

Autonomous weapon systems



Source: Bertrand Bouchez/unplash.com

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Summary

- › Robotic weapons systems that can select and engage targets without any human intervention are standing on the edge of being tangibly implemented.
- › Proponents of this development expect decisive military and possibly even humanitarian benefits from such autonomous weapons systems.
- › Critics, however, raise concerns over whether it would be ethically justifiable, politically responsible and legally allowed in compliance with (international) law to delegate the decision on the life and death of human beings to machines.
- › Moreover, the development and possible use of AWS might entail some risks with regard to security policy.

What is involved

Enormous technological progress in the field of artificial intelligence (AI) is enabling a plethora of new applications that are about to penetrate and fundamentally transform all areas of the economy and life. This development does not stop at the military sector either. Intensive research and development projects worldwide aim at increasing the degree of autonomy of military systems as well as the military use of AI. Today, unmanned weapons systems with highly automated or autonomous functions, e.g. for navigation, target recognition or precise guidance (homing), are already in use. So far, however, the selection of the target, the decision to attack and finally the release of the trigger are the responsibility of a human commander or operator.

An autonomous weapons system (AWS) would be capable of carrying out all these steps on its own and without any (or with only minimal) human intervention. From a military point of view, this is attractive for two main reasons: On the one hand, an autonomous system does not require a communication link to a base station. On the other hand, it allows a faster response in combat situations, since there are no delays caused by the runtime of data transmission and by the decision-making process or response time of a human

operator. This is why the increase of autonomy of weapons systems is on the agenda of all technologically advanced countries and has triggered a global debate. As the autonomy of weapons systems increases, particularly one central question becomes virulent: Would it be ethically justifiable, politically responsible and legally allowed in compliance with (international) law to delegate the decision on the life and death of human beings to machines?

State of development and trends

Autonomous weapons systems capable of targeted action in combat operations in a complex dynamic environment without any human control do not yet exist. However, over the last ten years, the number of state and non-state actors who have unmanned weapons systems (UWS) available in their arsenals and who partly have already deployed this kind of weapons in combat operations has increased significantly. This development is almost exclusively attributed to remote-controlled aerial combat drones. Advanced combat drones can have various autonomous functions, i. a. for flight control as well as navigation and reconnaissance tasks. However, these weapons are usually deployed using remote control and therefore ultimately still subject to human control. Modern guided weapons also have extensive autonomous functions. Once started, they can basically search for and engage targets completely independently based on stored signatures. Moreover, some models are said to have the ability to independently coordinate the attack strategy with other missiles in a salvo or swarm.

Aerial systems are the most advanced in development and predominant with regard to the proliferation of UWS. This is largely due to the fact that navigation, orientation and radio communication are much easier in the air than on

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land, on water or underwater. Although the significance of unmanned ground and maritime vehicles is also increasing, their operational capabilities are currently still largely limited to unarmed purposes (reconnaissance, surveillance, logistics, etc.). In addition to aerial systems, there is a strong motive particularly for unmanned underwater vehicles to implement largely autonomous operation for technical, operational and military strategic reasons. But armed ground vehicles equipped with more complex autonomous capabilities are also being worked on intensively. Inherently, there are numerous common aspects with civil research on autonomous driving. One focus of current research and development projects are unmanned systems that are able to communicate and cooperate in swarms.

Implications with regard to security policy

Whether the availability of AWS will lead to an earlier recourse to military force in the event of conflict or whether military conflicts will be conducted more violently is currently a controversial question.

In the event that the deployment of AWS significantly reduces the risk to the own soldiers, i. a. because AWS take on tasks that are dangerous for humans, the inhibition threshold regarding the use of violence might be lowered. Even below the threshold of full-scale wars, military operations to achieve political goals might become more attractive and increasingly the rule.

This argument loses much of its force, however, if not considering an asymmetric scenario – as it is currently the case with drone strikes in Afghanistan, Somalia and elsewhere – but one with opponents on an equal footing. In this case, the

The Guardium UGV made in Israel«



side using AWS would always run the risk of retaliatory measures or even escalation with an uncertain outcome. Particularly for the nuclear weapons states among themselves, this risk of escalation would seriously argue against a deployment of AWS that is intended as locally limited.

