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Defense Primer: U.S. Policy on Lethal Autonomous Weapon Systems

Lethal autonomous weapon systems (LAWS) are a special class of weapon systems that use sensor suites and computer algorithms to independently identify a target and employ an onboard weapon system to engage and destroy the target without manual human control of the system. Although these systems generally do not yet exist, it is believed they would enable military operations in communications-degraded or -denied environments in which traditional systems may not be able to operate.

Contrary to a number of news reports, U.S. policy does not prohibit the development or employment of LAWS. Although the United States does not currently have LAWS in its inventory, some senior military and defense leaders have stated that the United States may be compelled to develop LAWS in the future if potential U.S. adversaries choose to do so. At the same time, a growing number of states and nongovernmental organizations are appealing to the international community for regulation of or a ban on LAWS due to ethical concerns.

Developments in both autonomous weapons technology and international discussions of LAWS could hold implications for congressional oversight, defense investments, military concepts of operations, treaty-making, and the future of war.

U.S. Policy

Definitions. There is no agreed definition of lethal autonomous weapon systems that is used in international fora. However, Department of Defense Directive (DODD) 3000.09 (the directive), which establishes U.S. policy on autonomy in weapons systems, provides definitions for different categories of autonomous weapon systems for the purposes of the U.S. military. These definitions are principally grounded in the role of the human operator with regard to target selection and engagement decisions, rather than in the technological sophistication of the weapon system.

DODD 3000.09 defines LAWS as "weapon system[s] that, once activated, can select and engage targets without further intervention by a human operator." This concept of autonomy is also known as "human out of the loop" or "full autonomy." The directive contrasts LAWS with human-supervised, or "human on the loop," autonomous weapon systems, in which operators have the ability to monitor and halt a weapon's target engagement. Another category is semi-autonomous, or "human in the loop," weapon systems that "only engage individual targets or specific target groups that have been selected by a human operator." Semi-autonomous weapons include so-called "fire and forget" weapons, such as certain types of guided missiles, that deliver effects to human-identified targets using autonomous functions.

The directive does not cover "autonomous or semi-autonomous cyberspace systems for cyberspace operations; unarmed, unmanned platforms; unguided munitions; munitions manually guided by the operator (e.g., laser- or wire-guided munitions); mines; [and] unexploded explosive ordnance," nor subject them to its guidelines.

Role of human operator. DODD 3000.09 requires that all systems, including LAWS, be designed to "allow commanders and operators to exercise appropriate levels of human judgment over the use of force." As noted in an August 2018 U.S. government white paper, "'appropriate' is a flexible term that reflects the fact that there is not a fixed, one-size-fits-all level of human judgment that should be applied to every context. What is 'appropriate' can differ across weapon systems, domains of warfare, types of warfare, operational contexts, and even across different functions in a weapon system."

Furthermore, "human judgment over the use of force" does not require manual human "control" of the weapon system, as is often reported, but rather broader human involvement in decisions about how, when, where, and why the weapon will be employed. This includes a human determination that the weapon will be used "with appropriate care and in accordance with the law of war, applicable treaties, weapon system safety rules, and applicable rules of engagement."

To aid this determination, DODD 3000.09 requires that "[a]dequate training, [tactics, techniques, and procedures], and doctrine are available, periodically reviewed, and used by system operators and commanders to understand the functioning, capabilities, and limitations of the system's autonomy in realistic operational conditions." The directive also requires that the weapon's human-machine interface be "readily understandable to trained operators" so they can make informed decisions regarding the weapon's use.

Weapons review process. DODD 3000.09 requires that the software and hardware of all systems, including lethal autonomous weapons, be tested and evaluated to ensure they

> Function as anticipated in realistic operational environments against adaptive adversaries; complete engagements in a timeframe consistent with commander and operator intentions and, if unable to do so, terminate engagements or seek additional human operator input before continuing the engagement; and are sufficiently robust to

minimize failures that could lead to unintended engagements or to loss of control of the system to unauthorized parties.

Any changes to the system's operating state—for example, due to machine learning—would require the system to go through testing and evaluation again to ensure that it has retained its safety features and ability to operate as intended.

