability of each subject will inevitably hinder the negotiation process. Here we can introduce the game model. Considering that the main body of arms control negotiation is mostly great powers with relatively strong military and economic strength, we put forward two hypotheses. The first assumption is that the capable and willing powers are committed to the development of such weapon systems, but they believe that their research will not be used for active attacks on the battlefield, and other countries are willing to believe their commitment, then the development of such weapon systems will not lead to war and the whole process can be controlled. The second assumption is that the capable and willing powers are committed to the development of such weapon systems, but they do not make a commitment to restricted use of weapons, and other countries do not believe that their research purposes are purely self-defense. Then those countries that are not capable but facing security threats will conduct relevant research and even purchase relevant technologies with the help of the black market, which will hinder the whole process of arms control negotiation.

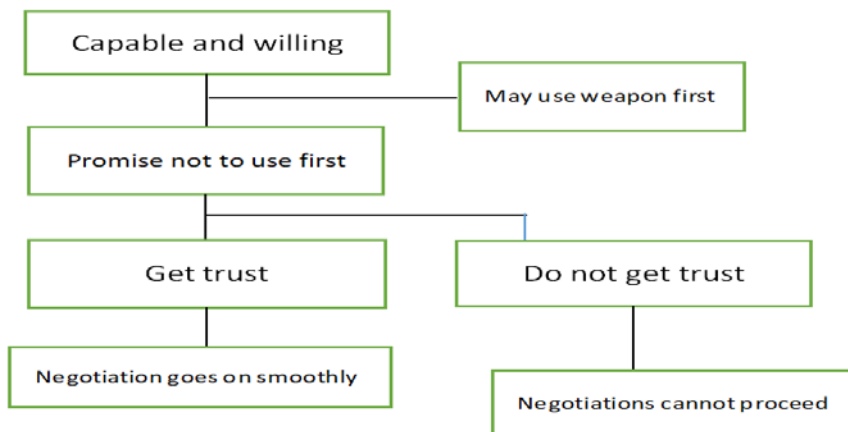


Fig.1

In addition, as the definition of lethal autonomous weapon system is not clear in the world, which will cause the fuzziness of the object of military control negotiation. As it is impossible to define it accurately, the next negotiation will be difficult to continue. Although in fact, many countries have begun to develop autonomous weapon system, However there is still no clear answer how autonomous and lethal the weapon is, what is the proportion of human manipulation. So if there is no precise definition of the weapon system, it's really hard to negotiate. Moreover, the ethical issues involved in the lethal autonomous weapon system and the challenges to the content of the international laws are all problems that may be encountered in the future negotiation process.

3. Results and discussion

3.1 The motivation to develop LAWS

The development of high-tech has promoted the rise of the weapon system, especially with the advent and development AI technology, the development process of autonomous weapon system has been accelerated. The algorithm of AI has been planted into the weapon system, which makes a robot can make its own decision like a human being, with the upgrading of algorithm, the robot can make more decisions. The weapon system was first designed to save soldier's lives in the battleground, robots can perform some dangerous tasks in place of soldiers, to reduce the casualties of war. However, soldiers cannot be replaced by robots, robots can just perform tasks according to the instruction planted in its operating system, they cannot own human's intelligence and wisdom, however accurate the algorithm is, the decisions made by robots are not totally reliable. Once the bad results have been reached, everything is so hard to recover, but manual operation can avoid major problems. When a well-trained soldier is on duty, he can distinguish soldiers and civilians and those who have surrendered or pretended to surrender. But a robot cannot make precise decisions when confronted with complex circumstances. Except for the development of high-tech, the game among great powers has also induced research and development of the Laws. Nowadays, the US is the only hegemon of the world, the trend of multi-polarization is increasing, the rise of emerging countries has challenged the hegemon status of the US, competition among great powers is rather intense, the game among hegemon state and emerging states has also accelerated the research process.

But it is still uncertain whether the weapon system can be used in practice, but related research is under way.

3.2 Threats and challenges

Once the new weapon system is put into use without good surveillance, it can not only threaten the existing international humanitarianism and human rights but also threaten the existing laws of war. Actually, the autonomous weapon system is a

killer machine, it can just decide whether to strike or not but cannot identify whether it is proper to do so. The challenge now is to embed human morality in machine algorithms so that it can make right decisions when faced with moral dilemma, which is also the greatest challenge for the development of artificial intelligence. Also, the machine algorithm still has errors, which cannot be avoided.