The availability of AWS might affect both stability in regional contexts and the strategic balance of nuclear powers. On the one hand, AWS might increase stability by using them (e.g. through reconnaissance missions) to obtain and analyse more information. This would provide a better basis and more time for human decision-makers to take into consideration all possible consequences of escalation and make a well-considered decision. On the other hand, AWS could help to speed up operations and decision-making processes to such an extent that people involved reach the limits of

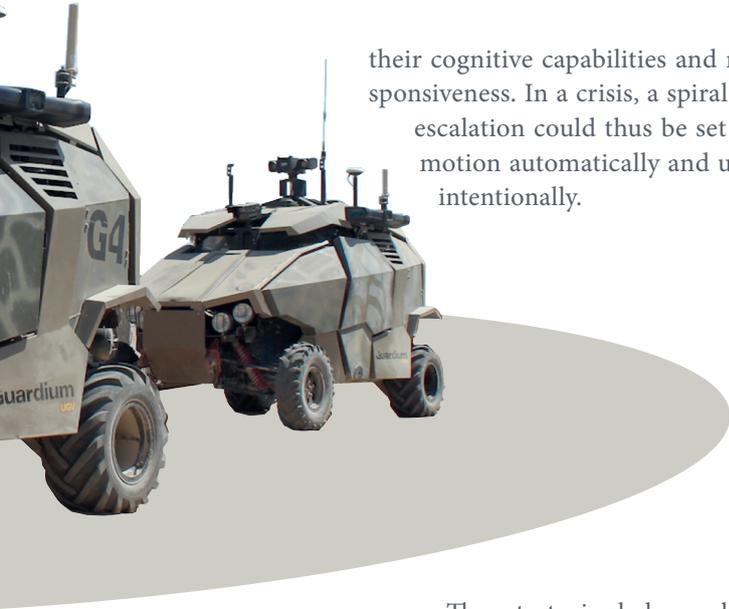
Autonomous, semi-autonomous or (highly) automated?

»Autonomous weapons systems should be banned« or »Autonomous weapons systems protect human lives«: The meaning of statements like these usually remains unclear, as it is not explained how the term »autonomous« is to be understood. It can mean the capacity for moral judgement, which only rational, free beings are capable of (in the sense of Immanuel Kant's philosophy). Autonomous weapons in this sense would thus have to show a general human-like intelligence including consciousness (strong AI) and not only simulate partial aspects of intelligent behaviour (weak AI). It is highly speculative whether such intelligent AWS will ever exist.

In contrast, autonomy can also be understood in purely operational terms. An AWS in this sense would be able to take actions without constant monitoring and control –

and therefore independently of humans. With this understanding of autonomy, however, a mine that explodes as soon as a certain weight is placed on it could also be called an autonomous weapons system – although its operating principle is based on a simple automatism.

Basically, the terms »automatic«, »automated« and »autonomous« – in this order – form a continuum of increasing complexity. However, a clear distinction between these terms is hardly possible. In particular, the red line from which a weapon system must no longer be referred to as semi-autonomous but fully autonomous is highly controversial. This is closely linked to the questions of whether humans still have sufficient control over the weapons system and who bears responsibility for its actions.



their cognitive capabilities and responsiveness. In a crisis, a spiral of escalation could thus be set in motion automatically and unintentionally.

The strategic balance between the nuclear weapons states is based on the assured second-strike capability and the resulting deterrence of a possible first strike. It is imaginable that very potent AWS might be used in the future as conventional first-strike weapons to destroy the enemy's nuclear weapons arsenals. One conceivable scenario would be AWS, which could autonomously detect targets such as missile silos or submarines armed with nuclear weapons, remain undetected in their vicinity and then attack and destroy them on command in a coordinated manner. The mere fear that such a use of AWS would be actively pursued could seriously undermine strategic stability.

As explained above, the major powers ascribe a high military value to autonomous technologies in the long term. Technological breakthroughs by one side could fundamentally shake the existing balance of power. It is to be feared that

this will fuel arms races. Today already, an incipient arms race can be observed with increasingly automated UWS (unmanned weapons systems).