Senior-level review. In addition to the standard weapons review process, a secondary senior-level review is required for LAWS and certain types of semi-autonomous and human-supervised autonomous weapons that deliver lethal effects. This review requires the Under Secretary of Defense for Policy, the Chairman of the Joint Chiefs of Staff, and either the Under Secretary of Defense for Acquisition and Sustainment or the Under Secretary of Defense for Research and Engineering to approve the system "before formal development and again before fielding in accordance with the guidelines" listed in Enclosure 3 of the directive. In the event of "urgent military operational need," this senior-level review may be waived by the Deputy Secretary of Defense "with the exception of the requirement for a legal review."

The United States is not currently developing LAWS; therefore, no weapon system has gone through the senior-level review process to date.

International Discussions of LAWS

Since 2014, the United States has participated in international discussions of LAWS, sometimes colloquially referred to as "killer robots," under the auspices of the United Nations Convention on Certain Conventional Weapons (UN CCW). In 2017, these discussions transitioned from an informal "meeting of experts" to a formal "Group of Governmental Experts" (GGE) tasked with examining the technological, military, ethical, and legal dimensions of LAWS. In 2018 and 2019, the GGE has considered proposals by states parties to issue political declarations about LAWS, as well as proposals to regulate them.

In addition, approximately 25 countries and 100 nongovernmental organizations have called for a preemptive ban on LAWS due to ethical concerns, including concerns about operational risk, accountability for use, and compliance with the proportionality and distinction requirements of the law of war. The U.S. government does not currently support a ban on LAWS and has addressed ethical concerns about the systems in a March 2018 white paper, "Humanitarian Benefits of Emerging Technologies in the Area of Lethal Autonomous Weapons." The paper notes that "automated target identification, tracking, selection, and engagement functions can allow weapons to strike military objectives more accurately and with less risk of collateral damage" or civilian casualties.

Although the UN CCW is a consensus-based forum, the outcome of its discussions could hold implications for U.S. policy on lethal autonomous weapons.

Potential Questions for Congress

- To what extent are potential U.S. adversaries developing LAWS?
- How should the United States balance LAWS research and development with ethical considerations?
- What role should the United States play in UN CCW discussions of LAWS? Should the United States support the status quo, propose a political declaration, or advocate regulation of or a ban on LAWS?
- If the United States chooses to develop LAWS, are current weapons review processes and legal standards for their employment in conflict sufficient?

CRS Products

CRS Report R45178, *Artificial Intelligence and National Security*, by Kelley M. Sayler

CRS Report R44466, *Lethal Autonomous Weapon Systems: Issues for Congress*, by Nathan J. Lucas

CRS Report R45392, *U.S. Ground Forces Robotics and Autonomous Systems (RAS) and Artificial Intelligence (AI): Considerations for Congress*, coordinated by Andrew Feickert

Other Resources

Department of Defense Directive 3000.09, "Autonomy in Weapon Systems," Updated May 8, 2017, https://www.esd.whs.mil/portals/54/documents/dd/issuances/dodd/300009p.pdf.

U.S. Government, "Humanitarian Benefits of Emerging Technologies in the Area of Lethal Autonomous Weapons," March 28, 2018, https://www.unog.ch/80256EDD006B8954/(httpAssets)/7C177AE5BC10B588C125825F004B06BE/$file/CCW_GGE.1_2018_WP.4.pdf.

U.S. Government, "Human-Machine Interaction in the Development, Deployment and Use of Emerging Technologies in the Area of Lethal Autonomous Weapons Systems," August 28, 2018, https://www.unog.ch/80256EDD006B8954/(httpAssets)/D1A2BA4B7B71D29FC12582F6004386EF/$file/2018_GGE+LAWS_August_Working+Paper_US.pdf.

United Nations Office at Geneva, "Background on Lethal Autonomous Weapons Systems in the CCW," https://www.unog.ch/80256EE600585943/(httpPages)/8FA3C2562A60FF81C1257CE600393DF6?OpenDocument.

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