The autonomous weapon system has a relative lower threshold compared to other high-tech weapons, once the research process be terminated, the black market will become alive, relevant technology will be traded secretly, which can bring more difficulties to surveillance.

There is no specific rule prohibiting or restricting the use of LAWS, as International Humanitarian Law doesn't prohibit or restrict the use of autonomy in weapon systems. Some experts stressed that any development and the use of LAWS would need to comply with International Humanitarian Law. Whether LAWS could comply with IHL would depend on the type of weapons system and the specific tasks and the context in which the weapon would be used. Increased autonomy and complexity of the weapons systems would affect the predictability of that system. Concern was expressed that developing a weapons system with unpredictable effects would increase the risk that such a system would not conform with IHL.

For example, the United States currently used human-supervised defense weapon systems, autonomous capabilities designed to counter time-critical or saturating attacks. These weapon system include the Aegis ship defense system and the counter-rocket, Artillery, and Mortar System. (MW Meier, 2016) One of the biggest problems with high uncertainty targeting situation is time pressure. Identification and classification of such targets is always the highest priority, but when targets are moving and perceived as a target, there is limited time humans in control to make a high-quality decision. (Cummings, 2019) Research has shown that war-fighters under time pressure in the air and on the ground are predisposed to a number of psychological biases that cause them not to evaluate all relevant pieces of information, which in many ways leads to disastrous outcomes (Cummings, 2004, Parasur Parasuraman & Manzay, 2010) Recently, a Ukrainian Airliner crashed in Tehran, Iran has admitted that the Iranian missile unintentionally shot down the Ukrainian Airliner. At that time, the sensitivity of air defense system was improved, the Ukrainian airliner took off just in this sensitive and critical situation and it was too close to the sensitive strategic center, due to communication problems, the signal was interrupted when the operator asked for instructions from the superior and made the wrong decision, and the human error caused misfortune.

At the same time, the transfer of large quantities of data from the platform to the ground system requires huge bandwidth on satellite transponder. Already today, dedicated military satellites alone are insufficient to provide this bandwidth. Also, remote control via long distance radio involves a delay of up to several seconds. Locomotion as well as sensing, grasping and moving objects are still highly complex tasks for a robot to perform.

4. Conclusion

Although the lethal autonomous weapon system has not been put into practice, we should take precautions in advance. First of all, we should promote multilateral negotiation and seek a plan which is acceptable to all the parties on the basis of friendly consultation. We need to share information on weapons Reviews .Whether to deploy, and where to deploy should also be negotiated. Consider the specific population, environment, technology, military and civilian background. Secondly, we should also support the establishment of a multilateral regulatory system that ensures transparency, accountability and the rule of law. We should constantly improve relevant laws. Thirdly, We need to consider some remedial measures. The long standby time of autonomous weapons causes vulnerability and risks, so it is necessary to timely review and find loopholes and remedy them, such as remote patching, recalling weapons and other measures.

The continuous progress of science and technology is inevitable, although the LAWS has not been put into action, we should take precautions in advance. The Chinese side should advocate arms control negotiation process led by the United Nations.

With the development of high-tech, the Lethal Autonomous Weapon Systems will be created, what we can do is to control and restrict the use of this new weapon. We should make both high-tech and weapons serve for human beings.

References

- [1] Xu Nengwu; Ge Hongchang .Lethal Autonomous Weapon System and arms control negotiation thoughts[J]. Contemporary International Relations, 2018, No.345, 27+58-6
- [2] Dong Qingling. New War Ethics: Regulating and Restricting Autonomous Weapon Systems [J]. International Observation, 2018, No. 154, 57-72.
- [3] Dong Qingling. Artificial intelligence should not be used to harm lives [J]. China Investment, 2018, No. 479, 34-36.
- [4] Chen Huibin; Zeng Yang Zhi. Legitimacy and Future Challenges of Military Unmanned Systems [J]. Military Abstracts, 2018, No. 419, 51-55.
- [5] Liu Yang-yu. Autonomous Arms Control in the Perspective of Global Security Governance [J]. International Security Research, 2018, v.36; No.161, 51-73 + 159-160.