

In, on or out of the loop

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Three terms for the human role in systems that detect and engage targets on their own have entered the industry's everyday language. Documents give them specific meanings, and each of them costs a different number of seconds.

Counter-drone systems are said to have a human in the loop, on the loop or out of it. The terms appear in sales material, in debates and in government documents, often without an explanation of what they mean. This piece puts them in order using the documents that give them content. It also shows how much time each of the three roles costs.

THREE ROLES

In the loop, a human decides on every use of force, and the system only detects and designates the target. On the loop, the system selects and engages the target itself, while a human supervises it and can stop it. Out of the loop, the system operates without supervision once activated. The roles differ in who takes the decision and how much time a human has to change it.

WHAT THE DOCUMENTS SAY

The most frequently cited document is American. Department of Defense Directive 3000.09 of 2023 requires autonomous systems to allow appropriate levels of human judgment over the use of force. It does not require a human in the loop in every scenario. Its definition of an autonomous weapon system expressly includes systems supervised by an operator who can override them, which is the role on the loop. The directive also exempts a certain group of operator-supervised systems from additional review at the highest level. These are systems that engage materiel targets to intercept time-critical or saturation attacks against installations and their personnel. That is almost exactly a description of defending a site against drones.

The International Committee of the Red Cross takes a different view. In its 2021 position it called on states to adopt new, binding rules. It proposes prohibiting systems that are unpredictable or that target people directly, and strictly restricting the rest. This two-tier division has made its way into the work of the United Nations.

The group of governmental experts under the Convention on Certain Conventional Weapons adopted eleven guiding principles in 2019. One of them states that human responsibility for decisions on the use of weapons must be retained, because accountability cannot be transferred to machines. The UN General Assembly adopted resolutions on autonomous weapon systems in 2023, with 152 states in favour, and in 2024, with 166. A third followed on 1 December 2025, with 164 in favour. The working draft of a future instrument, developed by the same group of experts, rests on the division between prohibitions and restrictions. The review conference of the convention will decide on the next steps between 16 and 20 November 2026.

All these documents concern war and international humanitarian law. Protecting a power plant or a refinery in peacetime falls under national law.

WHAT THE LAWS OF THE THREE COUNTRIES SAY

The Polish Aviation Law lists the persons authorised to destroy a drone, including employees of specialised armed security formations. The Czech bill requires a designated employee first to establish that the flight is unauthorised, to warn the pilot where possible and to weigh proportionality. The Latvian law allows a guard to act without warning, on the guard's own assessment of the threat. All three texts assume that a human decides and acts, and none expressly provides for a device that decides on the use of force itself. Grzegorz Matyasik of the Eastern Flank Institute notes that the Polish operator-decision requirement, meant to secure legality, is also the system's main operational weakness.

WHAT EACH ROLE COSTS

The time-budget model makes it possible to compare the three roles on the same target. In the loop, the system checks the flight's authorisation automatically and a human decides, with a median of 45 seconds. A guard then carries out the decision. On the loop, the rule is set in advance and the system fires unless a human vetoes it within a fixed time window. Out of the loop, there is no such window. The table shows the chance that the procedure finishes before a medium-speed target covers the detection distance.

Detection distance	In the loop	On the loop, veto 20 s	On the loop, veto 10 s	On the loop, veto 5 s	Out of the loop
2 km	81.8%	100.0%	100.0%	100.0%	100.0%
1 km	12.6%	100.0%	100.0%	100.0%	100.0%
500 m	0.0%	0.0%	99.2%	100.0%	100.0%
300 m	0.0%	0.0%	0.0%	21.5%	99.6%

Illustrative model, target flying at 21 metres per second, 20,000 draws per cell with a fixed random seed. The code for this table is in the model package available for download.

With detection at two kilometres, every role usually finishes in time. At one kilometre, a human in the loop finishes in time in only one case in eight. The supervised system still finishes in every draw. At 500 metres, even a twenty-second veto window is too long. At 300 metres, only the system out of the loop finishes reliably in time. The shorter the veto window, the less time a human has to understand what the system is about to do and to stop it.

THE COST IN TIME AND THE COST IN CONTROL

Each role has two costs. A human in the loop gives the fullest control and costs the most time. A human on the loop saves time, but their control depends on the length of the veto window. Out of the loop, time is shortest and human control ends at the moment of activation. The documents differ on where a reasonable balance lies. The Department of Defense treats supervised autonomy against materiel targets in the defence of installations as a standard case. The Red Cross wants strict limits. National laws in the region still assume a human who decides. Choosing the role for a given site is therefore a legal and political question, not only a technical one.

Declaration of interest. The author is the founder of Silesian Advanced Systems, a team developing an autonomous counter-drone system ahead of incorporating a company. The system is intended to operate in the role this piece calls on the loop, with a human veto in automatic mode. This gives the author a direct interest in the subject. The text describes the terms and their time cost on the basis of the sources listed and the published model, without assessing any particular solution.

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