International humanitarian law and ethical considerations

International humanitarian law (IHL) is designed to ensure the maximum protection of civilians, non-military buildings and infrastructures as well as the natural environment in the event of international armed conflicts. According to IHL, the use of weapons can only be permissible if, firstly, it is directed only against military targets (principle of distinction). Secondly, collateral damage to civilians and civilian objects must not be excessive in relation to the direct military utility of the operation (principle of proportionality). Thirdly, the means of least harm to the civilian population or civilian objects must be chosen (principle of precaution).

As a basic prerequisite for an AWS to be deployed in compliance with international law, it must therefore be able to reliably identify legitimate military targets. Whether this will be technically feasible at some point can hardly be reliably predicted from today's perspective. Considering the current rapid technological development, it does not seem impossible at least.

However, the real problem is different, since the mere identification of a person or object is far from sufficient to determine whether it is a legitimate military target. This requires a more comprehensive situation awareness as well as an assessment of the opponent's behaviour and – ultimately – intentions. For example, it is difficult to imagine how a wounded soldier could surrender to an AWS. This

The UN Convention on Certain Conventional Weapons (CCW)

The central forum for the debate on a possible containment of AWS at the international level is the UN Convention on Certain Conventional Weapons (CCW). This UN agreement was adopted in Geneva in 1980 and has been signed by 125 states so far. Since 2014, the issue of AWS has been on the agenda of the CCW. In 2016, a Group of Governmental Experts (GGE) was established to clarify technological and definitional issues and, where appropriate, pave the way for formal negotiations on the prohibition or other regulation of AWS.

There is a broad consensus that there shall be no AWS that can or may make decisions on the use of violent means against people without any human intervention. Beyond that, however, there are only few agree-

ments in the positions of the individual states. Even a commonly agreed definition of AWS is still missing.

Some states and NGOs are calling for a prohibition or ban of AWS. Others currently prefer softer options, such as transparency and confidence-building measures. Still others are opposed to any political activity, as there is not yet sufficient knowledge of AWS and their implications. As binding agreements require the unanimity of the CCW Parties, the chances of success of this process must be considered rather in a longer-term context – particularly since answers must be found to a complex series of issues, e.g. with regard to adequate verification, progressive proliferation or arms export control.

would require the correct interpretation of subtle signals including emotional signals as well as verbal and non-verbal communication. There are justifiable doubts as to whether AWS will be able to cope with such a situation in the foreseeable future.

Proponents of AWS point out that these weapons are not subject to typical human imperfections, such as fatigue, strong emotions (fear, anger, desire for revenge), etc., which – again and again – lead to violations of IHL and even to serious war crimes. Moreover, AWS would operate more precisely and faster than humans and would not have to fire for self-defence before they have got a comprehensive situation awareness. Thus, the deployment of AWS might bring significant humanitarian benefits.

In contrast, in the ethical debate on AWS, the argument is often put forward that killing people by means of autonomous systems is not compatible with human dignity. The victims would be undignified by being degraded to target objects in a purely technical process. In Germany and in many other liberal democratic societies, human dignity is considered to be a fundamental value that is particularly worthy of protection.

Outlook

The increasing use of automated and future autonomous weapons systems might represent a paradigm shift that will revolutionise warfare in the 21st century. The topic of AWS raises many questions: Is their deployment compatible with the principles of international humanitarian law? Does their proliferation trigger new armament dynamics? And what are the consequences for international security as well as regional and strategic stability? The international community has begun to address these issues.

There is currently a window of opportunity to develop an internationally coordinated, targeted approach to limit the potential threats that AWS could imply. This window is gradually closing as technological development advances and autonomous functions are being continuously integrated into weapons systems of all kinds, thus consolidating structures

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Autonome Waffensysteme

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and creating facts that make regulatory intervention difficult or even impossible. In the context of the implications that the international community will have to face in the future due to autonomous weapons systems, it seems to be urgently needed to address these challenges immediately and develop solutions. Within the framework of the UN Convention on Certain Conventional Weapons (CCW) and beyond, there are many ways of taking action to stimulate international dialogue, increase transparency and confidence and limit identified risks of AWS. Political and diplomatic initiatives in this regard require persevering efforts and a broad discourse involving science and civil society.

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